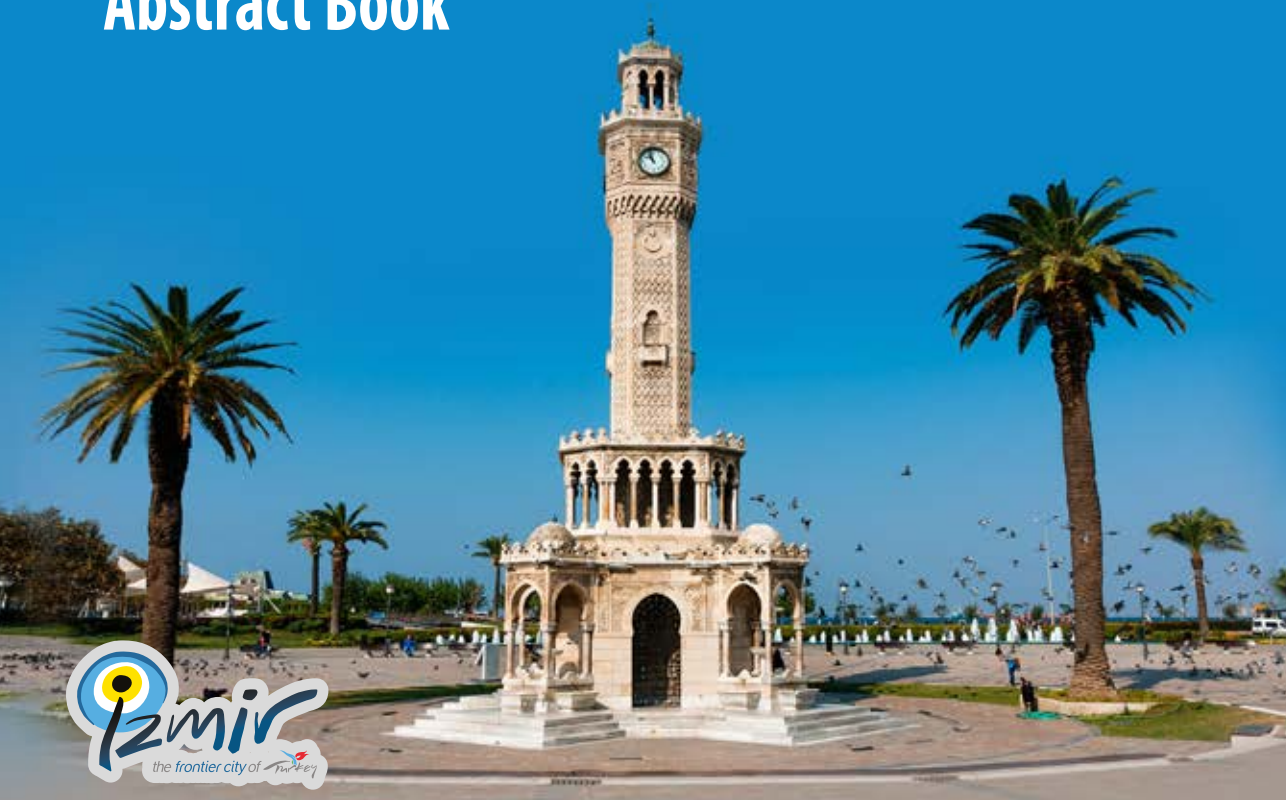
7th GLOBAL CONFERENCE on GLOBAL WARMING

GCGW - 2018

June 24 - 28, 2018

Hotel Wyndham Grand Izmir Ozdilek, Izmir, Turkey

Abstract Book



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ABSTRACT BOOK

INDEX

FOREWORDS

MESSAGE FROM THE CHAIRS

Global Conference on Global Warming (GCGW) is a multi–disciplinary international conference on all aspects of global warming including its evidence, causes, impacts and potential solutions. This conference aims to provide a forum for the exchange of technical information, dissemination of high-quality research results, presentation of new policy and scientific developments and promoting future priorities for a more sustainable development and energy security. It covers a broad range of topics on atmospheric changes, climate change impacts, climate change modeling and simulations, energy and environment policies, energy resources and conversion technologies, renewables, emission reduction and abatement, waste management, ecosystem and biodiversity, sustainable development, etc.

GCGW has been organized successfully as a leading congress in the area since 2008; and GCGW-2018 is the 7th one of this conference series. The previous conferences were held in various parts of the world, namely three times in Istanbul, one time in Lisbon, Beijing and Athens successfully. The scientific part of the GCGW-2018 includes plenary sessions in which keynote speakers present as well as parallel sessions in which invited papers and general papers are presented in oral form. There are also poster presentation sessions. During the conference, awards best paper and best poster awards will be given to acknowledge the high quality of work of the participants. The social part of the GCGW-2018 includes a welcoming reception, a gala dinner, a boat tour, and an optional tour to some major touristic sites.

All the papers submitted to the conference have gone through a quick review process to increase the quality of these papers. Accepted papers have been published in the GCGW-2018 proceedings. After the conference ends, high-quality papers will be considered, in extended form, for publication in the special issues of the specific reputable international journals.

As we are all aware, a significant effort should be spent on organizing such an event. Many individuals voluntarily took a part in this organization and played key roles in its success. Thus, firstly, we would like to take this opportunity to express our sincere appreciation to the executive organizing committee and local organizing committee members for their exemplary efforts. Secondly, we would like to thank to the staff of Bros Company, particularly Mr. Alen Demirel, for their arrangements towards the organization of this conference. Thirdly, we would like to thank to all the sponsors and the cooperating organizations. Finally, we would like to express our gratitude to the GCGW-2018 keynote speakers, invited speakers, session chairs, presenters, and all attendees, who contributed to the success of this conference.

We hope that GCGW-2018 will lead to effective and fruitful discussions and collaborations between the participants from different disciplines, institutes and sectors from all over the World; and you will find this conference both enjoyable and valuable, and also enjoy the historical, cultural and natural beauty of Izmir, Turkey.

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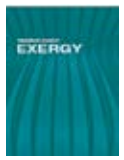
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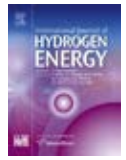
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KEYNOTE SPEAKERS

:: Paper No: GCGW 2018 – KT1 ::

LOW CARBON INNOVATION FOR AN ELECTRICITY DEPENDENT WORLD: OPEN ENERGY ACCESS

Feridun Hamdullahpur
University of Waterloo

Energy offers the promise of a better quality of life, but its production and use on a vast scale also brings with it unintended consequences. Impacts of greenhouse gas emissions on climate change reflects the dominant role fossil fuels in the existing global energy system. The threat of climate change has now become the central driver of action and the urgency of need to transform the energy system to one that is cleaner, greener and carbon friendly.

In this presentation, the conclusions of the 2016 Waterloo Global Innovation summit will be outlined. A technological road-map, with emphasis on innovation, for a low-carbon electrified future that has the promise and potential for meeting the global needs of a growing population will be presented as part of the summit outcomes.

:: Paper No: GCGW 2018 – KT2 ::

EXTREME WEATHER AND THE CHANGING CLIMATE

Kevin Trenberth

National Center for Atmospheric Research

The Earth's energy imbalance is caused by increasing greenhouse gases in the atmosphere and its partitioning between atmospheric, ocean, cryosphere and land heat reservoirs govern the rate at which the global climate evolves. Most of the imbalance, over 90%, goes into the ocean and accordingly ocean heat content (OHC) provides a primary indicator of climate change, along with sea level rise. 2017 was the warmest year on record for the global OHC down to 2000 m depth. It fuels storms of all sorts and contributes to very heavy rain events and flooding. For instance, hurricanes are certainly natural, but climate change is supersizing them! The observed increases of upper OHC supports higher sea surface temperatures and atmospheric moisture, and fuels tropical storms to become more intense, bigger and longer lasting, thereby increasing their potential for damage. At the same time sea level is also steadily rising, increasing risks from coastal storm surges. The damage and loss of life from such storms does not have to be disastrous, however, if there is adequate preparation through better building codes, drainage systems, shelters, and evacuation plans. We have the options of stopping or slowing climate change from humans, and/or adapting to and planning for the consequences, but we are not doing enough of either! Harvey in Houston, Irma in the Caribbean and Florida, and Maria in Puerto Rico are excellent cases in point of the tragedy of global warming.

:: Paper No: GCGW 2018 – KT3 ::

SUSTAINABILITY AND COMPLEX SYSTEMS THINKING TO DEAL WITH THE GLOBAL WARMING - PROCESS INTEGRATION EXTENSIONS AND ENVIRONMENTAL FOOTPRINTS IMPLEMENTATIONS

Jiří Jaromír Klemeš[1], Petar Sabev Varbanov[1], Ferenc Friedler[2]

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Energy and water supply and its efficient use in production are key to ensuring the healthy functioning of the world economies. Based on that, to ensure sustainability, the supply and use of energy, and recently increasingly water as well have to apply the principle of minimizing negative environmental impacts and even improving the environment through net-regenerative development. Climate change, together with the haze in growing megalopolis, and water scarcity area key environmental challenges of our time. The polluted air and water, especially in places with a large concentration of population and resources has been creating an increasing threat to the mankind. To solve those issues a complex thinking is very much needed. Traditionally the involvement of process and chemical engineering was considered as a cornerstone of a successful outcome, however global sustainability issues require the solution of a large system covering the whole planet. The close and strategic collaboration from most fields is a strong requirement. The complex systems thinking requires a close synergy of technologists, managers and economists, policymakers and politicians and related social scientists. In this context, ensuring cleaner energy and water is the cornerstone for cleaner production, especially for reducing the emissions of greenhouse gases and other pollutants, which are directly related to the types and loads of the energy sources used.

They are various emerging methodologies of sustainability assessment. The footprint methodology is one of gaining considerable attention. Greenhouse gasses (GHG – rather than just carbon) footprint becomes a widely accepted environmental accounting tool for business managers, policy makers and non-governmental organizations attempting to identify mitigation measures that reduce the threat of climate change. The industry is increasingly engaged as a part of policy development and product design. Footprints methodology have been reaching worldwide popularity, and the environmental issues they are addressing become increasingly diverse, such as climate change freshwater use (water footprint), land use (land footprint), material use (material footprint), Business (financial footprints) and well as the society and living conditions (health and employment footprints)

This presentation a review of the main lessons recently learned in the field of more efficient energy use, cleaner fuels and biofuels, cleaner production, CO_2 capture, optimization, water and waste management, including process level emission minimization, self-sufficient regions, and industrial symbiosis for optimizing usage of waste heat and waste material flows.

As an illustrative case study of a toll following complex systems thinking is presented the development of Process Integration. It originated from Heat Integration to target the minimum heat requirements and following the demand being extended to Total Sites, Locally Integrated energy systems and even to self-sufficient regions methodology. To cover the complexity the Water, Hydrogen and Power Integration and their combinations followed, with even wider scope targeting GHG and haze creating emissions, integration of renewable energy sources, biofuels, waste and effluents supply chains, investment, property and material recovery targeting.

The presentation will be concluded by suggestions for future research, and the discussion and exchange of ideas are most welcome.

Acknowledgments

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:: Paper No: GCGW 2018 – KT4::

ATMOSPHERIC VARIABILITY DURING THE WARM SEASON IN SOUTHWEST EUROPE: EOF ANALYSIS AND TRENDS IN THE CONTEXT OF GLOBAL WARMING

J. L. Sánchez*[1], A. Merino[1], S. Fernández-González[2], E. García-Ortega[1], J. L. Marcos[1], J. Dessens[3], C. Berthet[3]

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There is a consensus among the authors that have found. On one hand, the global warming leads us to an evolution toward synoptic environment, favoring the severe convection and hail precipitation, on the other hand, the increase of temperature results of an increase in the melting level height. In some regions with higher altitude in Southern Europe, we have found an increase of intensity and severe hail precipitations with statistically significant results. The expected scenario is that an increase of 1,5ºC or 2ºC, at least in medium altitudes, provokes the small hail precipitations decrease for the melting effect and increase the severe hail precipitations as an effect of the increase of convection. In this article, we analyzed atmospheric variability at synoptic scale during the central months of warm season in Southwest Europe using empirical orthogonal function (EOF) analysis. The results show that the main modes of variability of geopotential height at 500 hPa and lapse-rate patterns between 850 and 500 hPa facilitate the identification of patterns that favor hailfalls on the study area. In addition, temporal changes in the patterns related to hailfall variability suggest changes in the hailfall distribution during June and July, with a decrease in hail frequency during June and an increase during July.

:: Paper No: GCGW 2018 – KT5::

HYDROGEN ENERGY OPTIONS IN COMBATING GLOBAL WARMING

Ibrahim Dincer

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Energy is recognized as one of the most critical elements for societies in building, developing and sustaining the sectors in their countries. It is also an interfunctional vector for economy, technology, environment and sustainable development. Many environmental issues are caused by or relate to its production, transportation, transformation, conversion and consumption, for example, acid rain, stratospheric ozone depletion and global warming/climate change. Recently, a variety of potential solutions to the current environmental problems, particularly associated with the greenhouse gas emissions, has evolved drastically. Hydrogen energy options appear to be one of the most effective, so-called: carbon-free, solutions to the current energy, environment and sustainability issues and can play a significant role in providing better performance, better environment and better sustainability.

This presentation covers the results of comprehensive studies about hydrogen production methods and integrated energy systems driven by renewable energy sources where we produce hydrogen as one of the multiple useful commodities. The environmental performance, life cycle assessment, sustainability, and thermodynamic (both energetic and exergetic) aspects of hydrogen energy systems are presented and compared with each other for various fuel cells and hydrogen production technologies. Fossil fuels (e.g., natural gas) and renewable energy resources (e.g., solar, wind, geothermal) are considered for hydrogen production, and a life cycle assessment is conducted to study the aspects of efficiency, environmental impact and sustainable development. Since an understanding of the thermodynamic aspects of hydrogen energy systems can help in taking sustainable and environmentally benign actions regarding energy, both energy and exergy analysis studies are undertaken for various hydrogen energy systems and fuel cell systems to study energy and exergy efficiencies and their improvement for better system performance and hence faster commercialization. In this regard some new techniques, methods and models are developed and discussed for practical use, in particular to help researchers, scientists and engineers who deal with the design, analysis and implementation of such hydrogen energy systems, including fuel cell systems.

Keywords: Hydrogen energy, energy, exergy, efficiency, environmental impact, sustainability, life cycle assessment.

INVITED SPEAKERS

INVITED SPEAKERS

:: Paper No: GCGW 2018 – IT1 ::

CLIMATE CHANGE AS A FORCING FUNCTION IN AGRI-FOOD AND ENERGY INNOVATION

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Climate change is occurring globally. Land and sea temperatures are rising, while precipitation patterns are changing, and climate-related extremes such as heat waves, heavy precipitation and droughts are increasing in frequency and intensity around the world. Climate change affects forestry, fishery, agriculture and human health by affecting the productivity of rainfed crops and forage, reducing water availability and changing the severity and distribution of crop and livestock diseases. Key industries such as tourism, fishing, agriculture, energy and water supply will have to adopt new and innovative approaches and solutions to mitigate and adapt to climate change, ensure resource security and contribute to the sustainable growth and economic development. Climate projections predict that climate change will continue for many more decades to come, increasing climate-related extremes. Businesses and governments are therefore realizing that they have to plan and build for resilience to climate change, directing procurement towards adaptation-related products, processes and services. Hence, climate change adaptation is offering a major business opportunity, especially for companies operating in the built environment, agri-food and energy production and supply, water infrastructure, finance, and health and climate services. With the extent and severity of climate-related extremes such as heat waves, the demand for cooling is expected to rise and accelerate, placing additional demands on energy supply and increasing the risk of electricity black outs. Similarly, projections from the Intergovernmental Panel on Climate Change provide warnings about declining water availability and increased drought risk in many regions around the world. Moreover, according to the United Nations, it will be necessary to produce 60% more food globally and 100% more in developing countries by 2050. When this is viewed in the context that currently, approx. 70% of freshwater resources are used for agri-food production, and as a result of increasing and competing demands, exacerbated by pollution and climate change-driven impacts, available freshwater resources are becoming increasingly stressed. Consequently, reducing the vulnerability of agri-food production systems to climate change and strengthening the adaptive capacity are important priorities to protect and improve the livelihoods of billions of people around the world. Furthermore, reducing emissions due to fossil fuels production and consumption that contribute to global warming is crucial to securing global wellbeing as well, and agri-food and energy sectors have tremendous potential for reducing emissions and inefficiencies while at the same time playing their important roles in poverty reduction, and food and energy security. In short, agri-food and energy sectors are facing with significant climate change-driven challenges, which provide tremendous opportunities for cutting-edge knowledge, and innovative products, processes, services and policies. This Invited Talk will be discussing the impacts of climate change on agri-food and energy innovation for strengthening the management of our precious resources into the future.

:: Paper No: GCGW 2018 – IT2 ::

DEVELOPMENT OF HIGH PERFORMANCE DIRECT CARBON SOLID OXIDE FUEL CELLS FOR EFFICIENT ENERGY CONVERSION

Meng Ni

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Carbon is an important component in coal and can be derived from renewable biomass. How to increase the energy efficiency of carbon-based fuel is critical in greenhouse gas emission reduction since the carbon-based fuel will continue to be an important energy source for the coming decades. Direct carbon solid oxide fuel cells are electrochemical systems that can convert the chemical energy of carbon fuel into electrical power in a more efficient manner than conventional thermal power plant. In this talk, the experimental and modeling studies on direct carbon solid oxide fuel cell by the speaker's team will be summarized, including catalyst developments for carbon gasification in fuel cells, the use of different gasification agents, power-gas cogeneration etc. The future of this technology for cleaner energy conversion will also be discussed.

:: Paper No: GCGW - 2018 – IT3 ::

AN INNOVATIVE FLUID MIXTURE FOR HEAT ENHANCEMENT/ STORAGE

M. Ziad Saghir*

Ryerson University, Department of Mechanical and Industrial Engineering, Toronto, Canada
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Nanofluid is a class of fluid which has been recommended for heat removal. The current heat removal efficiency is found to be around 6%. Recently a new class of nanoparticles called microencapsulated phase change material (MEPCM) have shown a great interest amongst researchers for heat storage. This paper investigates the performance of this new class of fluid inside a heated circular pipe. A proposed mixture of Al_2O_3 particles, MEPCM particles and water is used and its effectiveness has been investigated. The numerical approach using finite element method has been applied over the entire pipe. Results revealed that this new class of fluid can effectively contribute in heat removal/storage. The flow rate has been found to play an important role in the heat storage performance.

Keywords: Porous medium, Phase change material, Heat enhancement, Heat storage.

ORAL AND POSTER SESSIONS

ORAL AND POSTER SESSIONS

:: Paper No: GCGW - 2018 – P002 ::

ENERGY AND SUSTAINABLE DEVELOPMENT: SOCIO-ECONOMIC OF IMPLEMENTING NEW TECHNOLOGIES

Abdeen Omer

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Sudan is an agricultural country with fertile land, plenty of water resources, livestock, forestry resources, and agricultural residues. Energy is one of the key factors for the development of national economies in Sudan. An overview of the energy situation in Sudan is introduced with reference to the end uses and regional distribution. Energy sources are divided into two main types; conventional energy (woody biomass, petroleum products, and electricity); and non-conventional energy (solar, wind, hydro, etc.). Sudan possesses a relatively high abundance of sunshine, solar radiation, moderate wind speeds, hydro, and biomass energy resources. Application of new and renewable sources of energy available in Sudan is now a major issue in the future energy strategic planning for the alternative to the fossil conventional energy to provide part of the local energy demand. Sudan is an important case study in the context of renewable energy. It has a long history of meeting its energy needs through renewables. Sudan's renewables portfolio is broad and diverse, due in part to the country's wide range of climates and landscapes. Like many of the African leaders in renewable energy utilization, Sudan has a well-defined commitment to continue research, development, and implementation of new technologies. Sustainable low-carbon energy scenarios for the new century emphasis the untapped potential of renewable resources. Rural areas of Sudan can benefit from this transition. The increased availability of reliable and efficient energy services stimulates new development alternatives. It is concluded that renewable environmentally friendly energy must be encouraged, promoted, implemented, and demonstrated by full-scale plan especially for use in remote rural areas.

Keywords: Sudan, Energy, Consumption patterns, Renewable energy potential, Sustainable development, Impacts on environment, Mitigations, Global warming, Climate change.

:: Paper No: GCGW - 2018 – P003 ::

SYNTHESIS AND CHARACTERIZATION OF GRAPHENE/MULTI-WALLED CARBON NANO-TUBE SUPPORTED PTRU CATALYST FOR HIGH TEMPERATURE PEM FUEL CELL

Guvenc Umur Alpaydin[1*], Elif Damla Arica[2], Yilser Devrim[2], C. Ozgur Colpan[1, 3]

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A fuel cell is an electrochemical device that uses reduction and oxidation reactions to convert the chemical energy of fuel and oxidant into electric energy, water and some heat. Fuel cells operate silently and efficiently when powered by hydrogen. One of the fuel cell types that use hydrogen as fuel is proton exchange membrane fuel cells (PEMFCs). PEMFCs can be classified as HT-PEMFC and LT-PEMFC. HT-PEMFCs, which can operate between 120^0C-200^0C, have a higher performance, higher tolerance to carbon monoxide, and higher reaction rates than LT-PEMFCs which operate below 100^0C. HT-PEMFCs have attracted the attention of researchers because of these features and studies are made to improve their performance. Carbon-supported Pt and Pt alloys in these studies are commonly used catalysts in existing PEMFCs. To reduce the amount of precious metal used, platinum is usually supported as nano-dispersed particles on carbon. This distribution allows high catalyst surface areas in low catalyst loads. Among carbon supports, carbon black (CB) is the most commonly used material due to its high mesoporous distribution and graphite-like properties. Graphite-like structure provides a high electrical and thermal conductivity and a high oxidation resistance while high mesoporous distribution provides high specific surface area and large pore volume. However, CB can be electrochemically oxidized, dissolving or aggregating under PEMFC conditions and for this reason, the performance of the PEMFC decreases. To overcome this problem, MWCNT (multi-walled carbon nanotubes) and GNP (graphene nanoplatelets) can be used as support material instead of CB. Because, MWCNT and GNP provide high thermal and electrical conductivities, chemical stability, high surface area, and mechanical strength. In structures where the graphene is used as a support material, the overlaying of the layers may greatly reduce the conductivity. To solve this problem, MWCNTs connect the graphenes to prevent the reduction of conductivity and thus the performance degradation.

In this study Pt-Ru/GNP-MWCNT (50:50 wt/wt) catalysts were synthesized using five different microwave synthesis parameters (microwave power and process duration) to be used as HT-PEMFC anode catalysts. Microstructure and morphology of the synthesized catalysts were investigated using thermal gravimetric analysis (TGA), X-ray diffraction (XRD), Scanning Electron Microscopy (SEM), and Energy Dispersive Spectroscopy (EDS). Furthermore, the electrochemical surface area (ECSAPt) of PtRu/GNP-MWCNT catalysts was measured with Cyclic Voltammetry (CV). Finally, the synthesized catalysts were compared with each other in term of structural properties. A comparison between the performance of the synthesized most superior catalysts and that of the commercial Pt-Ru/CB PEMFC catalyst is also presented. The performance tests were done in a single HT-PEMFC hardware with a 5 cm^2 active area. 1.2 and 2.5 stoichiometry ratios were used at anode and cathode, respectively. Acid doped PBI membrane was used as the membrane; hydrogen and dry air were used in the performance tests; and the cell temperature was taken as 160^0C.

Keywords: Anode catalyst, graphene nanoplatelets, multi-walled carbon nanotubes, cyclic voltammetry studies, performance tests

:: Paper No: GCGW - 2018 – P004 ::

BIOLOGICALLY BASED NETWORK DESIGN WITH ANTS FOR ROUTE PLANNING

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Cities are large constructs that shelter more than half of the human population on Earth. As the cities grow, their complexity increases and design disciplines such as architecture and urban design need new tools to optimize many parameters related to various applications; including transportation, telecommunication, energy, water and waste flow infrastructure, emergency services, and land use. In this context, the aim of this study is to evaluate biologically based optimization methods related to network design in route planning applications, on the premise that their construction and environmental costs would be minimized. The scope of this paper is suggestion of a route design for a new park in the historical Kadifekale district of Izmir, Turkey via ant algorithm. The results can be utilized as a design template for the route infrastructure of the new park. The ant algorithm can sufficiently identify focal points and less used routes within a robust network. However, the matrix does not suggest new nodes to the system therefore its utilization is limited for a new design problem and would require a careful analysis of the suggested nodes for a more complex problem, thus decrease the ease of its applicability. To conclude, the parameters in the ant colony algorithm are significant on suggesting routes, however to reach the desired benefits, the strengths and weaknesses of the algorithm should be carefully considered before application in a design problem.

Keywords: Infrastructure, Route Planning, Design Template, Ant Colony Algorithm, Kadifekale.

:: Paper No: GCGW - 2018 – P008 ::

SHORT REMARKS TO THE OVER-GLORIFIED USING ELECTRIC OR HYDROGEN-DRIVEN CARS

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This short note underlines the true benefits of using electric or hydrogen-driven car which does not reduce the global releasing of CO_2 but only spreads it out from the polluted cities. Emphasized is the significance of chemosynthesis and photosynthesis as the counter-phenomena, consuming CO_2, to the process of the combustion generating CO_2. Approximately have been estimated the amounts of released CO_2 when various fuels are used for generation of 1 MJ electrical energy; e.g. ~220 g/MJ for coal, ~160 g/MJ for ethylene or ~120 g/MJ for methane. Creation of the huge super-mega pipeline systems for the fresh air delivery could be suggested to ventilate of the most polluted zones (urban or industrial) and for moving the "fertilizing" air overloaded with CO_2 to the absorbing water body surfaces (oceans) or to the extents overgrown with green plants (forests or jungles).

Keywords: Climate, Fuels, CO_2.

:: Paper No: GCGW - 2018 – P009 ::

DESIGN AND DEVELOPMENT OF ENERGY EFFICIENT TWIN MODE DOMESTIC IMPROVED BIOMASS COOKSTOVE

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This study deals with the design and development of a novel wood gas stove that works in both natural and forced draft mode to meet the cooking energy demand of a family of six members. Thermal performance of the developed stove was examined as per BIS (IS: 13152; Part-I) test protocol. The stove was tested with babool wood *(Acacia nilotica)* and groundnut *(Arachis hypogaea)* shell pellet in forced draft mode. In the forced draft mode with babool wood *(Acacia nilotica)* thermal efficiency, power rating, CO and CO_2 emissions, and total particulate matter (TPM) was estimated at about 36.56%, 3.15 kW, 179.95 ppm and 5783.17 ppm, and 134.1 mg/MJ_d, respectively. During testing with groundnut shell pellets, the estimates were 36.79%, 2.95 kW, 61.43 ppm and 7174.6 ppm, and 132.73 mg/MJ_d, respectively. The developed stove was also evaluated in natural draft mode with babool wood the estimates for thermal efficiency, power rating, CO and CO_2 emissions, and TPM were about 33.44 %, 2.5 kW, 208.48 ppm and 4922.83 ppm, 298.8 mg/MJ_d, respectively. Economic assessment was also carried out in terms of Net present value (NPV), minimum number of cooked meals to achieve economic efficiency (n_m), and payback period (PP). The results indicate that the developed cookstove is economically viable and technically feasible.

Keywords: Thermal efficiency, Wood Gas Stove, Power rating, Dual Draft Mode, Emission, Fuel saved.

:: Paper No: GCGW - 2018 – P010 ::

THERMAL DESIGN AND TESTING OF MINI-SCALED HEAT SINK FOR 400 W THERMOELECTRIC GENERATOR DRIVEN BY EXHAUST-GAS FROM VEHICLE ENGINE

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The potential for thermoelectric power generation (via waste heat recovery onboard automobiles) to displace alternators and/or provide additional charging to a vehicle battery pack has increased with recent advances in thermoelectric material processing. In gasoline fueled vehicles (GFVs), about 40% of fuel energy is wasted in exhaust heat, while a smaller amount of energy (30%) is ejected through the engine coolant. Therefore, thermoelectric generator (TEG) has been a focus for GFV applications since the late 1980s. The conversion efficiency of modern thermoelectric materials has increased more than three-fold in the last two decades; however, disputes as to the thermal design of TEG systems has kept their overall efficiency at limited and insufficient values. There are many challenges in the thermal design of TEG systems, such as increasing the efficiency of the heat exchangers (hot gas-side and cold-side), maintaining a sufficient temperature difference across the thermoelectric modules during different operating conditions, and reducing thermal losses through the system as a whole. In this work, the TEG consists of hot-side heat exchanger, which is designed in hexagonally shape to accommodate the affirmed attachment of the thermoelectric modules (TEM). The inner surface of the heat exchanger is provided by very short fins "turbulators" to break the thick thermal boundary of the exhaust gas and to augment the turbulence intensity. The cold-side heat sink consists of mini-scaled channels coupling in circuit including small particular finned-tube heat exchanger (PHX) located at the front of the vehicle and circulating pump of 50 W. The main objective of this study is to investigate the thermal performance of the TEG during implementation of microscale heat transfer principal to the cold-side heat sink of the TEG. A bench test-rig consist of exhausted manifold of Engine of Nissan Sunny of 1600 c.c incorporated by this TEG was prepared to conduct test runs for the TEG performance. The maximum power output could be harvested from this system is 400 W. The weight of the TEG was of 15 kg.

Keywords: Thermoelectric generator, Waste heat recovery, Minichannel heat sink, Conjugates heat transfer, Laminar flow, Numerical study.

:: Paper No: GCGW - 2018 – P011 ::

EFFECT OF STEAM INJECTION INTO INCINERATOR ON THERMAL DECOMPOSITION OF WASTE REFRIGERANT (HFC-134A)

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The reuse of hydrofluorocarbons (HFCs) with a global warming potential (GWP) of >150 is prohibited in developed countries. Decomposition and subsequent neutralization of the produced hydrogen fluorides is currently widely used for the treatment of high-GWP waste HFCs. However, there is the need to reduce the high auxiliary energy consumption of the utilized incinerator. For this purpose, we developed two versions of a burner for injecting fuel, oxidizer, refrigerant, and steam into the incinerator. The simultaneous supply of the waste HFCs and steam into the incinerator was expected to enhance the destruction of the former, thereby reducing the energy consumption. The following were determined from the results of experiments that were performed to evaluate the effectiveness of the developed type-1 burner. The simultaneous supply of steam and waste HFCs into the incinerator increased the internal temperature of the incinerator when using either version of the type-2 burner.

With the simultaneous supply of steam and the HFCs, the internal temperature of the incinerator increases with increasing steam supply regardless of the version of the burner used. When using the type-2 burner, by which steam is supplied to the incinerator in the same direction as the flame, the NO_x concentration decreases from 71 ppm to 62 ppm with increasing steam feed rate. In the case of using the type-1 burner, there is no decrease in the NO_x concentration.

The HFCs decomposition rate is 100% for a HFCs feed rate of up to 2.8 kg/h with no steam supply, while the 100% decomposition is maintained up to HFCs feed rates of 3.0 and 3.4 kg/h when using the types 1 and 2 burners with steam supply. The decomposition rate of the HFCs for the two types of burners are the same for steam feed rates above 0.5 kg/h.

Keywords: Waste HFCs, Incinerator, NO_x, Steam injection, Decomposition.

:: Paper No: GCGW - 2018 – P015 ::

OPTIMUM INSULATION THICKNESS FOR COOLING APPLICATIONS USING LIFE CYCLE INTEGRATED ECONOMIC ANALYSIS

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Buildings cause to meanly one third of carbon dioxide release and energy consumption. That's why; decreasing fuel consumption in building is considerable aim for scientists and engineers. The easiest way of this is to insulate building walls. Some researches including economic and environmental methods exist in the literature. Optimum insulation thickness for building walls is investigated using a new method called as life cycle integrated economic analysis (LIEA). In this method, environmental costs are integrated in the fuel and insulation material costs and in this way, it is possible to consider both of economic and environmental aspects. Environmental cost of carbon dioxide, fuel and insulation materials are added to their cost and total annual cost for the system is calculated and results are investigated according to insulation thickness. In this paper, optimum insulation thickness is researched for cooling applications. Rockwool is chosen as insulation materials and the analysis was conducted for the city of Bilecik, located in the Marmara Region of Turkey. Results for the life cycle integrated economic analysis, energy consumption according to insulation thickness are presented. Optimum point is calculated for rockwool is 0.198 m. Similarly, optimum point for the glass wool is 0.207 m.

Keywords: Insulation thickness, Life cycle integrated economic analysis, Energy consumption.

:: Paper No: GCGW - 2018 – P018::

CONTRIBUTION TO THE DEVELOPMENT OF ALGAE PRODUCTION PROCESSES FOR BIODIESEL PRODUCTION

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In the course of these last years, the replacing of the fossil fuel resources which are associated with negative factors; present a challenge for the search, to rethink to another source sustainable and respectful of the environment. Therefore, the sources of renewable energy have taken a considerable place, this is due to their various adventures.

Various sources such as food materials and the agrroalimentary residues are used as sources of renewable energy. Recently, the development of bioenergy has been highlighted by using the microalgae as biomass for the production of an alternative energy.

In this work, we present and describe the main parameters and factors limiting the technical improvement of bioprocesses (bioreactors). However, optically, operating and investment costs are the main constraints to be optimized in order to improve bioprocesses. Indeed, according to the obtained results, we show that only the approach of sunlight is an economically realistic factor.

However, in the field of seaweeds, it is necessary to decrease the light to overcome the effects of photo saturation and photo inhibition, which have a negative impact on crops in full sun. Among other approaches, we introduce a spectral adaptation technique based on luminescence in order to optimize the solar spectrum.

In this study, we have shown that the use of optically active molecules for spectral shifts of the light spectrum has a significant effect on the yield. On the other hand, we show the importance of parameters independent of culture media on the growth of the alga studied (*Chlorella pyrenoidosa*).

Keywords: Algae, Biomass, Biodiesel, Light, Photobioreactor, Spectral shifting

:: Paper No: GCGW - 2018 – P019::

CRITICAL MANAGEMENT OF WATER RESOURCES FOR GLOBAL WARMING

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Increased use of fossil fuel, electrical freezing appliances, more paved roads, deforestation and many others made it certain to contribute to global warming. As a result, fresh water reserve in north and south pole melting and mingle with salt ocean water causing a notion for inundation and destruction of human habitat.

This poster elaborates the importance of management and conservation process of natural fresh water sources before they get not portable for human or other animals and use in irrigation. Today's global authorities along with climate deal must also put emphasis to protect one of the important resources of fresh water. An elaborate collection process and storage system to develop whether underground or on surface for future use.

:: Paper No: GCGW - 2018 – P021 ::

THE DISCOVERY OF ANTIMATTER OFFERS THE ONLY SOLUTION OF GLOBAL WARMING, OZONE HOLE AND ALL ENVIRONMENTAL PROBLEMS

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It has certainly that global warming and climate change, ozone hole, pollution and environmental problems increased rapidly during the last decades, till it become threaten the future of humans and life on our earth planet. So; when thousands of Senior Scientists have participated in dozens of international conferences (in Turkey, Canada, USA, UK, Japan, Germany, Singapore, Australia, Netherlands and other countries along decades) and do not find the radical solution for these problems, this indicates some errors in the prevailing knowledge & scientific rules among scientists. That is why we are not convinced of what is going in the field of physics about the theories of chaos and randomness and uncertainty, and about those imaginary perceptions of Antimatter, Dark Matter and Black Holes. That is why we are not convinced of what is some scientists said: of that the moon's gravity is the cause of tides. And what they said: of that the earth rotation is the cause of wind, storm and hurricane.

:: Paper No: GCGW - 2018 – P022 ::

LIFE CYCLE ASSESSMENT OF PORTLAND CEMENT PRODUCTION IN ALGERIA

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Cement production sector is not only considered a pillar for public works, but also a very energy-intensive industry which releases huge amounts of pollutants to the environment. The objective of this paper is to assess the impacts of Portland cement production and particularly GHG emission and energy requirement. A cradle-to-gate life Cycle Assessment (LCA) for the Portland cement production process in Algeria, from extraction and transportation of raw materials, via clinker production, to cement production was carried out.

Impact assessment was carried out using the environmental modeling software GEMIS 4.7. The study was conducted according to the LCA standards ISO 14040 series, and the results were compared to that of a German production process extracted from GEMIS 4.7 database.

The results show that the energy requirement in the Algerian process is higher than in the German process (5.716 and 4.832 MJ/FU respectively), but GHG from the Algerian process are less than in the German process (882.36 and 551.39 kg CO_2 eq/FU respectively). The Algerian process is only base on natural gas combustion, unlike the German process that is based on coal and oil combustion. The Algerian process seems to be favored by this peculiarity.

Keywords: Algeria, Clinker, GHG, Portland cement, Resources depletion.

:: Paper No: GCGW - 2018 – P023 ::

INVESTIGATION OF THE MAIN CHEMICAL COMPONENTS AND BIOMASS PRODUCTIVITIES OF CHLORELLA VULGARIS IN CONTROLLED ENVIRONMENT MINKERY WASTEWATER

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The Nova Scotia minkery farms generate huge amounts of wastewater and have continuously ignored the public outcry for their environmental impacts. Eventually, the Nova Scotia Government was forced to draft Fur Industry Act, which was approved on January 11, 2013. As a consequence, the industry is now forced to employ different bioenvironmental technologies for reducing pollutants in effluent waters of its operations. Employing microalgae could serve a double purpose to generate high-value biomass while assisting in the bioremediation of mink wastewater. This study aimed to investigate the main chemical components and biomass productivities of microalgae in minkery wastewater. *Chlorella vulgaris* was cultivated in controlled environment photobioreactors.

During 6-day of cultivations, continuous light cycle and 48-hour light and 24-hour dark cycle achieved the largest biomass accumulation and crude protein productivity; however, using 48-hour light and 24-hour dark cycle instead of continuous light cycle reduces the energy cost of cultivation. The light cycles of continuous light, 48-hour light and 24-hour dark, and 24-hour light and 48-hour dark achieved the highest lipid and carbohydrate productivities, and there was no statistically significant difference in between; however, using 24-hour light and 48-hour light cycle reduces the energy cost of cultivation compared to continuous light or 48-hour light and 24-hour dark cycles. While the most appropriate light cycles were identified for the production of each main chemical component of *Chlorella vulgaris* in minkery wastewater, other microalgae strains may make minkery wastewater more competitive compared to traditional culture mediums.

Keywords: Chlorella vulgaris, Microalgae, Minkery wastewater, Lipid, Protein, Carbohydrate.

:: Paper No: GCGW - 2018 – P025 ::

MICROARRAY ANALYSIS OF HIGH LIGHT INTENSITY STRESS ON HYDROGEN PRODUCTION METABOLISM OF RHODOBACTER CAPSULATUS

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Biohydrogen produced by purple non-sulfur bacteria (PNSB) is an environmentally friendly method for hydrogen production. PNSB can be employed in large scale outdoor photobioreactors to produce hydrogen by photofermentation with sun light as the light source. In outdoor conditions bacteria can be exposed to high light intensities which can inhibit or slow down hydrogen production. *Rhodobacter capsulatus* is a PNSB which can grow and produce hydrogen efficiently on dark fermenter effluents containing acetate. Previous studies with other PNSB showed that light intensities above 4000 lux adversely affect hydrogen production in lab scale photobioreactors.

In this study, the effects of high light intensity stress on hydrogen production metabolism of *R. capsulatus* were investigated at gene expression level by microarray analysis using custom design Affymetrix GeneChip TR_RCH2a520699F. *R. capsulatus* DSM1710 was grown under cyclic illumination of 2000 lux (12h light/12h dark) in hydrogen production medium containing 30 mM acetate and 2 mM glutamate and was exposed to a high light intensity (10,000 lux) for 1 hour in the middle of a light period. The results reveal that photosysthetic reaction center genes were down-regulated in order to protect the photosynthetic membrane from damage, however; expression of nitrogenase and electron transport systems genes were enhanced by high light intensity. The results suggest that under high light intensity stress *R. capsulatus* adjusted the gene expression for hydrogen production and redox balance.

Keywords: Biohydrogen, *Rhodobacter capsulatus*, High light intensity, Gene expression, Microarray.

:: Paper No: GCGW - 2018 – P026 ::

NUMERICAL STUDY OF THE EFFECTS OF SURFACE RIBLETS ON BOUNDARY LAYER TURBULENCE

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Suitably sized and spaced surface riblets of streamwise orientation have the potential of influencing boundary layer transition and turbulence, which may favorably influence the surface skin friction. It has been argued that surface riblets realize this influence on the boundary layer by altering the structure and topology of hairpin-shaped coherent structures of turbulence and their mutual interactions. The present study examines the development of boundary layer turbulence over a surface with streamwise-oriented riblets through a direct numerical simulation (DNS). The study was conducted by artificially producing a turbulent spot in the boundary layer. The study of turbulence structures within a spot is favored over the study of a fully turbulent boundary layer as the younger turbulence in a spot has a more organized topology. The effects of the surface riblets on the development of the turbulent spot are quantified via comparison of the simulation result to those corresponding to a smooth surface.

The riblet surface has a positive effect on controlling the spanwise positioning of the wavepackets. Notably stronger sweep and ejection events are observed over the riblet surface compared to those with the smooth surface. The riblets promoted the positioning of hairpin vortices over their peaks by changing the spatial distribution of vorticity of the undisturbed laminar boundary layer. This created a locking effect which allowed the spanwise spacing of hairpin vortices to be controlled by the spacing of the riblets.

Keywords: Transition, Turbulence, Boundary layers, Riblet surface, Hairpin vortices, Direct numerical simulation.

:: Paper No: GCGW - 2018 – P028 ::

INVESTIGATION OF THE RELATIONSHIP BETWEEN URMIA LAKE DRYING AND DUST STORMS

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Monitoring dust storms have attracted attention of scientists in the last few decades. It is acknowledged that dust storm can be significant threat against human lives and disruptions of social and economic activities. In recent years, due to the significant decrease in the water-level of Urmia lake, which is known as a second largest hyper-saline lake on Earth, and increasing salt lands in the area, Urmia lake has considered as a prone location for dust storms especially dust salt storm. The aim of this study is to investigate the environmental impacts and environmental changes in Urmia lake in relationship with salt storms by applying the object-based image analysis (OBIA) approach between 2007 and 2017. We also aim to use of multi sensor measurements in thermal emission wavelengths. For this purpose, land cover changes in Urmia lake were obtained from Landsat satellite images for the years 2007, 2010, 2014 and 2017. Then, the saline dust storm maps for the mentioned years were generated by combining Terra and MODIS images. The result of this research is illustrated that there is a direct relationship between drying Urmia lake and rising salt lands with the increase of dust storms in North West of Iran. The results of this research are of great importance for authorities and decision makers to take appropriate decisions for dealing with this natural hazard.

Keywords: Dust storm, Urmia lake, object-based image analysis, Landsat images, Land use change.

:: Paper No: GCGW - 2018 – P029 ::

IMPACT OF SEPTIC TANK ON THE GROUND WATER AT SIDI AYACHE REGION IN THE PROVINCE OF KENITRA, MOROCCO

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In order to deduce the impact of septic tanks on the water, the soil, the vegetal, animal and man, a survey is conducted at Sidi Ayache in the province of Kenitra. The purpose of this survey is the evaluation of the quality of the groundwater in the study area and to have through the testimony of the inhabitants, a return on the various uses of water wells. Preliminary results of the survey revealed that most people doubt the quality of well water. They claim that all diseases observed in the region could come from the poor quality of water wells having a bad taste and therefore is not potable.

It was also observed that in some households, there is no respect of distance between septic tanks and wells. There is even a household that has transformed the wells to a septic tank. This behavior and others may cause adverse effects on the components of the environment. To confirm this hypothesis, we are analyzing water of the wells in the laboratory

Keywords: Analysis, Investigation, Septic tanks, Groundwater, Wells, Sidi Ayache, Kenitra, Morocco.

:: Paper No: GCGW - 2018 – P030 ::

SORBTIONS OF TOXIC EMISSIONS OF FLUE GAS ON ACTIVE CARBON OF MICROWAVE ACTED IN POST COMBUSTION

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Active carbon or char are produced in two different forms in size and chemical form. One type of highly amorphous activated at 1000C is in granular size and easily be evaluated in industry for gold scavenger and other char type may be evaluated as less filling materials in finer size and so soft as which collected following solid-liquid separation thickeners. That waste in finer size may deteriorate environment near pollution as discharge of plants and control of water contamination in streams is hard. Beneficiate from that finer marble waste in toxic gas emission control during combustion can efficiently be made. However, fluidized combustion is carried out over 100 microns solid fuel combustion. In order to avoid this disturbing flow manner of that waste material, clay pellets were used in combustion chamber. But post combustion capturing for toxic emissions active carbon or char are widely used.

Fine marble wastes, active carbon and activated by microwave may also be evaluated as lime raw material without calcining for filling material in industrial sectors such as rubber, paper, animal food production.

40%,60% and 80% active carbon, slag waste and fly ash containing Ca ferrite pellets and activated forms were used in our combustion experiments at 1-2mm sized pellets. The fly ash and marble waste clay pellets were provided a 78% sulfur dioxide emission and also 45% soot emission reduction in fluidized bed combustion.

Microwave activity and chemical activity were found to be effective in desulphurization of flue gas and soot occurrence.

Keywords: Flue gas control, Pollution control, Combustion, Toxic emissions, Microwave energy, Chemical reactivity, Air pollution.

:: Paper No: GCGW - 2018 – P033 ::

IMPACT OF CLIMATE CHANGE ON INDOOR THERMAL COMFORT FOR HISTORIC LIBRARIES IN MEDITERRANEAN CLIMATE ZONE

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Most historic library buildings house valuable manuscripts and archival materials that are kept in unconditioned environments. Future climate change is expected to have a critical impact on this vulnerable cultural heritage. In this study, variations in indoor environment, e.g. temperature and relative humidity, and their effect on thermal comfort of visitors as well as the microclimate around books/manuscripts are investigated to find out if damage may take place in the collection. As a case study, Necip Paşa Library, located in Tire-İzmir, Turkey is chosen. The Library has been preserving outstanding manuscripts (dating back to the 12th century) since 1827. The impact of climate change on indoor environment of the Library is analyzed by combining weather data from a future outdoor climate scenario with a dynamic Building Energy Performance Software. The predicted indoor environment from present till 2080s is assessed based on ASHRAE Guidelines for indoor conditions related to library archives and human comfort. Comparison of periodic results of future climate data indicates the necessity of developing mechanical ventilation strategies to deal with both human comfort and conservation of manuscripts.

Keywords: Climate change, Thermal comfort, Degradation risk, Historic libraries, Dynamic simulation.

:: Paper No: GCGW - 2018 – P035 ::

REFINING OF USED MOTOR OIL USING SOLVENT EXTRACTION

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Used lubricating motor oil is a high pollutant material that requires responsible management. It may cause damage to the environment when dumped into the ground or into water streams including sewers. This may result in groundwater and soil contamination. Recycling of such contaminated materials will be beneficial in reducing lubricating motor oil costs. In addition, it will have a significant positive impact on the environment. Used oil can be refined to yield base oils that are blended into lubricating products, thus reducing the consumption of virgin oils.

This work investigates refining of used lubricating motor oil using solvent extraction method. The laboratory experiment was based on a full factorial design and two categorical factors with two levels were nominated which were solvent to used oil ratio and solvent type (2-Propanol and n-Butanol, MEK and gasoline).

The type of solvent used and the mixing ratio applied for different runs has shown significant effects on the yield of recovered oil. The yield with bisolvent type MEK+gasoline was higher than the other solvents. The yield of treated oil with butanol mixed with gasoline is 87.5% and it is so close to the yield when we used the butanol a lawn which is 88.6%.

Keywords: Solvent extraction, Used motor oil, Refining.

:: Paper No: GCGW - 2018 – P036 ::

IMPACT OF HIGH THERMAL MASS IN FUTURE ENERGY CONSUMPTION: CASE STUDY IN ADOBE BRICK HOUSE IN KONYA

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Global warming is the problem that need more attention for all disciplines. Considering the global warming in terms of ecology, energy and architecture, it is seen that conservation of energy in extant building stock must be taken into consideration. This paper investigates thermal mass quality of building envelope as passive preventive phenomena. It questions that how much thermal mass we need, what the high thermal mass is and which material we can use for decreasing energy consumption according to future climate change. Adobe is commonly used material with its high thermal performance and heat storage capacity. In this research, the energy performance of building built in a traditional way with adobe brick is investigated in terms of thermal mass. Thermal characteristics of adobe building located in Konya was investigated by using dynamic energy performance software. Besides, the case building was equipped with diagnostics equipment to monitor inner and outer climate data every 10 minutes. After calibrating the digital model with measured data, different thermal mass scenarios, i.e. change of wall materials e.g. vertical hallow brick and lime stone, and change of wall thicknesses, e.g. 30 and 50 cm, are applied to the present and 2050's weather data. Then, scenarios are compared to analyze the impact of material choice and the volume of wall on energy consumption per each climate scenario. In conclusion, the study reveals that energy consumption of calibrated model is minimum with vertical hallow brick wall in 50 cm for present and 30 cm for 2050's, following with adobe brick and stone, respectively. It is deduced that thermal conductivity of materials will still have higher impact than thermal mass on energy consumption. The future climate scenarios require more study on how much thermal mass we need for proper energy conservation within changing climate.

Keywords: Thermal mass, Energy consumption, Adobe brick, Climate change, Dynamic simulation.

:: Paper No: GCGW - 2018 – P037 ::

ENERGY, EXERGY AND EXERGOECONOMIC ANALYSES OF A SOLAR REFRIGERATION CYCLE USING NANOFLUID AND ENERGY STORAGE

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In this paper, an exergoeconomic analysis of a solar absorption refrigeration cycle with energy storage is conducted. The solar collector utilizes nanofluids to improve the performance of the cycle. Energy and exergy analyses are performed to evaluate the effect of using nanofluid in solar collector on the COP and exergy efficiency of the cycle. An exergoeconomic analysis is conducted to determine the effects of different working parameters on the exergy cost of cooling effect. The main purpose is to determine the type of nanofluid and working conditions that lead to the optimum cost of cooling effect and the highest exergy efficiency of the cycle. It is concluded that the utilization of CuO and Al_2O_3 nanofluids with 5% volume fraction increases the COP of the solar cycle by 17.98% and 14.51%, respectively; and the exergy cost rate of cooling effect decreases by 10.25% and 5.48%, respectively. The CuO nanofluid has the best effect on improving the performance and exergy cost of the solar absorption refrigeration cycle.

Keywords: Solar absorption refrigeration cycle, Exergoeconomic analysis, Nanofluid, Energy storage.

:: Paper No: GCGW - 2018 – P038 ::

BEHAVIOR OF GROUNDWATER FROM SEMI-ARID AREA FACE THE GLOBAL CHANGE

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Global change will increase the pressure on water resources, especially in regions with high water scarcity like the arid and semi-arid part of Morocco. In this context and in according to the available data, this study aimed to identify the climate change effects on water resource in the Essaouira basin from southwestern Morocco. In this basin, the average of precipitation is about 300 mm/year and the temperature oscillate around 20 °C. The climate study showed that the paste precipitation and air temperatures show a general downward trend (12%) and an upward trend (0.9 to 1.1 °C), respectively. Under the scenarios of CMIP5, the future precipitation shows a downward trend for RCP 4.5 (17%) and upward trends for RCP 8.5 (21%) by 2050. As for the annual mean temperature was found to increase by 0.57 °C and 0.69 °C under the RCP 4.5 and 8.5 by 2050, respectively. The decrease in recharge following the decrease in precipitation caused a continuous decrease in piezometric level. The hydrogeochemical approach shows a degradation of groundwater quality with an increase in electrical conductivity (626 to 7840 µs/cm) that resulted from the dissolution of evaporite minerals and seawater intrusion. The isotopic method shows that the Local Meteoric Water Line (LMWL) close to the Global Meteoric Water Line (GMWL) characterizing ocean precipitation. The age of groundwater from Essaouira basin ranged between Late Pleistocene and actual. The groundwater of Essaouira basin are very sensitive to any variation in the natural change, this makes them very vulnerable faced with the climate change. The results of this study should be taken into consideration for the future protection and management of water resource in the region.

Keywords: Climate change, Essaouira basin, Semi-arid area, Groundwater, Quality.

:: Paper No: GCGW - 2018 – P039 ::

ANAEROBIC DIGESTION OF HIGH SALINITY WASTEWATER AND METHANE PRODUCTION

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The objective of this study was to investigate methane production from fish meal wastewater. The wastewater from fish meal factory was collected from a province near the Gulf of Thailand. The COD and pH of wastewater was 8530 mg/L and 6.58, respectively. The characteristics of wastewater were appropriate to be digested anaerobically except the high salinity which was recorded at 13.03 parts per thousand. The anaerobic digestion systems were operated by single-stage processes at room temperature of 30 C. The result revealed that the average percentage of methane production was not satisfactorily acceptable and showed at 21 %. The maximum methane yield obtained was only 46 L at STP/kgCOD degraded while the COD degradation efficiency was 75%. Anaerobic process was suitable for organics degradation for fish meal wastewater, but the process was not suitable for CH_4 production. The salinity caused adversely affected in methane production.

Keywords: Anaerobic digestion, Biogas, Fish meal, Methane, Salinity, Wastewater.

:: Paper No: GCGW - 2018 – P041 ::

ENERGY EFFICIENCY STRATEGIC APPROACH CONSIDERING SUSTAINABILITY ECONOMIC CRITERIA FOR SHIP MANAGEMENT

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Although having low capacity to struggle with global warming and climate change, maritime transportation, 84% of the world's maritime sector, is an exceptional sector which is showing important developments. In the sector, which the specific cargo ship commodity reaching approximately 78%, the idea of "energy consumption is affected not only by environmental effects but also economic costs", is increasing fast. From this perspective, while developing solutions for this problem, all of the actors' primary strategy must be based on an energy efficiency approach. But, first of all, this effect must be described individualistically on the basis of energy consumption.

An improvement activity on energy consumption in a cargo ship is a criterion for the whole fleet and this approach should be taken care of on ship management. In this study an approach is primarily enhanced based on energy efficiency strategy on board of ships. The effects of energy efficiency strategy, which is improved by integrating sustainable economic criteria, has been evaluated in accordance with energy consumption performance. Besides, performance analyses based on real values and effects of recycling based on improvement are comparatively examined. At the end of the study, it has been made evaluations on the sectoral effects of energy efficiency strategy.

Keywords: Cargo ships, Energy efficiency, Strategy, Sustainability, Maritime economy, ISO 50001.

:: Paper No: GCGW - 2018 – P042 ::

EFFECTS OF LOW CARBON TECHNOLOGIES IN CARBON MANAGEMENT OF INTEGRATED BUILDINGS: A CASE STUDY

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In this study, the energy performance of a settlement in which low-carbon technologies evaluated instead of a fossil-based solution was evaluated. In this study, the CO_2 emission potentials related to the thermal systems compared different fossil and the environmental effective was examined separately. In the process analysis, the resource preferences together with the energy preferences, the effects of different types of resources, and energy consumption performance were analyzed separately. It was observed that the technology applied was 45.38% more effective than standard natural gas systems, 71.07% fuel consumption of fuel oil 4 and 63.28% more effective use of LNG.

Keywords: Integrated buildings, Low carbon, Technologies, Energy efficiency, Carbon management.

:: Paper No: GCGW - 2018 – P044 ::

DEVELOPMENT OF SELF-HUMIDIFIED COMPOSITE MEMBRANE FOR PEM FUEL CELL APPLICATION

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In this study, self-humidifying nano-composite membrane electrode assemblies (MEAs) were aimed to develop for Proton Exchange Membrane Fuel Cell (PEMFC) which are able to work at elevated temperatures, and low humidity. The composite membranes were prepared by adding silica particles (SiO_2/inorganic filler) which are in powder form (~20 nm) and added into polymer membrane that is commercially named as Nafion (Perfluoro Sulfonic Acid/PFSA). The silica content into the composite membranes changes between 2.5 – 10 wt. %. In this manner, highly specific interaction surfaces were obtained between the polymer and added SiO_2 particles, so that dehydration of water which is already available in the polymeric membrane was tried to avoid at 70°C and moisture free (0 % RH) environment. Under favor of two different techniques (ultrasonic bath and probe), the composite membranes were prepared, and were characterized through the instrument of thermal gravimetric analysis (TGA), scanning electron microscopy (SEM), proton conductivity, water uptake capacity, and tensile mechanical testing measurements. Pluronic L64® and PEG were used as dispersing agents which were incorporated into the polymer membrane as 3 wt. % of added silica to prevent uneven distribution of the silica particles. Additionally, the silica (3 wt. % of catalyst solution) was also loaded into the anode side catalyst layer, thereby composite membrane and catalyst layers (anode and cathode) were hot pressed, and five layers MEAs were obtained. PEMFC performances of composite membranes having 5 cm^2 active electrode area were determined with help of single fuel cell test station by feeding pure hydrogen gas and air. The operation conditions were tested both for 100 % (external humidification) and 0 % RHs (self-humidification) cases at which working temperature varied from 65 to 80°C. The polarization curves of the self-humidifying MEAs were promising under 0 % RH condition.

Keywords: Proton exchange membrane, Fuel cell, Self-humidified membrane, Composite membrane.

:: Paper No: GCGW - 2018 – P045 ::

DEVELOPMENT OF HIGH PERFORMANCE CATALYST FOR HIGH TEMPERATURE PEM FUEL CELL APPLICATION

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In this study, we compared the carboxylic acid functionalized multi walled carbon nanotube (MWCNT) and graphized multiwalled carbon nanotube (g-MWCNT) as catalyst support material for high temperature proton exchange membrane fuel cell (HT-PEMC) application. Microwave irradiation method was employed to deposit highly active Pt nanoparticles on MWCNT support materials. Prepared catalyst was analyzed thermal analysis (TGA), Transmission Electron Microscopy (TEM) and corrosion tests. Gas diffusion electrodes (GDE) were fabricated by an ultrasonic coating technique with synthesized catalyst. Polybenzimidazole (PBI) membrane-based Membrane Electrode Assembly (MEA) was prepared for observe the HT-PEMFC performance of the Pt/MWCNT catalyst. The MEA was tested in a single HT-PEMFC with a 5 cm^2 active area at 160°C without humidification. A comparison of their performance with the commercial Pt/C catalyst is also presented. This study demonstrates the feasibility of using the microwave synthesis method as a fast and effective method for preparing high performance Pt/MWCNT and Pt/g-MWCNT catalyst for HT-PEMFC.

Keywords: PEM, Fuel Cell, High Temperature, Multi Walled Carbon Nanotube (MWCNT), graphitized MWCNT, Microwave, Catalyst.

:: Paper No: GCGW - 2018 – P046 ::

A CASE STUDY OF THE GREEN INDEX ASSESSMENT FOR AN INDUSTRIAL AND A MUNICIPAL WASTEWATER TREATMENT PLANT IN TURKEY

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The wastewater treatment plants deplete natural resources and release greenhouse gases that can cause the climate change. In this context, for reducing unfavorable environmental impacts that lead to climate change related to wastewater treatment plants, a new indicator to detect the environmental performance has been developed named as the Green Index. The Green Index is calculated with an equation developed by University Technology Malaysia. The Green index has a formulation that contains water consumption (WC), electricity consumption (EC), carbon dioxide emission (CE), nitrogen emissions (NE), nitrate concentration (NC), biological oxygen demand (BOD), chemical oxygen demand (COD) and air consumption (AC). In calculation tool, according to factor analysis by University Technology Malaysia, carbon dioxide emission, electricity consumption, nitrogen emission and air consumption are considered; the other variables are negligible. The main aim of this study is to determine climate change potential of the wastewater treatment plants. In this study, for an industrial wastewater treatment plant and a municipal wastewater treatment plant in Turkey, the green index was evaluated and compared. In the municipal wastewater treatment plant, A^2O Process is implemented so nitrogen removal is revealed but in the industrial wastewater treatment plant, activated sludge process and chemical treatment are available thus nitrogen removal is not ensured. The aspect of nitrogen removal to the green index has been investigated. For detecting of the greenhouse gas emissions, closed chamber method was implemented by using emission isolation flux caption and a gas analyzer. The evaluation results revealed that the green index of industrial wastewater treatment plant that activated sludge and chemical treatment are implemented is higher than municipal wastewater treatment plant that A^2O Process is fulfilled, and their values are 1.48 and 0.69 respectively. If nitrogen removal is ensured, the green index is lower for wastewater treatment plants.

Keywords: Green index, Environmental performance, Climate change, Greenhouse gases, Wastewater treatment plant.

:: Paper No: GCGW - 2018 – P047 ::

SLUDGE-DERIVED BIOCHAR APPLICATION FOR THE REDUCTION OF GREENHOUSE GAS EMISSIONS: A REVIEW

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Greenhouse gas emissions have been increasing due to growing population, industrialization and agricultural activities recently. Some technical methods have been developed to decrease greenhouse gas emissions. One of these methods is biochar application. Biochar is the solid substance occurred during the thermochemical decomposition of biomass. Hence, biochar is a product of slow pyrolysis or the byproduct of fast pyrolysis, gasification or combustion processes, can be generated from different organics such as plant biomass, food wastes, wastewater treatment sludge, animal manures and agro-industrial biomass. Although the major component of biochar is carbon, it also includes hydrogen, oxygen, ash, nitrogen and sulfur. Biochar is an inexpensive and environmentally-friendly application that can be utilized for various purposes such as greenhouse gas reduction, soil remediation, wastewater treatment and energy generation. Agricultural fields are the major resource of greenhouse gas emission. Carbon dioxide (CO_2) is regarded as the fundamental greenhouse gases. Biochar application of agriculture may have a crucial impact on reducing global warming through the reduction of greenhouse gas emissions and the sequestering of atmospheric carbon. When biochar is added to the soil, its recalcitrant composition leads to stay in the soil for a long time, so greenhouse gas reduction can be ensured by CO_2 fixation. The other significant greenhouse gas is Nitrous oxide (N_2O) generated by the soil microorganisms because of nitrification and denitrification. Biochar ensures ammonia adsorption; thereby it decreases N_2O production from the soil. Biochar can also be applied as a sorbent for the pollutant removal from high organic content of wastewater that emits greenhouse gas emissions in minor amount. The main aim of this study is to review sludge-derived biochar application, reducing greenhouse gases for climate change impacts reduction. Many investigated studies demonstrate that it is possible to reduce greenhouse gas emissions with biochar.

Keywords: Climate change, Biochar, Sludge-derived biochar, Greenhouse gas reduction, Global warming.

:: Paper No: GCGW - 2018 – P048 ::

EFFECTS OF CLIMATE CHANGE ON İZMİR WATER RESOURCES

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Climate is the average weather conditions experienced in a particular place over a long period. Climatological normals are averages for consecutive periods of 30 years which are calculated from climatological data. Using climate normals are very important tool to provide a standard base for preparing global assessment and studies especially for water, agriculture and fishery. In this study, it is aimed to establish of the relationship between temperature, precipitation and water conditions of İzmir between 1975-2015 period.

In long and short terms, climate oscillates between intervals dominated by dry and wet cycles. The shortest of these cycles are 18-20 years in duration, where a 7-10-year interval consisting of wetter than the regional average is followed by a 7-10-year interval consisting of dryer than the regional average. In today's studies, it is expected that great difficulties will arise in terms of water on our planet with the cause of drought that will be formed as a result of entering the "mini-cooling" period, in other words dry period, which is expected to be experienced after 2020 years. In this case, the surface and underground water resources of cities will have a strategic precaution.

In order to avoid these troubles, it is necessary to plan well for the future of surface and underground water resources that the city has in particular, to utilize the most intelligent way of rain water and to control water usage strictly. In this study, information and calculations about the current situation of these areas have been made, discussed and evaluations have been made about the steps to be taken.

:: Paper No: GCGW - 2018 – P049 ::

DEVELOPMENT OF A THERMODYNAMIC MODEL FOR A DIRECT METHANOL FUEL CELL SYSTEM

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Direct Methanol Fuel Cells (DMFC) are one of the promising electrochemical energy technologies to produce electricity. This fuel cell type is advantageous due to the high energy density and easy storage of methanol. However, water and heat management, low electro-chemical reaction rate, and methanol crossover restrains the performance and wide commercialization of this fuel cell. A typical active type DMFC system includes a fuel cell stack, a condenser, a blower, a mixing vessel tank, a fuel tank, valves, and pumps. In this study, a system-level DMFC model, which includes empirical correlations for the DMFC stack and mass balance and energy balance for the components, is formed. A computer code is written in the Engineering Equation Solver (EES) program to solve these equations. This model gives the exergy efficiencies of the system under different operating conditions.

Keywords: Direct Methanol Fuel Cell, System modeling, Exergetic efficiency, Auxiliary equipment, EES

:: Paper No: GCGW - 2018 – P052 ::

CLIMATE CHANGES AND HYDROLOGICAL EVALUATION OF POTENTIAL WATER CONSUMPTION DAMS IN KÜÇÜKMENDERES COASTAL BASIN

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Climate changes have become one of the most important branches of science that need to be studied continuously and in detail in terms of life, as it controls the basic factors of life such as water, agriculture and fisheries in the historical process and is indispensable for energy in addition to these factors. So basically a problem starting with water will also manifest itself in other areas as chain reactions. Because of this reason, there are two main issues in the management of water resources: one is to protect water resources and the other is to manage the use of water resources in a sustainable way.

The most important stream of the Aegean Region is the Küçükmenderes river and its side branches Fetrek, Uladı, Ilıca, Değirmen, Aktaş, Rahmanlar, Yuvalı, Eğridere, Birgi, Çevlik and Keles. According to the population census results, the total population of Küçük Menderes Basin is 3,37 million people. The total basin area is 6963 km2 and the length of Küçük Menderes Basin is 129 km. Annual average precipitation height is 706 mm; the average annual flow / precipitation rate is 0,13. 95% of the total area of the basin is within the boundaries of İzmir province, 4% is in Aydın and 1% is in Manisa province border.

Large irrigation projects are being constructed by DSİ in order to assess the surface water resources of the Küçükmenderes basin. The majority of these projects are for the central sections of the basin, Bayındır, Ödemiş, Beydağ districts and the vicinity, as well as proposed drinking water projects for the central and coastal sections. With the Metropolitan Municipality Law No. 5216, the authority to establish a dam was given to the General Directorate of IZSU and the evaluation of the water resources in terms of drinking water and usage water has accelerated.

In this study, the potential of superficial and underground water resources in the basin and the planning and future planning of existing water and water resources according to their intended use are stated. Within the boundaries of İzmir province of Havzan, there are 22 districts (Bayındır, Bornova, Çeşme, Karaburun, Karsiyaka, Kiraz, Ödemiş, Seferihisar, Selçuk, Tire, Torbalı, Urla, Beydağ, Buca, Konak, Menderes, Balçova, Gaziemir, Narlıdere, and Karabaghlar) will be proposed to suggest the need for the development and conservation of all water resources and hydrological determination of the existing and future needs of the basin in terms of drinking and potable water.

:: Paper No: GCGW - 2018 – P053 ::

BIMETALLIC CATALYST PREPARATION VIA SUPERCRITICAL CARBON DIOXIDE FOR ELECTROOXIDATION OF METHANOL

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A high-efficiency anode material, which is used for direct methanol fuel cells as alternative energy technologies for fossil fuels, is clearly an important parameter for methanol oxidation reaction (MOR). In order to increase Pt catalyst's activity, Ru is used together with Pt. In this study, the effect of other binary metal systems in acidic medium without Pt was investigated. For this reason; new bipyridyl derivative precursors that enable reduction at moderate conditions of Ru, Ni and Pd were synthesized and used to obtain Ru-Ni/AC and Pd-Ni/MWCNT bimetallic nanocatalysts via supercritical carbon dioxide deposition. Then, the dispersion and electrocatalytic performance of the catalysts for MOR were compared in means of cyclic voltammetry. Results showed that Pd-Ni/MWCNT catalysts have a higher oxidation current than Ru-Ni/AC catalysts and increase in Pd ratio acts in favor of methanol electro-oxidation while for Ru-Ni/AC catalysts the stability of the catalyst is more dependent on the metallic state of Ru since the non-reduced Ru containing catalyst showed a better performance than metallic Ru containing catalysts.

Keywords: Direct Methanol Fuel Cells, Bimetallic Electrocatalysts, Supercritical Carbon dioxide Deposition.

:: Paper No: GCGW - 2018 – P054 ::

THE IMPACTS OF WINDOW TO WALL RATIO AND ORIENTATION ON BUILDING ENERGY CONSUMPTION AND CO_2 EMISSIONS UNDER CLIMATE CHANGE

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Concerns about the effects of climate change on building thermal performance and CO_2 emissions are important issues for making improvements in early stages of architectural design. There are different parameters associated with the building operations. In this context, design decisions about the openings of the buildings play crucial role for energy efficiency purposes, because of being one of the key factors for heat exchange process. Therefore, the study mainly aims to investigate the effects of window to wall ratio (WWR) and window orientation on building annual heating, cooling energy consumptions and operational CO_2 emissions with respect to recent, 2050s and 2080s weather conditions of Izmir. The simulation model of a typical reference case for office buildings in Turkey is created in OpenStudio 2.3 plugin for SketchUp 2017. Then, twenty different scenarios are established by considering window to wall ratios of 0%, 20%, 40%, 60% and 80% and orientations facing cardinal directions (north, south, east, west), simultaneously. Besides, building performance simulations are carried out in EnergyPlus 8.1. Analysis of these design alternatives are performed for each weather condition, and the outcomes of total sixty scenarios are presented in order to make comparisons between different building performance characteristics under climate change. As final phase of the study, the results of the simulations are evaluated by taking account of different weather conditions to reach the most efficient opening design alternative for an office building located in Izmir. Considering the average life time of buildings, the conclusions obtained from this study can be used as additional data for understanding the relation between transparent surface design and energy, environmental performance of buildings.

Keywords: Climate change, Office buildings, Window to wall ratio, Window orientation, Energy consumption.

:: Paper No: GCGW - 2018 – P055 ::

EXERGETIC AND ENVIRONMENTAL ANALYSES OF TURBOJET ENGINE

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This study deals with exergetic and environmental analyses of turbojet engine used on the military training aircrafts. In the analysis, the engine data measured in the Engine Test Cell at First Air Supply and Maintenance Center of Turkish Air Forces in Eskisehir, Turkey are utilized. The exergy balance equations are derived for each component of the engine along with the overall the engine. Several thermodynamic parameters (the fuel exergy depletion ratio, the productivity lack ratio, the relative exergy consumption ratio, exergetic improvement potential, exergetic improvement potential ratio, relative exergetic improvement potential, exergetic fuel-product ratio, and sustainability index) are used to evaluate the performance of the engine and its main components (the air compressor, the combustion chamber, the gas turbine, the exhaust forward duct, the aft exhaust duct, and the mechanical shaft). Exergy losses and destructions are investigated to determine thermodynamic inefficiencies. The energetic efficiency of the engine is calculated to be 19.89% while the exergetic efficiency of the engine is determined to be 18.77%. The highest exergy destruction rate of 2921.01 kW in the engine occurs within the combustion chamber (CC) because the CC has the minimum exergy efficiency with 64.55% among the components. The mechanical shaft of the engine has the maximum sustainability index of 100.65. An environmental analysis of the engine is also performed.

Keywords: Turbojet engine exergy analysis, Exergy efficiency, Sustainability index, Environmental analysis.

:: Paper No: GCGW - 2018 – P056 ::

STUDY OF ENERGY EFFICIENCY OF A DRYING UNIT WITH A SOLAR DRYER AND ENERGY STORAGE SYSTEM FOR FRUIT AND VEGETABLE DRYING PROCESS

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Drying of fruits and vegetables under hygienic conditions have a great significance. In our country, these products are generally dried by lying on the ground, but products dried by this method are prone to harmful effects like aflatoxin which degrades the quality of the products. Driers which are used for this purpose, maintain drying to take place under healthy conditions. Recently, solar energy has shown as an attractive alternative form of energy since systems using solar energy as the heat source in drying of the products do not require additional operational costs except initial investment costs. A solar energy drying system enables the drying of fruits and vegetables in a short time period, under healthy conditions and as a good- quality product. Day time utilization and requirement for an uninterrupted drying process restricts the use of solar energy. In this study, pear is dried with a solar dryer. Also, the thermal energy storage system, which uses paraffin (melting at 55-60^{0}C) as the phase change material, operating as independent of the drying system, stores the daytime solar energy and then, in the absence of solar energy, the stored energy was transferred to the drying system to ensure the continuity of the drying process. In addition, a recuperator unit was used for waste heat recovery. A mathematical model was developed for determine temperature and moisture distributions on pear slices. In the mathematical model, related to the thermal energy storage system, air temperature, mean temperature in the system, stored energy and available energy amounts were estimated. The model was compared with experimental results and it was observed that the results were corresponded with each other. The advantage of the system is that it consumes less energy at the rate of 70% than the other drying techniques.

Keywords: Solar Energy, Drying, Dried Pear, Energy Storage, Phase Change Materials.

:: Paper No: GCGW - 2018 – P057 ::

CONVERSION OF SEAWEEDS INTO HYDROCHARS

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In this study, conversion of seaweeds into hydrochar was investigated in order to obtain suitable energy feedstock. Hydrochars were produced from *Fucus serratus*, *Alaria esculenta* and a mixture of seaweeds, mainly consisting of *Cystoseria sp*. and *Laurencia sp*, through hydrothermal conversion (sub-critical water, 200–250°C) method. Fuel characteristics and chemical structure of hydrochars have been determined using standard fuel analysis and spectroscopic methods. Hydrochar yields obtained from seaweeds were found to be lower than that of lignocellulosics. The temperature effect on hydrochar yield in the range of 200-250°C was insignificant. Hydrochars had lower ash contents in comparison to feedstocks which were due to the solubility of inorganics at subcritical water conditions. Because of lower ash content and higher carbon content, hydrochars from *Fucus serratus* had the highest calorific value. The H/C and O/C atomic ratios of resulting hydrochar from *Fucus serratus* and Alaria esculenta became increasingly similar to those of lignite with higher process temperature, whereas the H/C and O/C atomic ratios of hydrochar obtained from mixture of *Cystoseria sp*. and *Laurencia sp*, at all temperatures were out of the range of lignite. FTIR spectrum of hydrochars and seaweeds revealed that decomposition of carbohydrates were almost completed during HTC at highest temperature for *Fucus serratus*, while they were not decomposed effectively for *Alaria esculenta*.and mixture of *Cystoseria sp.* and *Laurencia sp.*

Keywords: Hydrothermal conversion, Seaweeds, Hydrochar.

:: Paper No: GCGW - 2018 – P059 ::

THERMODYNAMIC ANALYSIS AND ASSESSMENT OF A GEOTHERMAL COOLING SYSTEM FOR A HOUSE

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The main objective of this study is to design a geothermal assisted cooling system with a Vapor Absorption Chiller (VAC) to meet cooling demand of a 140 m^2 single-family house in Izmir, Turkey. The monthly and annual cooling demands of the house were calculated first. Next, some thermodynamic properties of the VAC system such as pressures, temperatures, ammonia concentrations and flow rates of each stream were determined. The performance of the whole system was evaluated through Coefficient of Performance (COP). In performing the theoretical and design studies, Engineering Equation Solver (EES) software package was utilized. As a result of the analysis, the cooling demand of the house was calculated as 4.48 kW. The COP of the VAC system was found to be 0.628 based on the operating conditions.

Keywords: Vapor absorption chiller, Geothermal energy, Residential cooling, Energy and exergy analyses.

:: Paper No: GCGW - 2018 – P060 ::

PHOTODEGRADATION OF OLIVE MILL WASTEWATER WITH SUNLIGHT USING NANO-ZNO-SIO_2 COMPOSITE, ITS REUSABILITY AND THE QUALITY OF TREATED WATER

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In this study, nano ZnO-SiO_2 was used to treat the pollutants from the olive mill industry wastewaters by photo-degradation. ZnO is widely used for treatment due to its cheapness and easy reachable. SiO_2 is also productable under laboratory conditions. In this study the main target is to get synergetic effects of ZnO and SiO_2 on the treatment of OMW due to qualification of these nano particles. The effects of increasing nano ZnO-SiO_2 concentrations (0.5 g/L, 1 g/L 3 g/L, 5 g/L and 10 g/L), photooxidation times under sunlight (8,16, 24 and 36 hours) and different pHs (4, 7 and 10) were evaluated on the treatment of OMW pollutants. The photocatalytic reactions were performed under sunlight irradiation in summer months. The maximum pollutant removal efficiencies for COD, total phenol and TS obtained under sunlight were 77%, 73% and 64% with nano ZnO-SiO_2 concentration (3 g/L) after 24 hours sunlight irradiation at pH 4. In this study, recovery capacity of Nano ZnO-SiO_2 was studied. According to recovery studies nano ZnO-SiO_2, this nano-composite can be used for six times for the treatment of OMW with yields as high as 30 % after sixth usage. The treated water was evaluated based on irrigation purposes.

Keywords: ZnO-SiO_2, Photocatalytic degradation, Olive mill wastewater, Sunlight irradiation, Reuse, Recovery.

:: Paper No: GCGW - 2018 – P061 ::

REMOVAL OF PHENOLIC COMPOUNDS FROM OLIVE MILL WASTEWATER WITH SUNLIGHT IRRADIATION USING NANO-ZNO-SIO_2 COMPOSITE

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OMW contains phenolic compounds at very high levels. Phenolic compounds are strict to remove from OMW with classical treatment methods. In this study, removal from phenolic compounds were performed by using nano-ZnO-SiO_2 under sunlight under optimum treatment conditions. The effects of concentration of nano composite, irradiation times and pH of OMW were investigated. The aim of this study is to remove the total phenol and three polyphenols (gallic acid, para coumaric acid, t-paracoumaric acid) in the OMW by nano-ZnO-SiO_2 composite with photocatalytic treatment. The effects of increasing nano ZnO-SiO_2 concentrations (0.5 g/L, 1 g/L 3 g/L, 5 g/L and 10 g/L), photooxidation times under sunlight (8,16, 24 and 36 hours) and different pHs (4, 7 and 10) were evaluated on the treatment of OMW pollutants. The maximum pollutant removal efficiencies for total phenol obtained was 73% with nano ZnO-SiO_2 concentration (3 g/L) after 24 hours sunlight irradiation at pH 4. The maximum removal efficiencies for gallic acid, para coumaric acid, t-paracoumaric acid were obtained as 90%, 5% and 5%, respectively.

Keywords: ZnO-SiO_2, Photocatalytic degradation, Olive mill wastewater, Sunlight irradiation, Phenolic compounds.

:: Paper No: GCGW - 2018 – P062 ::

RESOLVING THE NON-PRODUCTIVE PERIODS OF SOLAR CHIMNEY BY INTEGRATING WITH WASTE-TO-ENERGY PLANT

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Total global renewable energy capacity has been increasing worldwide, i.e. doubled from 2007 to 2016. The main disadvantage of most renewable energy-based plants is the lack of reliability for constant electricity production. Solar chimney is a renewable based plant with a power production of near zero during the night times. In this study, we have proposed a renewable integrated cycle by combining two plants and thereafter produce a reliable amount of electricity all the time. The proposed combination is achieved by injecting outlet air from the condensers of Tehran's waste to energy plant into the bottom of the chimney tower, just below the turbine. Tehran's average climate data for 12 months of the year is initially obtained and the Manzanares prototype is used for the solar chimney power plant model. The solar chimney power plant is simulated with 3D CFD simulation. The final power output of the solar chimney power plant reaches 20–70 kW and increased 20%–1200%, compared to the case without injection. This means power output of solar chimney power plant is at least 20 kW in the hottest night of the year with 5% relative humidity. We have concluded that by combining these renewable based plants, one of the most important solar chimney disadvantages could be removed.

Keywords: Solar chimney power plant, Waste to energy, CFD, Renewable energy, Exergy.

:: Paper No: GCGW - 2018 – P063 ::

EXERGY AND EXERGOECONOMIC ASSESSMENT OF TEHRAN'S WASTE TO ENERGY POWER PLANT

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Converting municipal waste into energy through the Waste-to-Energy (WtE) technology has been growing fast during the past decades. Besides the considerable reduction in the waste volume, it can generate steam and/or electricity. In the present work, energy, exergy, and exergoeconomic analysis techniques are used to investigate the performance of Tehran's 3 MW WtE plant. In the exergoeconomic analysis, the exergy cost of the stream, annual capital investment, and operating and maintenance costs are analyzed. Combination of economic principle and exergy analysis has been used to minimize the power generation costs. MSW is converted to a high enthalpy syngas via gasification to produce the required heat for steam generation in a Rankine power cycle. The effect of different inlet parameters is investigated on the target variables: net produced work, exergy efficiency, and power cost rate. Also, the exergy destruction and the exergetic efficiency of every component is calculated to assess the irreversibilities in the system. Results show that the gasifier has the highest exergy destruction. The overall exergy and energy efficiencies are 14.49% and 17.27%, respectively. Additionally, by

increasing the turbine inlet pressure, the power cost rate will decrease, and the net produced work and the overall system efficiency increases. It is further realized that the moisture content and gasification temperature have an indirect effect on the exergy efficiency of the gasifier.

Keywords: Gasification, Waste to energy, Exergoeconomic, Thermodynamic analysis, Exergy.

:: Paper No: GCGW - 2018 – P064 ::

SIMULATION FOR TECHNO-ECONOMIC AND ENVIRONMENTAL EFFECTS OF HEAT AND ELECTRICITY GENERATION FROM SOLAR ENERGY

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Electricity and hot water yields are possible from the infinite source of sun. Although the usage of solar energy for hot water is widespread technology especially in Turkey for a while, usage method of solar energy approach is increased to generate electricity. The controversial issue is that the solar energy is shared for thermal and electricity systems, if consumer needs both. Process of design for both system, there are some limitations should be considered which are place (area), needs and earnings. In addition to all, there is a developed system PV/T, considered in this research, collects irradiation for both in one surface and simultaneous generation. The research results provide mathematical modeling and simulation of a system for the consumer who needs both thermal and electricity. Analysis of this hybrid system optimization shows that significant parameters of design are temperature and irradiation; however, two arguments may have different influences for two technologies. Moreover, it is seen that the system has an effect on environment affirmatively by decreasing carbon emission thanks to usage of renewable sources.

Keywords: Solar energy, PV/T, Carbon emission, Techno-economic, Simulation.

:: Paper No: GCGW - 2018 – P066 ::

STEAM GASIFICATION OF ALMOND SHELL

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In this study, thermal and catalytic steam gasification of almond shell (AS) was carried out using a double-bed reactor in a two-stage process:1st stage was pyrolysis of biomass and steam gasification of biomass char (in top bed); 2nd stage was tar degradation and steam reforming of gases evolved from top bed (in bottom bed). The gases produced during the process were mainly H_2 and CO_2, and some amount of CO, CH_4 and light hydrocarbons. In all experiments top bed temperature was hold at 850 °C. In thermal gasification, different bottom-bed temperatures (600, 700 and 850°C) were tested. In catalytic experiments, seaweed ash, red mud(RM), Ni and Ni-Ce loaded red mud were used as catalyst. Temperature was found as the main effect on hydrogen production. In gasification at the temperatures 850-850°C, H_2 yields from both thermal and catalytic runs were almost the same (~ 1200 mL H_2/g biomass). However, in case of low bottom bed temperatures, catalytic gasification produced H_2 in higher yields compared to thermal runs at same conditions. In gasification at the temperatures 850-700 °C, highest H_2 yield (1340 mL H_2/g biomass) was obtained in presence of Ni(10%) / RM. In addition, the addition of seaweed ash into AS increased the H_2 yield due to the enhancing char gasification reaction.

Keywords: Biomass, Steam gasification, Hydrogen.

:: Paper No: GCGW - 2018 – P067 ::

DAYLIGHT PERFORMANCE OF HIGH-RISE BUILDING AS PARAMETER FOR ENERGY MANAGEMENT

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A global movement of green skyscrapers is upon us. Architects, engineers, developers, and clients are pioneering this shift towards eco-towers. These towers are shaping the future of high-rise buildings and utilizing green technologies on an entirely new scale. In sustainable high-rise buildings especially, an integrated process is necessary because of their scale and the fact that green design affects so many different elements of a building, such as daylighting, which in turn concerns siting, orientation, building form, facade design, floor to-floor heights, interior finishes, electric lighting controls, and cooling loads, among other things.

This paper presents summary information from a noncritical literature review on daylighting and solar energy in high-rise buildings. high-rise buildings have great potential to gain solar radiations because of their vast facade. Glazed facades are often proposed with the intent to guarantee high daylight levels and wide exterior views. However, an increasing attention is nowadays recognized to glare issues and indoor comfort levels. Applying daylighting strategies in high-rise buildings have a meaningful effect on reducing the total annual cooling and heating energy demand. Daylighting is an effective strategy to maintain a comfortable indoor environment and provides great opportunities for energy savings in buildings. This paper summarizes the benefits and defects of daylighting and solar energy effects on high-rise buildings. High-rise buildings are seemingly well-tuned to their climate; and they provide a major portion of their own energy requirements through integrated passive design, daylighting, and intelligent control systems. Daylighting has been associated with higher productivity, lower absenteeism, fewer errors or defects in products, positive attitudes, reduced fatigue, and reduced eyestrain. Good daylighting strategies and concepts are also discussed in the guide on building systems.

Keywords: Daylighting, High rise building, Solar energy efficiency, Effective solar strategy.

:: Paper No: GCGW - 2018 – P068 ::

THE IMPACT OF CLIMATE CHANGE ON THE PERFORMANCE OF FLEXIBLE PAVEMENTS

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The increase in unpredicted extreme weather events around the globe, is rising many challenges that could significantly impact the performance of civil infrastructure systems. Transportation infrastructures are one of the main systems affected by the changes in weather patterns. Flexible pavements constitute one of the most critical systems of transportation infrastructures. The purpose of this paper is to investigate the impact of climate change on the performance of asphalt concrete pavements. A study was conducted using historical climate data and laboratory tests to predict the influence of the increase in temperature due to climate change on the behaviors of asphalt concrete pavements. The performance of pavements was evaluated based on the permanent deformation or rutting that is expected to occur over the service life. The results of the study showed that, changes in weather patterns, could substantially impact the serviceability of pavements by reducing its rutting life. The study also showed that relying on historical climate data to design pavements, is no longer an effective approach, due to the changes in average temperatures, precipitations and sea levels.

Keywords: Climate change, Pavements, Rutting, Geographic Information System, Infrastructures.

:: Paper No: GCGW - 2018 – P070 ::

APPLICATION OF ASPEN PLUS TO RENEWABLE HYDROGEN PRODUCTION FROM GLYCEROL BY STEAM REFORMING

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This study is aimed to investigation of hydrogen production from glycerol in Aspen Plus. The effect of reaction temperature, water/glycerol molar feed ratio and reactor length and diameter on the mole fraction of components and conversion of glycerol was investigated. The synthesis of hydrogen from glycerol was carried out by using plug flow reactor. Thermodynamic model SRK (Soave-Redlich-Kwong) was chosen as the property model. The glycerol conversion and mole fractions of products were examined. The optimum process conditions are determined. Reactor design has been done in Aspen Plus. The obtained results are shown that Aspen Plus has been successfully applied to investigate the effects of reaction parameters and reactor sizing.

Keywords: Aspen plus, Glycerol, Hydrogen, Steam reforming.

:: Paper No: GCGW - 2018 – P071 ::

HYDROGEN SEPARATION USING GRAPHENE NANOPLATE INCORPORATED POLY (DIMETHYL SILOXANE) MEMBRANE

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Hydrogen based energy devise is promising as an alternative to fossil fuel. Hydrogen-rich fuel is a key solution to reduce the emission of CO_2 and other gasses and contributes for future's "zero emission" energy politics. Hydrogen can be produced from the renewable feedstock and it is basically defined as 'bio-hydrogen'. However, there are some drawbacks to limit the bio-hydrogen production; the important one is the hydrogen purification. Membrane gas separation is one of the efficiency hydrogen purification/separation techniques. The performance of the MGS is directly related to the materials to be used for membrane synthesis. In this study, nanocomposite graphene nanoplate (GNP) incorporated poly (dimethyl siloxane) (PDMS) membrane was produced and used for the purification of hydrogen from model bio-hydrogen syngas which was also included carbon dioxide, and nitrogen. Effect of GNP addition, trans-membrane pressure and membrane thickness on gas selectivity was evaluated. As a result, GNPs addition increased the hydrogen selectivity. The highest selectivity of 7.65 was obtained for CO_2/H_2. Briefly, it was observed that the GNP was appropriate to increase hydrogen selectivity (H_2/N_2 and H_2/CO_2) and PDMS was appropriate matrix to increase CO_2/H_2 selectivity.

Keywords: Hydrogen separation, Membrane gas separation, Nanocomposite membrane.

:: Paper No: GCGW - 2018 – P072 ::

SOCIAL AND ENVIRONMENTAL IMPACT OF HYDROELECTRIC POWER PLANTS

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By the end of 2015, 25.8%of the produced electricity, which is 259.7 billion kWh in total, is provided from the hydraulic source. When the whole planned Hydroelectric Power Plant (HPP) projects are completed, there will be 1383 HPP in Turkey. The objective of this review is to evaluate the impact of HPPs on the environment and people in the context of the international privatization policies. In the past decade, the legislation on HPPs changed and HPP construction tasks have been transferred to private sector. The construction of mini and micro hydroelectric power is permitted with the amendments made in the legislation and private sector is allowed to produce and sell electricity from its constructed HPP. Destruction of vegetation, forests, natural habitats of endemic species, water quality degradation and negative impact on aquatic life, deltas, wetlands, groundwater, historical are the environmental effects of HPP. Migration and its social problems, the economic effects, electricity transmission lines related problems and the increase of parasitic diseases are the effects on humans. There are many deficiencies and errors during the preparation process of the environmental impact assessment report. Community participation meetings and review and evaluation committee meetings are also non-functional. Water policies in Turkey are formed parallel to the international privatization policies.

Keywords: Hydroelectric power plant, Environmental effect, Water policies, Privatization, Social and environmental impact.

:: Paper No: GCGW - 2018 – P074 ::

CLIMATE CHANGE EFFECTS ON ARCTIC SHIPPING ROUTE

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Sea ice extent reaches nearly fourteen million kilometers square surface area over the Arctic Ocean during the winter months. Its surface extent shrinks more than ten million kilometers square during summer with increase of temperature. Arctic ocean has a quickest route between continents, but sea ice is an obstacle for the vessels to navigate in these routes. Icebreakers are the strongest structured ships for this kind of voyages with their unique design. The commercial vessels go through in Arctic routes with assistance of those icebreakers during summer months. Extent of sea ice decreased almost every year in the last thirty-year period with the effects of global climate change. As consequences of this melting period, the first commercial ship which is a Russian liquefied natural gas (LNG) tanker passed the Arctic Ocean without assistance of icebreakers in this year.

Sea ice extent and concentration are being followed daily by developing remote sensing technology. According to some sea ice modelling scenarios, there will be no more sea ice in the Arctic Ocean in the next century because of the increasing temperature and CO_2 ratio in the atmosphere. If the sea ice disappears in the north pole, this will cause the changes in ocean currents, especially the conveyor belt which complete its turn in one thousand years after rotating all world. Also, the melting sea ice will cause less reflectivity from earth surface. This study will discuss the consequences of climate change and the current status of sea ice by using remote sensing technology.

Keywords: Global climate change, Sea ice, Polar regions.

:: Paper No: GCGW - 2018 – P075 ::

CHANGES OF SEA ICE EXTENT STUDIES IN TURKISH ANTARCTIC EXPEDITION-I

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Sea ice occurrence is quite important for the ocean currents to be effective. The waters come to polar regions with ocean currents of tropical latitudes, cool down through cold sea ice. While sea ice occurs the salt of the sea water sinks to the bottom. This alteration creates the greatest current called thermohaline cycle. If the average temperature and CO_2 rate in the atmosphere continue to increase, there will be no more sea ice in the next future. The main role of the sea ice is reflecting sunlight back to space rather than absorbing it into earth. This called as albedo effect which helps to stabilize earth's temperature.

Turkish Antarctic Expedition – I (TAE – I) was carried out by participation of nine scientists between February and April 2017 onboard the Research Vessel Australis. The navigation route was 2100 nautical miles long, had two sections as northern passage and southern passage. Sea ice observations studies carried out in seven days during thirty-days voyage. This year, Antarctic sea ice extent reached its minimum in the last thirty years as a result of global climate change. Sea ice reports of TAE – I will be compared with second observation reports after completion of TAE – II (Turkish Antarctic Expedition – II) in 2018. This study will show the changes of sea ice extent near the coastline of Antarctic continent between 62° S and 68° S latitudes. The local sea ice observations will compare with sea ice extent images of remote sensing satellites. This study will also include Göktürk – 2 and RASAT satellites to examine changes of sea ice.

Keywords: Global climate change, Sea ice, Antarctica, Turkish Antarctic Expedition.

:: Paper No: GCGW - 2018 – P076 ::

HYDROGEN PRODUCTION FROM COFFEE WASTE

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The aim of this work is to produce hydrogen from coffee wastes, their biochars obtained at 300 °C and 500 °C (BC300 and BC500) via steam gasification process in a double-bed reactor. The used gasifier, main gasification reactions took place in top- bed of reactor, while tar reforming reactions took place in bottom-bed of reactor. The effects of temperature, catalyst and feedstock type on hydrogen production and tar reforming were comparatively investigated. The different bottom-bed temperatures (600 - 850 °C) were tested in the meanwhile the top bed temperature was held at 850 °C. In case of raw spend coffee beans, by increasing of bottom bed temperature from 600 °C to 850 °C, H_2 yield increased from 697 mL H_2 /g biomass to 1155 mL H_2 / g biomass and tar amount decreased by 81%. On the other hand, tar amount and H_2 yield were considerably changed by using of biochars as feedstock instead of raw biomass. In comparison of raw biomass gasification, H_2 yield increased two (for BC300) and three (for BC500) folds. In catalytic experiments, alkaline (dolomite and mussel shell) and iron (red mud) catalysts were used as catalyst. The catalysts had no considerable effect on gas yields, but they reduced the tar formation.

Keywords: Biomass, Coffee wastes, Biochar, Steam gasification, Hydrogen.

:: Paper No: GCGW - 2018 – P077 ::

ADAPTATION STRATEGIES FOR SEA LEVEL RISE IN COASTAL CITIES OF TURKEY

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Sea level rise due to global warming and climate change is among the most significant environmental problems in the 21st century. Sea level rise is becoming a threat to the coastal areas, where population and socio-economic focal points are mostly concentrated in. This global threat would have significant impacts for Turkey, especially in coastal areas, cities and settlements that are important trade and tourism centers. According to the IPCC's 5th Assessment Report in 2013, global average surface temperature is expected to rise in the range of 0.3-0.7 °C in the period of 2016-2035. Accordingly, the average global sea-level rise is estimated to be in the range of 0.26 m to 0.82 m during the period of 2081-2100. Among a number of coastal cities, İstanbul, İzmir, Muğla and Antalya in particular would face the risk of sea level rise in the near future (2050-2100). However, adaptation strategies in the scales of urban design and architecture developed for Turkish coastal areas are lacking. Within this framework, this paper focuses on adaptation strategies for sea level rise in coastal cities of Turkey. Dwelling on the future scenarios, it brings a number of questions into being: Will climate change scenarios be a threat for the coastal cities of Turkey? What kind of strategies should be considered and what kind of adaptation strategies could be developed for the physical, spatial and social qualities of the coasts in Turkey? The amount of risk in Turkey can be determined by considering the morphological structures, diversities, densities and coastal uses of the existing cities and settlements. Thus, developing awareness by adapting the estimated climate change impacts to the cities in Turkey would lay a ground for further studies within the frameworks of architectural and urban design.

Keywords: Global warming, Climate change impacts, Sea-level rise, Adaptation strategies, Coastal cities and settlements in Turkey.

:: Paper No: GCGW - 2018 – P078 ::

DESTRUCTION OF ESTROGENS USING PHOTOCATALYTIC PROCESS AS REINFORCE TREATMENT SYSTEMS

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Expansion of organic chemicals contamination especially which have endocrine disrupting effects in wastewater threat environment health by contaminate water resources and food chain by deposit in sea products. Considering the disadvantages of these chemicals on environment and human health, it is essential to treatment and elimination of these pollutants, however, in most countries there is no official rules for destruction of endocrine disrupting chemicals.

We were chosen Estrone and 17 β Estradiol to study, regards watch list in the field of water policy of European Union (DIRECTIVE 2013/39/EU). Real samples were gathered from effluent of a wastewater treatment plant (WWTP) with input of both municipal and industrial wastewater. Row sewage was exposed to physical, chemical and biological processes in the WWTP.

Solid phase micro extraction method by hollow fiber has used for samples extracting due to its compliance with green chemistry. Hollow fibers provide fast and sensitive extraction method for volatile organic compounds. Under optimum extraction condition, HPLC used for measures Estrone and 17 β Estradiol.

After assessing the contents of studied analytes, the pilot reactor was designed to complete the treating system. In added system, treated wastewater was passed over glass surface covered by titanium dioxide (TiO_2) under UV light. Using photocatalytic process has shown a great potential for wastewater treatment technology. Optimum refining condition was selected through changes in effective factors in degradation.

Experimental results shown the efficient effects of photocatalytic system on studded chemical materials. TiO_2 photocatalytic modifications can successfully utilized for the degradation of organic pollutants in wastewater treatment plants.

Keywords: endocrine disruptors, solid-phase micro extraction, wastewater treatment, photocatalytic process

:: Paper No: GCGW - 2018 – P079 ::

EFFECT OF HYDROGEN ENRICHMENT ON THE EXERGY EFFICIENCY OF BLENDED METHANE-HYDROGEN MILD COMBUSTION

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An exergetic-based analysis of blended methane-hydrogen combustion in a MILD burner is performed. The effects of hydrogen enrichment on exergy efficiency of a MILD burner with various amounts of hydrogen are analyzed. The simulations are carried out employing computational fluid dynamics (CFD) coupled with reduced chemical mechanism. The simulations are carried out using OpenFOAM v. 3.0. The results indicate considerable the pivotal role of the amount of hydrogen present in the fuel stream. It is therefore evident that hydrogen enrichment could be considered as a promising strategy for further increasing the exergy efficiency of burners working in MILD combustion mode.

Keywords: MILD combustion, Hydrogen enrichment, Exergy analysis.

:: Paper No: GCGW - 2018 – P082 ::

THE EFFECT OF WIND SPEED AND TEMPERATURE CHANGES ON PERFORMANCE OF PAVEMENTS: FINITE ELEMENT ANALYSIS

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This paper analyzed the heat transfer process within the layers of both asphalt concrete (AC) pavement and Portland concrete (PC) pavements and provided better understanding on the temperature predictions due to the effect of wind speed. Natural environment such as temperature changes and wind speed have been found to have influence on the heat energy absorption of pavement surfaces. The effect of wind speed is believed to have an impact on the solar radiation filtration. The purpose of this research is to systematically determine the surface temperature changes of AC and PC pavements caused by solar radiation and wind speed. Finite element method (FEM) and heat transfer theory were performed to analyze solar radiation and temperature variations. Filed observations and temperature collections were conducted to compare the analysis results. The paper concludes that the effect of wind speed has a significant influence on the accuracy of temperature predictions of AC and PC pavements.

Keywords: Finite element analysis, Wind speed, Temperature change, Pavement analysis.

:: Paper No: GCGW - 2018 – P083 ::

CARBON FOOTPRINT OF SOL-GEL METHOD APPLIED FOR FLAME RETARDANCY OF COTTON FABRIC

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The textile industry is an intense user of chemicals, water, and energy throughout the textile production chain; hence especially consist of dominant processes in terms of emission of greenhouses gases and contribution to global warming potential. In this phase, it is quite important to develop alternative methods, which reduce the need for raw material, energy and have the potential to minimize the waste. The sol-gel technique is prominent as one of the alternatives to reduce environmental load caused by textile wet finishing processes. It enables functional properties on textile surfaces with less mass and energy input and almost without waste in comparison to conventional methods. Particularly, the flame retardancy of cotton fabrics is enhanced significantly via sol-gel method. However, there is still need of systematic and holistic assessment to clarify the environmental profile the sol-gel technique as predicted solution for industrial scale.

In this study, Life Cycle Analysis (LCA) was performed to quantify and evaluate the carbon footprint related to production of the flame-retardant cotton fabric using sol-gel technique. Life cycle inventory data for the flame-retardant finishing processes were collected from the section of the patent application filed with the number 2016/20343 in Turkey under the master's thesis study. LCA has been carried out using the GaBi 6 Software (Thinkstep). The global warming potential was obtained using factors defined by Centrum voor Milieukunde Leiden (CML, 2001).

Keywords: Life cycle analysis, Carbon footprint, Sol-gel method, Flame retardancy, Cotton fabric.

:: Paper No: GCGW - 2018 – P085 ::

HYDROCHARS AS SOIL AMENDMENT

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In this study, we investigated the effect of biomass type and hydrothermal carbonization conditions on the soil amendment characteristics of hydrochar derived from food industry wastes. HTC experiments were carried out between 150-275 °C at 0.05-0.55 biomass: water ratio and for 0-300 min. duration time and optimized hydrochar production condition by using Design Expert Software programme. HTC properties relating to its agronomic value, such as pH, electrical conductivity (EC), cation exchange capacity (CEC), polycyclic aromatic hydrocarbon (PAH) and water extractable nutrients were determined. The temperature and biomass type were the significant factors affecting the hydrochar properties. It was found that hydrochars might be more suitable than biochars from the point of PAH content, pH and CEC values.

Keywords: Hydrochar, Biomass, Carbon Sequestration, Soil Amendment.

:: Paper No: GCGW - 2018 – P086 ::

DETERMINATION OF POLYCYCLIC AROMATIC HYDROCARBONS IN TREATED WASTE WATER AND REMOVAL PROSSES USING PHOTOCATALYTIC SYSTEM

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Polycyclic aromatic hydrocarbons (PAHs) are known as ubiquitously present environmental pollutant. More than one hundred PAHs exist in the environment and often occur as complex mixtures. Due to ability to affect the endocrine systems of humans and animals, also toxic and carcinogenic effects of some PAH compounds, they are included among the priority pollutants announced by the U.S. Environmental Protection Agency and priority substances to the water farm work DIRECTIVE 2013/39/EU. Effluents of waste water treatment plants convey compounds of PAHs in the sea so, loss of species in aquatic environment and developmental delays and deformities in amphibians is inevitable.

In this study, solid phase micro extraction (SPME) was effectively performed for extraction PAH compounds from real samples gathered from effluent of a waste water treatment plant (WWTP) with input of both municipal and industrial waste water. Row sewage was exposed to physical, chemical and biological processes in the WWTP. Under optimum extraction condition, GC-MS used for investigating target analytes.

Pilot photocatalytic reactor was designed to improve the treating system. Treated waste water was passed over glass surface covered by titanium dioxide (TiO_2) under UV light. Two important aim were followed in this method. First of all, the series of experiments were designed by changing effective factors. During treating time several samples were analyzed to determine the purification process and choosing the optimum destruction condition. Next step was performed to identification of new degradation products.

In environmental researches it should be considered to use methods in accordance with green chemistry as performed in this research. The results of this study provide new insight into the advantages and disadvantages of using photocatalytic process and UV light as reinforce treatment systems in destruction of PAHs.

Keywords: Polycyclic aromatic hydrocarbons, Solid-phase micro extraction, Wastewater treatment, Photocatalytic process.

:: Paper No: GCGW - 2018 – P087 ::

ENVIRONMENT STANDARDS POLICIES AND STRATEGIES SUSTAINABLE BUILDING TECHNOLOGY IN MEXICO

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The present project analyzes the conditions of the actual construction standers and their relationship with the conditions of global warming mitigation and adaptation of the western zone of Mexico. The analysis of the energy efficiency will be based mainly on the conditions of sustainability, understanding that the consumption of the energy and the water is certain determined for the conditions of habitability. Consequently, a series of sustainable sections was developed to be applied in the construction criteria as a global warming mitigation solution in Mexico, reason for which it is decided to choose a specific place to exemplify the points treated in the development of the investigation. The presentation includes the different analysis stages, the data processing and the standards proposals, which are grouped according to the "criteria of sustainability" for the sustainable urban development and the construction of sustainable buildings.

The analysis of the energy efficiency will be based mainly on the conditions of sustainability, understanding that the consumption of the energy and the water is certain determined for the conditions of habitability. A sustainable construction can be a space completely integrated to the natural landscape and the natural flows of an ecosystem or can be an artificial place with a high energy performance, built with low environmental impact materials.

The primary objective is to maximize the energy efficiency, to reduce the carbon dioxide emissions, the conservation of the natural resources, as well as to integrate sustainable technologies and to make integral an urban planning with citizen participation in the different phases from the project. The analysis of the energy efficiency will be based mainly on the conditions of sustainability, understanding that the consumption of the energy and the water is certain determined for the conditions of habitability.

Adaptation will occur in new constructions if standards are enhanced. As for counteracting consequences of heat waves, installation of air conditioning in existing buildings could be expected, along with a demand for buildings with more efficient indoor climate control and global warming adaptation.

Keywords: Building standards, Energy saving, Global warming.

:: Paper No: GCGW - 2018 – P088 ::

ENERGY HOUSING POLICIES AND STRATEGIES AS A SOLUTION FOR THE CLIMATE CHANGE IMPACT

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The present work analyses on the comparison between traditional and contemporary houses in Mexico by analyzing design characteristics of the traditional house that could be adopted in the new urban development in order to further improve occupants´ comfort and minimize energy consumption while considering issues of climatic requirements of contemporary living and culture issues which may also influence the housing design and its performance. This must be considered as a perfectibility study and potential savings would only be possible if recommendations are adequately implemented and look for the occupants' comfort and quality of the architecture.

The principal intention of the present research is the study of the housing policies conditions of a rural community western Mexico, with the purpose of establishing the sustainable parameters to realize recommendations of energy savings in rural houses as a solution for the climate change impact. This paper proposes an alternative of sustainable technology for energy savings in the rural communities, by means of mechanisms that provides the energetic efficiency used in the air conditioning, the artificial lighting, as well as the equipment connected in all the processes of the building: From the project, the construction, the habitability and the maintenance.

For the suitable power efficiency of the houses the use of passive systems like auxiliary elements is due to consider controlling an architectonic space in inadequate bioclimatic conditions. These systems activate and work by themselves, reason why it is not the same to talk about passive systems that to architectonic elements of climatic control.

This paper analyses some important aspects integral to the development of a national normative structure of adaptation to climate change, discusses practical considerations, and proposes a new policy design approach for more efficient elaboration and implementation of adaptation policy and strategies.

Keywords: Building standards, Energy saving, Global warming.

:: Paper No: GCGW - 2018 – P092 ::

INVESTIGATION OF EMISSION INVENTORY FOR CEMENT PRODUCTION BASED ON THERMAL IRREVERSIBILITY

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The cement sector, which has about 50% of the cost of energy consumption, has a high threat of environmental impact as well as intensive energy consumption. In addition to effective and efficient use of energy in this sector, alternative studies have become a necessity in order to eliminate such threats. The sector will be lead as related to the potential for thermal sourcing in the industry to approach about 80%, the identification of the thermal sources-derived potentials in the work. In this context, the thermal effects on the emission loads of the irreversibility's occurring in the systems should be shaped by an inventory operation. In this study, the thermal inefficiency of the production was evaluated in the cement plants, primarily due to the energy and exergy analysis of the sector, taking into account national potentials in Turkey. Subsequently, based on total inefficiency-related emission inventory, thermal irreversibility related to emission inventories were established by enterprise inventory approach. Comparative analyzes of individual cargoes with national targets have also been made. At the end of the study, suggestions were made to improve the environmental and economic effects of reducing the potentials reached as a result of the analysis.

Keywords: Cement, Efficiency, Irreversibility, Emission, Sustainability.

:: Paper No: GCGW - 2018 – P094 ::

DISPOSAL OF LAYING HEN MANURE WITH BUBBLING FLUIDIZED BED REACTOR IN COMBINED HEAT AND POWER SYSTEM

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One of the main problems in the world is the elimination of poultry manure that came from cage house. Poultry manure causes illnesses, bad smell and leads to formation of larval. To avoid these unwanted situations, it is necessary to disposal the poultry manure. The manure taken from the poultry house is about 75-80% moisture. In this humidity manure cannot be stored, cannot be given directly to the soil and cannot be processed. The humidity is reduced to about 20% by processing. Seasoned fertilizer is preferred due to agricultural activities in the world, the fertilizer is stocked in the rest of the year. Keeping the environmental effects of stocked fertilizer under control puts a serious burden on poultry producers in terms of storage cost and biosecurity. This study will investigate the effect of the structure of chicken manure, gasification processes (gas concentrations depending on temperature, temperature values of gas etc.), air quantity, fuel quantity and temperature on the combustion process. When the environmental effect is considered, it is important that chicken manure can be eliminated in small, medium, and large-scale poultry house.

Combustion of laying hen manure is the most difficult process in literature and field application. There is no combined heat and power system that includes drying process of manure with waste heat, combustion with fluidized bed reactor and electric generation in the world. A special fluidized bed reactor design is required for the combustion process of the laying hen manure which include high alkaline and ash contents. Partial combustion with primary air is provided to keep the fly ash in the bed. Considering the parameters such as gas temperature and speed, it comes into complete combustion with secondary air. In this study, the design of the reactor for the combustion of laying hen manure in a fluidized bed reactor, CFD studies and significance of the cogeneration system will be discussed.

Keywords: Poultry, Manure, Cogeneration, Fluidized Bed Reactor, ORC, Dryer.

:: Paper No: GCGW - 2018 – P099 ::

EXERGETIC IRREVERSIBILITY AND CO2 EMISSION ANALYSIS BASED ON DIFFERENT SEA TEMPERATURE IN THE DIESEL ENGINE OF CARGO SHIP

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The maritime industry, which has about 80% of potential of transportation, is a sector caused about 3% of total emission potential. In recent years, developed emission target together with the legal limitations of the sector that it has achieved a structure that is actively fighting with emissions. In the heavy fossil fuel consuming sector, Energy efficiency and management are evaluated as primarily important issues. In particular, cooling with sea water in the main engines is a parameter that is evaluated in terms of system efficiency. However, the effects of seawater heat exchanges on energy efficiency can be directly assessed with fossil fuel consumption.

This study has been examined in the effects of direct sea temperature changes on the engine performance relation to exergetic irreversibility. In the study, the emission effects of irreversibility in engine performance were also evaluated. In this context, effectiveness of cooling water activity for the main engine, which is 69.39% on its average exergy destruction, were calculated. According this data, the effect of this change related to CO_2 emission potential caused by these was also found. At the end of the study, some evaluations on the cooling efficiency were made.

Keywords: Cargo ship, Diesel engine, Efficiency, Emission, Sustainability.

:: Paper No: GCGW - 2018 – P100 ::

POLAR CODE FOR THE POLAR REGIONS

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International Maritime Organization (IMO) has adopted International Code for Ships Operating in Polar Waters (Polar Code). The Polar Code amends SOLAS 74 and MARPOL 73/78 with binding regulations, which entered into force on 1 January 2017 that supports safe and environmentally-friendly shipping in the Arctic and Antarctic waters. With more ships navigating in polar waters, IMO has moved to address international concern about the protection of the polar environment and the safety of seafarers and passengers with the introduction of new regulations that all ships operating in these harsh and challenging waters must comply with.

The polar regions are facing increasing challenges resulting from the interactions between climate change, human activities, and economic and political pressures. As the sea ice coverage has been decreasing in the Arctic during the last few years, there is an increasing number of ships transiting the region. Although there is relatively little commercial shipping traffic in the Southern Ocean, these routes still involve potential encounters with icebergs, but the level of risk is uncertain. Unfortunately, in the Arctic, several disasters and collisions occurred in the last years. Those incidents have been caused by the special conditions which underline the special need for appropriate ship safety infrastructure in form of ports of distress, maritime salvage stations and bases for search and rescue operations. The challenges of search and rescue operations in polar regions, for instance, the lack of marine infrastructure, the harshness of the environment, makes emergency response significantly more difficult in the Arctic and Antarctica. The limitations of radio and satellite communications to monitor and control ship movements in polar waters is another issue. However, Arctic is surrounded by land, but Antarctica surrounded by the Southern Ocean which means search and rescue operation standards cannot be same. There is still a debate if Polar Code provides significant additional protection for Antarctic waters. In this study, we will discuss the lack of any significant new provisions in Polar Code.

Keywords: Polar code, Polar regions, Navigation, Search and rescue.

:: Paper No: GCGW - 2018 – P101 ::

INVESTIGATION OF SYSTEM EFFICIENCY AND COOLING CAPACITY DEGRADATION BASED ON THE FOULING EFFECT IN AIR-COOLED CONDENSERS

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In this study, effects of fouling in air-cooled condenser of a vapor-compression refrigeration system on the efficiency degradation are presented. These are performed by negative changes in condenser pressure, superheating temperature, compressor energy consumption and COP due to blocking the condenser air passage caused by degradation effects. Deterioration of energy performance caused by degradation effects emerges by increasing of condenser fouling. In addition, since uniform air flow rate which may also improve heat transfer capability of condenser coil can't be achieved, COP value of refrigeration system will be decreased considerable. At the end of the study, it was discussed how degradation effects can be eliminated.

Keywords: Degradation, Cooling capacity, Condensation, Fouling.

:: Paper No: GCGW - 2018 – P102 ::

TROPICAL CYCLONE ACTIVITY IN NORTHWEST PACIFIC AND ITS RELATIONSHIP WITH SEA SURFACE TEMPERATURE

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The strong tropical cyclone, called typhoon in China, belong to the extreme climate events (ECEs), their trend of intensity and frequency is concerned with climate change. Utilizing the Best-Track Tropical Cyclone (TC) Data from the Joint Typhoon Warning Center (JTWC) and the NOAA Daily Sea Surface Temperature Analysis Data for the period 1982–2014. Spatial and temporal characteristics of northwest pacific TC activity, and its relationship with sea surface temperature (SST) are analyzed. The results show: (1) TC has three distinct birthplaces: Birthplace 1 (10°-22°N, 110°-120°E), Birthplace 2 (8°-20°N, 125°-145°E), Birthplace 3 (5°-20°N, 145°-155°E), and the frequency of birthplace 2 is more than the other two. (2) The frequency of TC has an evident inter-annual variability; 1982-1992 and 2003-2014 were Low-frequency years, and 1993-2002 was High-frequency years. From 1982-2014, the frequency characteristics of TC showed slow increase - rapid increase - decrease. During 2000-2014, the number of TC shows a clear downward trend. (3) TC concentrates in June-Oct of every year. General, there is the largest number of TC's occurrence in Aug, whereas the smallest number of it in Feb. In May, Nov and Dec, the number of TC increases slowly in 1982-2014; and from June to Oct, the frequency showed a trend of slow decline. (4) The birthplace of TC occurs with a corresponding movement of the warm pool. From Jan to Aug, the birthplace of TC with the warm pool was gradually moving toward the higher latitudes. From Sept to Dec, the birthplace of TC with the warm pool was gradually moving toward the low latitudes. (5) The birthplace of TC often appears in the sea area which was in the south of 27℃ isotherm in the center of warm pool. More than 70% of TC appears in the south of 29℃ isotherm. During Jan-Mar and Nov-Dec, TC mainly appears in the sea area between 27-29℃ isotherm, and during April-Oct, it mainly appears in the sea area between 28-30℃ isotherm. (6) Over the past 33 years, there was little relationship between SST and TC for the annual change in the northwest Pacific; since 2000, with the rise of SST, TC frequency shows a downward trend.

Keywords: Northwestern Pacific, Tropical cyclone, Sea surface temperature, Spatial and temporal characteristics, Climate change

:: Paper No: GCGW - 2018 – P103 ::

BIOREMEDIATION OF MINKERY WASTEWATER AND *ASTAXANTHIN* PRODUCTION BY *HAEMATOCOCCUS PLUVIALIS*

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Haematococcus pluvialis (*H. pluvialis*), a freshwater microalgae species, is well known for its massive astaxanthin accumulation. In order to achieve a resource efficient and environmentally friendly production strategy, an integrated system associated with bioremediation of wastewater was studied. A two-stage system was designed for the *H. pluvialis* culturing and induction processes. *H. pluvialis* was cultivated in minkery wastewater with serial dilutions and compared with the conventional Bold's Basal Medium (BBM). The results showed that *H. pluvialis* grew well in diluted minkery wastewater and the highest biomass production was observed in 1.5% minkery wastewater cultures, yielding 906.3±34.0 mg L^{-1}. Moreover, successful removals of total nitrogen (TN) and total phosphorus (TP) were realized during the cultivation process. In the following photoautotrophic induction stage, nitrogen-deprived vegetative cells were exposed to high light intensity for astaxanthin production, and the resultant production was 39.72±1.69 mg L^{-1} in 1.5% minkery wastewater cultures. This study concludes that a potential opportunity of *H. pluvialis* exists for treating minkery wastewater and producing high-value astaxanthin.

Keywords: Bioremediation, Minkery wastewater, Water pollution, *Haematococcus pluvialis,* Astaxanthin.

:: Paper No: GCGW - 2018 – P104 ::

DETERMINING THE EFFECTS OF ACETATE AND NACL CONCENTRATIONS ON THE *ASTAXANTHIN* PRODUCTION OF *HAEMATOCOCCUS PLUVIALIS* USING RESPONSE SURFACE METHODOLOGY

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The green microalga *Haematococcus pluvialis* (*H. pluvialis*), a freshwater microalgae species well known for its massive astaxanthin accumulation, was used to produce antioxidant astaxanthin. Various stress conditions can stimulate the astaxanthin production in microalgae. In order to achieve a resource efficient and environmentally friendly production strategy, an integrated astaxanthin production system associated with bioremediation of wastewater was studied. Diluted minkery wastewaters were employed as growth media; and following an appropriate cultivation process, a mixotrophic induction strategy was tested by using a series of acetate and NaCl concentrations. The acetate concentrations tested were 20, 40, 60 and 80 mM, while the NaCl concentrations were 0.4, 0.6, 0.8 and 1.0% (w/v). The response surface methodology indicated that the optimal combination for astaxanthin production was 38.14 mM acetate and 0.58% (w/v) NaCl. And the optimal astaxanthin concentration was determined to be 67.95 ± 3.93 mg L^{-1} after a 12-day induction period.

Keywords: Bioremediation, *Haematococcus pluvialis,* Astaxanthin, Mixotrophy, Stress conditions, Surface response methodology.

:: Paper No: GCGW - 2018 – P105 ::

WIND FARM POTENTIAL SITES IDENTIFICATION AND PRIORITIZATION FOR SUSTAINABLE ENERGY DIVERSIFICATION IN ZAMBIA: GIS ANALYTIC BASED APPROACH

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Wind energy is clean, free, and renewable energy source which is increasingly used in the world for electricity generation as it is the key factor for inclusion in the electricity generation mix in many countries. However, just like any other alternative energy supply option, wind farms developments at utility-scale are not free from imposing impacts on both the environmental and the society. These potential impacts can hinder or delay wind energy technology deployment in wind potential sites. Hence, in order to address these negative issues and increase social acceptability and support environmental sustainability of wind farm deployment in Zambia. A bottom up approach using Geographical Information System methods has been adopted in this study for wind energy potential sites identification and prioritization. The potential sites are grouped into four suitability levels depending on the level of wind speed. The results show a total feasible potential site of approximately 1.31% (9,854.26km^2) of the total surface area of Zambia with the extremely suitable sites accounting for only 0.45% (3,391.23km^2) representing electricity generation potential of 65.48TWh/year at a hub height of 90m. This wind electricity generation potential is more than the 2030 projected energy demand (21TWh/year) for the whole country. The study is very important to help guide in the deployment of wind energy technology across the country and also guide the decision makers, energy planners and developers when planning and setting target of wind energy share in the national electricity generation mix. It will further help guide for the development of mini off-grid, grid tied, and hybrid system based on wind energy across the country with increased public acceptability and reduced environmental impacts.

Keywords: Renewable energy, Wind energy, Sustainability, Potential site, Zambia.

:: Paper No: GCGW - 2018 – P112 ::

NUMERICAL STUDY OF THERMAL TRANSPORT IN A FLAT-PLATE SOLAR COLLECTOR USING NOVEL ABSORBER PLATE

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In this paper, analysis of laminar forced convection and heat transfer in a flat-plate solar water collector equipped with novel absorber plate are numerically studied. Numerical solutions of the flow domain are implemented by solving the two-dimensional governing equations of continuity, momentum and energy using finite volume method based on the SIMPLE algorithm technique. The influence of some important parameters such as, roughness spacing, relative triangular width and Reynolds number on the local and average Nusselt number, velocity vector distribution and temperature contours have been presented and discussed in detail. Special prominence is given to the grid generation near the triangle sectioned. Results indicate that the heat transfer enhancement is achieved by specific selection in absorber geometry. The present results are determined and compared with the previous experimental data, and the results are very close to each other.

Keywords: Heat transfer enhancement, Novel absorber plate, Solar collector.

:: Paper No: GCGW - 2018 – P113 ::

EXERGETIC, EXERGOECONOMIC AND ENVIRONMENTAL (3E) ANALYSIS OF A TRIGENERATION SYSTEM DRIVEN BY A BIOMASS GASIFIER, GT AND S-CO_2

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Recent depletion of fossil fuels along with increasing population and environmental concerns have brought up new methods for generating power, heating and cooling for daily uses. Waste heat recovery and utilization of renewable energies have drawn great attention in this regard. Gasification is a very suitable option for producing energy from biomass as it is a simple and economically viable process. In this paper, a biomass gasifier is used in order to generate syngas as a fuel of the CCHP system. Wood and air at environmental conditions enter the gasifier and go through the chemical process to produce syngas. To recover the heat from high-temperature exhaust heat, an S-CO2 and a double effect lithium bromide refrigeration cycle are used. A through thermodynamic, exergoeconomic and environmental study is conducted. In order to model the system, EES (Engineering Equation Solver) software is used. Exergy analysis results which are helpful in determining the irreversibilities in each component show that the highest and the second highest exergy destruction occurs in the combustion chamber and the gasifier, respectively. In fact, three sources of irreversibility, i.e., chemical reaction, mixing and temperature difference exist in these components while in the other components only one or two of these sources are present. Also, results of environmental analysis illustrate that when comparing to single generation, (not trigeneration and not using waste heat recovery options) CCHP system has higher efficiency and lower CO2 emission. The reduction of 50.62% in emitted CO2 to the environment is a good motivation to use waste heat recovery options of the systems as in CCHP systems.

Keywords: Exergy, Exergoeconomic, Environmental impact, CCHP system, GT-S-CO_2.

:: Paper No: GCGW - 2018 – P114 ::

PHOTODEGRADATION OF CIPROFLOXACIN AND OFLOXACIN ANTIBIOTICS AND THEIR PHOTO-METABOLITES WITH SUNLIGHT

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In this study, nano graphene oxide magnetite (Nano-GO/M) composite was prepared and characterized under laboratory conditions with FTIR and SEM analysis to investigate the metabolites of ciprofloxacin (CIP) and ofloxacin (OFL) antibiotics formed during photooxidation under sunlight. Two different metabolites of CIP and OFL namely desenthylenciprofloxacin (M1) and oxociprofloxacin (M3); and 9-piperazino ofloxacin (POF) and des-methyl ofloxacin (MOF) were in HPLC. For maximum removal efficiency (80%) of 1 mg/L initial CIP concentration, 250 min irradiation time were obtained as optimum time for photo-oxidation via sunlight irradiation at 80 W power in august at hours between 10.00 am and 17.00 pm (for 24-hour experiments, we keep going at these hours for 4.5 days). Best results were obtained at 1 mg/L initial concentration of CIP, at original pH of CIP solutions (6.5) and at 2 g/L Nano-GO/M concentration. For maximum OFL removal (82%) the optimum Nano-GO/M concentration was found to be 2 g/L at 1 mg/L OFL concentration, at pH 6.5, after 350 min irradiation time, at 35°C±5°C. Final concentrations of M1, M3, POF and MOF metabolites were found as 0.425, 0.125, 0.098 and 0.075 mg/L, respectively.

Keywords: Ciprofloxacin, Ofloxacin, Photo-oxidation, By-product, Sunlight.

:: Paper No: GCGW - 2018 – P117 ::

COMPARISON OF SOME CONVENTIONAL AND PHOTOCATALYTIC TREATMENT PROCESS COST: TOXICITY ANALYSIS TO SOME NANOPARTICLES

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Nano-metal oxides (NMOs) offer significant improvement in the treatment of hazardous, toxic and non-biodegradable contaminants to enhance their biodegradability. Some of these metal oxides was separated recovery. Metal oxide nanoparticles are among the most used engineered nanoparticles (NPs) in various treatment plants in recent years since nanoparticles offer significant improvement with their extremely high specific surface area and associated sorption sites, short intraparticle diffusion distance, and tunable pore size and surface chemistry. Although some acute toxicities were detected in the performed ecotoxicological for NMOs studied below the NMOs should be used to treat the recalcitrant, non-biodegradable pollutants since their cost are 10 times lower than that conventional treatment plants. The acute toxicity tests should be monitored regularly to prevent the ecosystem since the cost spent for toxicity analysis is very low and their harmful effects remain largely unknown. The aim of this study was to evaluate toxicity of NMOs of ZnO, Co3O4, ZrO2, Bi2O3 and ATO (Antimony oxide) to Vibrio fischeri, crustaceans (Daphnia magna) and fish (Poecillia reticula - lepistes). In the ecotoxicological tests; the EC50 values was calculated from the inhibitions of NMOs used at increasing concentrations (0.1 - 14 mg/l) for 24 and 48 hours. The bioaccumulation the NMOs given above were performed. It was found that the most sensitive organism was Vibrio fischeri - bacteria while the most resistant organism was fish - Poecillia reticula - lepistes. The most toxic NMO were Co3O4 with low EC5O values (1.5 mg/L, while the less toxic NMO was ATO with high EC30 values (12.5 mg/l). Furthermore, the cost of the different treatment processes (like MD, RO, MF, UF, NF, DCMD and treatment with NMOs) and the cost of toxicity test analysis were compared. Although some acute toxicities were detected in the performed ecotoxicological tests for NMOs studied above the optimum NMOs levels did not cause acute toxicity and their cost are 10 times lower than that conventional treatment plants.

Keywords: Nanometal oxides, Acute toxicity, Bioaccumulation, Wastewater treatment, Vibrio fischeri, Daphnia magna, Cost.

:: Paper No: GCGW - 2018 – P120 ::

EFFICIENCY ANALYSIS OF PCM ADDED COLD STORE

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In the recent years, the use of phase change material (PCM) for thermal storage has been increasing day by day in many fields. Thermal energy storage systems provide the potential to attain energy savings and reduce the environmental impact related to energy use. In this respect, phase change materials (PCMs) work as "latent heat storage units" which store or release large amounts of thermal energy. These materials have been utilized in different application areas such as solar energy storage, logistics, cold storage and HVAC systems. Several different investigations have been carried out in recent years to increase the energy efficiency of cooling systems and reduce the energy consumption in industrial and residential refrigeration applications. In this case, PCMs play a promising role in increasing the performance of cooling systems and refrigeration applications. The aim of the presented study is to determine energy consumption changes with and without PCMs in an actively operating cold store based on operation time. Temperature of the encapsulated PCM, air temperature in the cold store, wall temperature and the range of phase change temperatures have been measured depending on the on-off periods and the effects of PCM usage have been revealed graphically in detail. In this context, on-off periods of a cold store with and without PCM were experimentally examined. Also, cold store run times with and without PCM were analyzed. The results indicated that off period time increased whereas working period time decreased, significantly. PCM application provided a total energy efficiency increase of 20-22%.

Keywords: PCM, COP, Energy storage, Efficiency.

:: Paper No: GCGW - 2018 – P123 ::

CFD SIMULATION OF THE PELTIER EFFECT IN A REFRIGERATOR DESIGN

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The oil crisis has been spread out and the fossil-based primary energy resources have been run out overall world. From that day to this, the renewable energy resources have been used widely to meet the energy requirement of the population. Current energy needs lead government to take some precautions as to save the possessed energy. To illustrate, the energy usage of the building decreased using some insulation materials according to region. In addition, electrical car has been used for a while as to decrease the energy consumption and CO_2 emission. In the worldwide, the energy consumption of the pumps is about 40% of all energy consumption. Therefore, some alternative systems to the pumps have been searching for a while. In the refrigeration cycle, the Heat Pumps have been used, but in a small-scale application, Thermoelectric Modules (TEMs) can be used as a Heat Pump. Computational Fluid Dynamic (CFD) is used to design control as the analysis program group. CFX is a commercial program as to define the analysis of a fluid domain gives to user the closest results to the real results. This paper focuses on the design of a refrigerator volume using heat transfer and energy equations, and also a series of CFX analyses of the refrigerator box are included. This method helps to investigate TEM cooling effect and also design the box. TEC 12706 type TEM with heat sink and fans are used in the study, and thermal region is modeled in CFX simulation program.

Keywords: Thermoelectricity, Simulation, Design, Refrigeration, TEM.

:: Paper No: GCGW - 2018 – P124 ::

ROLE OF LARGE PENETRATION OF ELECTRIC CAR IN INCREASING SYSTEM FLEXIBILITY WITH LARGE SHARE OF RENEWABLE RESOURCES IN LOW-CARBON STRATEGY OF THE REPUBLIC OF CROATIA

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The European Union's goals of reducing energy dependence and carbon emissions are to be achieved primarily by increasing production from renewable energy sources. Large penetration of fluctuating renewable sources (RES) into the power system requires a substantial increase in the capacity of various energy storages. As one of the most prominent options today, is the penetration of electric vehicles (EVs), whose use reduces air pollution while connecting them to the smart grids creates the possibility of increasing the flexibility of the power system since vehicle batteries could be used as storage but also as sources of electricity. In this paper, using PLEXOS programming tool, the power system of the Republic Croatia was modeled and based on the results of simulations the role of large penetration of electric vehicles in increasing system flexibility with a large share of renewable resources in low/carbon strategy of the Republic Croatia was identified.

Keywords: Low-carbon, RES, Electric vehicles, Power system flexibility, PLEXOS.

:: Paper No: GCGW - 2018 – P125 ::

SPATIAL DISTRIBUTION OF PAH AND PCBS IN URBAN SURFACE DUST IN KOCAELI

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The dust samples were collected from 40 different locations across Kocaeli that were classified into four main groups as residential, industrial, road and rural between 26-28 December in 2015. After extraction and column clean up steps, 16 priority Poly Aromatic Hydrocarbon (PAHs) pollution were analyzed with 7890/5977A GC-MS and 15 target Poly Chlorinated Biphenyl (PCBs) were detected with same GC equipped with ECD detector. Σ_{16}PAHs concentrations in the collected dust samples varied from 5.74 to 6 214 ng g^{-1} while Σ_{15}PCB was ranged from 1.12 to 682.43 ng g^{-1}. The ratio of Ant/(Ant+Phe) and BaP/BgP showed that the main sources of PAHs could be traffic emissions. The high levels of Σ_{15}PCB were observed in sampling points closed to industrial plants and roads. The relatively high variability between minimum and maximum measured Σ_{16}PAHs and Σ_{15}PCBs concentrations indicated that the sample points affected from such factors e.g. the different source strengths, distance between source and receptor, meteorological conditions and topography.

Keywords: Urban surface dust, Spatial distribution, Poly aromatic hydrocarbons (PAHs). Poly chlorinated biphenyl (PCBs).

:: Paper No: GCGW - 2018 – P127 ::

PHOTOBIOREACTORS AS POTENTIAL TOOLS FOR ENVIRONMENTALLY FRIENDLY AND SUSTAINABLE BUILDINGS

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With the increase in the world population, natural energy sources are getting depleted and substantial amounts of varied kinds of waste are emerging. Particularly CO_2 as a greenhouse gas, contributing rising of temperature of world makes scientists think to find out solutions of global warming. One approach for minimizing global warming is the improvement of sustainable and environmentally friendly buildings by using effective and also aesthetic bio-façade systems. Within these regard microalgae as potential tools to enhance the quality of atmosphere due to mitigating of CO_2 and producing of O_2 through photosynthesis could be beneficial through bio-façade systems.

The aim of this study is to investigate the usage of microalgae production in photobioreactors as a potential bio-façade unit. Along with the bio-façade concept targeting the multiple usage of water and nutrients as well as capturing high amounts of CO_2, dilutions of microalgae medium (10%, 20%, 40%, 80%), recycling the cell separated medium several times, addition of CO_2 enriched air (5% and 10%) in photobioreactor have been tested focusing on their effects on various key factors like biomass and photosynthetic activity. *Chlorella vulgaris* is selected as a model microalga due to its low doubling time and high biomass productivity. According to the results, up to 80% dilutions can support the production of the microalga and 5% CO_2 increase the yield of biomass (even if microalga can resist higher CO_2 concentration like 10%).

With the results from the first step experiments a photobioreactor integrated laboratory scale house unit has been constructed for the simulation of buildings. Interior air quality, changing of temperature and amounts of CO_2 - O_2 was investigated. The results showed positive effects of the microalga in the measured variables related with its effect especially as a biofilter and a bio curtain.

Keywords: Global warming, Microalgae, Bio-façade, Photobioreactor, Carbon dioxide.

:: Paper No: GCGW - 2018 – P133 ::

NEO GREEN ENERGY (THE HYBRID SOLUTION)

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The world is striving forward extravagant technology while we are still struggling to generate energy through Water, Furnace Oil, Solar etc. We are working first time in Pakistan to generate electricity by utilizing Magnetic and wind power together. Neo Green Energy (The Hybrid Solution), the objective of this project is to design and utilize magnetically levitated-wind system for power generation purposes that will have the ability to work without fuel. Our newly crafted magnetically levitated power generation turbine with the added input of wind power is made to originate the possibility of home-based power generation system. To do so, the effects of magnetic repulsion is used, circular shape turbine propeller is fitted on a rod (shaft) and suspended pairs of magnets of different sizes on it in a configuration of like poles facing each other or in levitation. For the generation of power, a DC Magnetic Motor is used which is coupled with the rod through pulleys. Output will be collected as constant DC voltage through circuitry and will be fed to batteries through charge controller. Inverter will then be used to get AC output. All this process in this prototype will generate electricity for 10 minutes after removing the wind (This time period could be increased by configuring Magnets type and its strength).

Keywords: Neodymium energy, Sustainable, Magnetic levitation.

:: Paper No: GCGW - 2018 – P134 ::

EFFECT OF PARTICLE SIZE ON THE THERMAL DECOMPOSITION CHARACTERISTICS OF THE FIVE WASTE WOOD SAMPLES

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In the present study, effect of the sample size on the thermal decomposition characteristics of five waste wood samples was examined in air atmosphere. For this purpose, Thermogravimetric Analyses (TG) of the five waste wood samples namely pine, window frame, flooring material and two different types of furniture were performed at three different particle sizes (i.e. < 300 μm, 300–850 μm and 850 μm-2.4 mm) for the comparison. Thermal analyses of the waste wood samples were carried out by using a Perkin Elmer-Pyris-1, Thermal Gravimetric Analyzer (TGA). About 20 mg sample was used for each TG analysis. Experiments were performed at 20 mL/min air flow rate in a temperature range of 30–900°C. Three heating rates; 10°C/min, 40°C/min and 80°C/min were selected to investigate the effect of heating rate on thermal decomposition characters of the waste wood samples.

The results found in this study showed that the combustion characteristics of the samples were affected by the particle size. When particle size increased, higher oxidative thermal decomposition and char combustion temperatures were observed for all waste wood samples. Moreover, peak temperatures of the wood samples were also affected by particle size.

Keywords: Biomass, Combustion, TGA, Thermal decomposition, Particle size.

:: Paper No: GCGW - 2018 – P135 ::

RETROFITTING OF R-22 AIR CONDITIONING SYSTEM WITH R1234ZE(E)

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In this study, effect on energy parameters and total equivalent warming impact (TEWI) using R1234ze(E) as a substitute for R22 in an air-conditioning device was investigated. The R22 system was retrofitted with R1234ze(E) changing compressor oil. The experimental data was obtained for three different ambient temperatures (30, 35 and 40°C). It was seen that power consumption of R1234ze(E) was smaller than that of R22 about by 41%. Although cooling capacity of R1234ze(E) was 50% lower, its coefficient of performance (COP) was reduced only by 5% compared to R22. Furthermore, refrigerant charging amount of R1234ze(E) was smaller by 16% than R22. The results indicated that TEWI value of R1234ze(E) was lower than that of R22 by 65% due to small GWP (global warming potential) value and proper COP of the alternative refrigerant tested in the study. Hence, it can be expressed that R1234ze(E) can be used in air-conditioners of small capacity as an alternative to R22.

Keywords: GWP, TEWI, Retrofitting, R22, R1234ze(E).

:: Paper No: GCGW - 2018 – P137 ::

ENERGY EFFICIENCY ESTIMATION OF INDUCTION MOTORS WITH ARTIFICIAL NEURAL NETWORKS

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Induction motors make up 80% of today's motors in industry. For this reason, the contribution of energy efficiency analyses to induction motors is very important. There are many techniques for measuring the efficiency of electric motors. These are the generally experimental ones as specified in certain standards. Experimental methods can also be divided into direct (IEEE 112-B, CSA-390) or indirect (IEC 34-2, JEC 37) methods. The use of experimental methods is not common due to the cost of installing and operating test laboratories worldwide. Therefore, energy efficiency estimation methods are used in the worldwide.

In this study, efficiency estimates were made with Artificial Neural Networks (ANN), which is optimization-based estimation method with using data of 307 induction motors from three different companies (AEG-TECO-GAMAK). The results are very close to the efficiency values given in catalogue values. However, another noteworthy issue is that the estimation errors of the efficiency changes from company to company. The errors of one company is higher than the others. ANN's error rate changes with company.

Keywords: Induction motors, Efficiency estimation, Energy efficiency, Efficiency estimation methods.

:: Paper No: GCGW - 2018 – P138 ::

ESTIMATION OF PROPULSION THRUSTER POWER ON LNG FUELED MARINE VESSELS WITH ARTIFICIAL NEURAL NETWORKS

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Global climate change has been recognized as the leading environmental issue of the twenty-first century. The amount of increase in greenhouse gases is one of the main factors that caused environmental deterioration change. Considering this issue, studies to reduce the effects of greenhouse gases in the academy and the business world are frequently carried out. In order to solve this problem, either the use of alternative fuels or the optimization of fuel consumption applications have been encountered to create more efficient systems, when examining the work done up to now.

By taking into account International Maritime Organization (IMO) MARPOL Annex VI "Prevention of Air Pollution from Ships" regulations, it is more important to obtain energy savings and low emission values on marine vessels. In this context, ship engine manufacturers and users in the maritime sector are conducting to research and development studies. Liquefied natural gas (LNG) fuelled marine vessels meet these limitations without needing any improvement. This indicates that such marine vessels will increase in the future.

In this study, operated by LNG fueled marine supply vessels dimensional properties and main generator engine values were recorded and using these values propulsion thruster power outputs were estimated by artificial neural networks. The data obtained at the end of the study aims to be informative to the ship-owners who will construct LNG fueled marine vessels. Besides, this study will be possible source to make comparisons with similar studies.

Keywords: Artificial neural networks, Emission, Liquefied natural gas.

:: Paper No: GCGW - 2018 – P139 ::

PREDICTION OF SOLAR ENERGY POTENTIAL WITH ARTIFICIAL NEURAL NETWORKS

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The rapid increase in the world population and the dramatic growth of technology has caused rapid increases in daily energy demand. Industry associations need improvement in their respective fields and trying to find alternative sources in order to minimize further costs along with advancing technology. The energy requirement has been met from fossil fuels since the early 1800's. However, the increasing of environmental awareness and limited fossil resources are triggered to tendency of using renewable energy resources. Solar and wind energy, shale gas, biofuels and natural gas are leading ones. Solar energy is an effective and clean energy source not causing greenhouse effect, when compared in terms of sustainability, reliability and economy.

In the maritime sector as well as in other sectors, eco-friendly and sustainable qualities are sought in all of the efforts to reduce costs. In order to be able to carry out efficient operations, researchers are working on the hull design, main engine and propeller type of ships. There have been many studies in the marine industry on the use of solar energy as an alternative energy source.

This work aims to use of the existing solar panels, benefit from maximum efficiency level. In this context, the energy estimation that can be obtained from the solar panels was done by artificial neural networks method, observing of weather condition changes in Izmir Gulf. The results are compared with the "Renewable Energy General Administration" data of Turkey. As a result of this work, the obtained data will be informative to the researcher who will study solar energy's maritime applications. Besides, this study will be possible source to make comparisons with similar solar energy studies.

Keywords: Artificial neural networks, Emission, Energy saving, Solar energy.

:: Paper No: GCGW - 2018 – P146 ::

THERMODYNAMIC MODELLING OF A SEAWATER COOLED FOLDABLE PV PANEL SYSTEM

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Solar powered systems are becoming more and more crucial energy resources for marine vessels. These systems are able to supply clean and sustainable energy for both service requirements and also for the propulsion of small vessels. However, restricted available area for photovoltaic panels and high setup costs inhibit the sufficient energy production for satisfying the whole needs of vessels. Due to the limited panel area that can be installed on the boat, it is necessary to improve the system efficiency in order to obtain more power from the existing solar panel system. Thus, enhancing photovoltaic system efficiencies become significant to maintain sustainability. Latest studies show that lowering the surface temperature of solar cells increases the power output and also solar panel efficiency generated from the cells because of the characteristic properties of P-N junctions in crystalline silicon cells. In this study, cooling solar panels with seawater in an open loop cooling water circuit for a 527 Watts solar-powered system is investigated. In order to observe effects of cooling the panels, a thermodynamic analysis has been carried out. The data set of the thermodynamic model is composed of the previous experimental study of the authors. The data was taken from one solar panel with eight pieces of cell on June irradiation conditions at Izmir, and the model is customized for the whole system based on it. In the model, the sea water in the ambient passes through a cooling system on the back side of the panel that is installed with a pump, so that the heat generated on the panel cools down and reduces the panel surface temperature. By taking the mass flow rate of the cooling water into account, the feasibility of cooling the solar panel system is investigated according to the solar irradiation changes by time.

Keywords: Solar energy, Sea water cooling systems, PV panel, Thermodynamic analysis.

:: Paper No: GCGW - 2018 – P148 ::

ENERGY ANALYSIS OF A VACUUM FRESH WATER GENERATOR ON A COMMERCIAL VESSEL

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Vacuum type fresh water generators (FWG) are a crucial machinery part of merchant's vessels. This study deals with the effects of determined parameters on freshwater (FW) generation capacity on vessels. The objective of the study is analysing the capacity of a merchant ship which navigates at different seawater (SW) temperatures and main engine jacket water (JW) mass flow rates. For calculating fresh water production rate, a thermodynamic analysis has been carried out on a marine FWG. A model of FWG is created with Engineering Equation Solver (EES) software using thermodynamic and heat transfer equations. Mentioned parameters are changed in the model, according to environmental conditions and results are observed. These results illustrate that increasing of SW temperature and decreasing of JW mass flow rate decrease the FW generation capacity.

Keywords: Heat exchanger, Fresh water generator, Desalination, Thermodynamic analysis.

:: Paper No: GCGW - 2018 – P150 ::

BIO-ACTIVE FACADE SYSTEM SYMBIOSIS AS A KEY FOR ECO-BENEFICIAL BUILDING ELEMENT

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Today with the growing rate in urbanization, loading of populations to the cities pushes the civilization to a bottleneck for novel solutions against the key environmental issues. The problems in today's-built environment has a strong interrelation with key factors like pollution, global warming, energy and limited natural resources. When thinking of an ideal city the management of all these factors play an important role for sustainability. Searching a magical solution to all these problems in this dynamic structure is not realistic but some novel approaches like using the greenery (plants and microalgae) as bio-active elements adapted throughout the urban environment especially in the form of living façades on the buildings is getting more attention with regards to their eco-friendly potential. Bio-active façades can create a positive impact on managing some important parameters like thermal comfort, energy efficiency, wastewater recycle, CO_2 capture, real estate price increase in micro scale focusing on a single building as well as global warming, pollution control, urban heat islands, social wealth, sustainable future in macro scale focusing on a big city. The aim of this review will be the key parameters for an efficient bio-active façade with regards to pros and cons, challenges and future. The review will cover the background of using plants as living walls or green walls and then will focus on the microalgae and photobioreactor adapted buildings through their potential supported by case studies from the scientific literature.

Keywords: Global warming, Urbanization, Building, Bio-active, Façade

:: Paper No: GCGW - 2018 – P151 ::

EFFECT OF HYDROGEN REDUCTION ON TRANSPARENT CONDUCTIVE ITO ELECTRODES

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Renewable energy sources have an increasing importance to reduce irreversible effects of global warming. Among them, solar energy has a significant place for its continuous and non-consumable properties. One of the key components of solar cells is transparent electrode layer since it may remarkably influence the cell performance by transmitting incoming photons to active layer with high efficiency. Indium tin oxide (ITO) is the most commonly used transparent conductive oxide as electrode material for various types of solar cells due to its low sheet resistance and high transparency. Preparing ITO by utilizing from simple and cost-effective solution-based methods is an advantage for large scale productions. However, thin films produced by solution-based techniques show lower conductivity compared to vacuum based physical vapor deposition techniques. Reduction of thin films by post treatment with hydrogen can ensure an increase in conductivity without causing any change on transparency of ITO films.

In this study, the effect of post treatment with hydrogen to ITO thin films was investigated. ITO films were produced by using solution-based spin coating technique and annealed at 600°C for 30 min. After that, several reduction parameters such as H_2 concentration and temperature for different processing times were applied in H_2/Ar atmosphere. Crystal structure was determined from X-ray diffraction spectroscopy (XRD) and the morphology of ITO thin films were observed by scanning electron microscopy (SEM). Optical and electrical properties were characterized by UV-Vis spectrophotometer and four-point probe measurement, respectively. As a result of post treatment, a decrease in sheet resistance (up to 70%) was observed and transparency of thin films remained above 80%.

Keywords: Indium Tin Oxide (ITO), Hydrogen reduction, Thin film, Solar cell.

:: Paper No: GCGW - 2018 – P152 ::

SYNTHESIS OF CARBON NANOTUBE VIA CHEMICAL VAPOR DEPOSITION METHOD ON SILICA PARTICLES FOR LITHIUM ION BATTERY ANODE MATERIALS

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In this work, carbon nanotubes (CNT) were grown on the surface of silica ($SiO_{2)}$ nanoparticles using in-situ chemical vapor deposition (CVD) method where SiO_2 nanoparticles were impregnated with iron (Fe) catalyst. This CNT/SiO_2 sample used as anode active material for lithium ion battery and showed high reversible capacity of 550 mAh g^{-1} at a current density of 50 mA g^{-1} compared with the CNT anode. The enhanced specific capacity improvement of CNT/SiO_2 material can be attributed to three-dimensional conductive networks between SiO_2 particles and CNTs and the addition of CNTs that buffer the volume change of SiO_2, maintain the electrical conductive network, and increase the electrical conductivity and lithium-ion transport. Thus, the in-situ growth of CNTs on SiO_2 particles with catalyst can be used in the synthesis of more stable SiO_2 anode materials for a lithium ion battery.

Keywords: Energy storage, Lithium ion battery, Carbon nanotube, Silica.

:: Paper No: GCGW - 2018 – P153 ::

ENERGY AND EXERGY ANALYSIS OF HEAT EXCHANGER FOR WASTEWATER AIDED REFRIGERATION SYSTEMS

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Recovering waste energies from any system has gained a great attention over the last years due to increasing energy needs and the limited availability of energy resources. Wastewater is widely used as an efficient heat source for heat pumps and refrigeration systems since it could help reducing energy consumption. The most commonly used refrigeration cycle, vapor compression refrigeration cycle, contains four main elements; compressor, condenser, expansion valve and evaporator. The utilization of wastewater in refrigeration systems has a large potential to provide cost effective and environmental friendly alternatives to conventional air-source heat pump systems. In this study, compression refrigeration system using wastewater, as a heat sink, was designed and analyzed to obtain experimental results about wastewater-cooled condenser and evaluate the performance of the system. Hermetic compressor with cooling capacity of 2880 BTU/h was used. The condenser was a coaxial heat exchanger with capacity of 1 kW and R134a was used as a refrigerant.

This study was performed to investigate the effect of different temperatures and flowrates of wastewater in a refrigeration system and to make energy and exergy analysis of the condenser working at three different pressures. Working conditions were 8, 9 and 10 bar with constant wastewater flow rate of 300 liters/hour. Conservation of energy has been applied to both refrigerant and wastewater sides in the condenser, and the amount of heat transfer from refrigerant to wastewater was determined. Also, second law efficiency of the condenser is calculated and the change in second law efficiency with condenser pressure was presented.

Keywords: Wastewater, Refrigeration, Energy analysis, Exergy, Second law efficiency.

:: Paper No: GCGW - 2018 – P154 ::

A NEW APPROACH FOR SOLAR RADIATION FORECAST: CASE OF ALGERIA

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The current situation in Algeria tends to support sustainable development and climate change issues, with the new program dealing with the integration of renewable energy in the national energy mix. More than 60 % of the total capacity is planned to be solar photovoltaic (PV). Therefore, in order to enable energy managers to make a distribution that meets the demand of consumers, it is essential to go toward the forecast of energy production. Nowadays, this solution is mainly used in the smart grids.

Forecasting energy production plays an essential role; indeed, it is a decisive tool for operators in their energy management. Moreover, the production of electrical energy by a solar system depends mainly on solar radiation potential.

Prediction of solar radiation will be used in order to model the electrical quantity received by the panels according to their technical characteristics. This new approach of the solar irradiation is a very active area of research in recent years, particularly in the photovoltaic field.

Our work is based on the use of the numerical weather prediction model (NWP) to forecast the atmospheric vertical profile (cloud liquid and ice water, humidity, …etc.), the results will be used as an input for the radiative transfer model (libRadtran), in order to calculate the three solar radiation components (Direct, Diffuse and Global received on horizontal plane). The values of the irradiation will be obtained in Grid points. The next step of our work will consist on the production of electrical maps hourly up to next 72 hours.

Keywords: Climate change, Renewable energy, Solar radiation, Weather prediction model, Radiative transfer model.

:: Paper No: GCGW - 2018 – P155 ::

DEVELOPMENT OF PHOTOVOLTAIC CELLS

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Increase in the human population and improvements in the industry caused a serious increase in the energy demand. Therefore solar energy, which is one of the renewable energy sources, is become crucial from a global perspective.

First photovoltaic (PV) effect showed by a French physicist Edmund Bequerel in 1839 which was defined as a small amount of electric current can be generated when the materials are exposed to light. Albert Einstein's Physics Nobel Prize in 1905 and Russell Ohl's patent for the PV cell in 1946 have led ongoing innovations every year in the process.

PV is the direct conversion of light into electricity at the atomic level. Some materials exhibit a property known as the photoelectric effect, which causes the photons of the light to be absorbed and release the electrons. When these free electrons are captured, an electric current is generated that can be used as electricity.

Researchers are working with a variety of semiconductors and trying to find optimal production methods for lower cost, higher efficiency. Silicon wafers have been studied extensively (monocrystalline, polycrystalline, amorphous), and then Gallium Arsenide, Cadmium Telluride, Copper Indium Di-selenide began to be used in PV cells. In addition to single-jointed structures, multi-jointed structures were beginning to study and this study led to increase in efficiency. There are new researches about ferroelectric materials in PV cells. It is expected that their usage in recent years will give us higher efficiency results.

The aim of this paper is to discuss the semiconductors that used in PV cells, their fabrication process, their power conversion efficiency (PCE), their advantages and disadvantages relative to each other.

Keywords: Renewable energy, Photovoltaics, Solar cell.

:: Paper No: GCGW - 2018 – P156 ::

GLOBAL WARMING IS INCREASING THE RISK OF REEMERGENCE OF MALARIA IN ROMANIA

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This study contains the analysis of the climatic data (between 1961 and 2016), with the purpose of demonstrating their favourable evolution over the life cycle of culicids, at present and up to 2030. For this purpose, we implemented a new mathematical model, the ET30 model, based on the construction of a function of interpolation of Lagrange polynomial type, which offers the possibility of a prognosis with over 95% probability. Consequently, comparing with the period of malaria eradication in Romania, the 60's, a raise of 1.1°C has been registered up to present in Iaşi, and the level of the whole country raised by 0.72°C, showing the probability of adaptation of new species of culicids to our climate. Two maps were made, illustrating the current situation in Romania, and there was an extrapolation of the data to 2030, showing a raise of 0.7-0.8°C, results that coincide with those provided globally for 2030 by the most famous research institutes in the world (0.8-1.7°C), demonstrating the validity of the mathematical model we implemented, ET30.

Keywords: Malaria, Vector, Raise.

:: Paper No: GCGW - 2018 – P158 ::

CONTRIBUTION OF REMOTE SENSING FOR GEOLOGICAL STUDY OF THE SOUTH – EAST OF CONSTANTINE BASIN, NORTH OF ALGERIA

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The main objectives of this work are to map and characterize network of likely fractures to develop major deposits carbonated in the region. It is a contribution to a better knowledge of the geometry of existing surface fractures networks and their extension in subsurface. For this it appeals to the tool of remote sensing and seismic.

Using remote sensing data, our study enabled us to draw up a card lineamentire, along with tectonic analysis, where we could list 409 lineaments divided into 9 classes according to their directions, among which: the main directions of the NW/SE fracturing are: H (N1300-N1500), G (N1100-N1300) and F (N900-N1100).

These three classes are in agreement with the major flaws of the region, which are: the fault of Biskra-Outaya, Ouinet-Morsott-Tébessa and the dextres form.

Of after the deferential work carried out on the South East Constantine area, and the results obtained by the seismic reflection, as well as the well data, summarizes our reservoirs are characterized by a mainly low to medium porosity and low permeability, these tanks are carbonated, and are affected by the majority of vulnerabilities detected on the surface, but these do not contribute to the improvement of the Petrophysical characteristics This can be reported to the clogging of the cracks.

Keywords: South-East of Constantine, Remote sensing, Petrophysical characteristics, Carbonate reservoir.

:: Paper No: GCGW - 2018 – P161 ::

IMPROVING ENERGY EFFICIENCY IN TURKEY: A CASE STUDY FOR TEXTILE INDUSTRY

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Energy efficiency, which can be defined as the reduction in the energy consumption per unit or product amount is one of the most important components of Turkey's national energy policies. That is also growing policy priority for most of the countries around the world due to its direct relation to both economic and social development, energy security and environmental sustainability especially playing a key role in reducing the total greenhouse gas emissions. Textile sector is one of the most energy-intensive sectors which has a significant contribution to the production and the export industry in Turkey. This study aims to present the results of the implementation of the energy management system (EnMS) in a textile finishing factory in Turkey. The management system begins with the establishment of an energy policy for the factory initially and preparation of the energy inventory. After the determination of the significant energy users and energy drivers for electricity and thermal energy, measurement plan was identified for monitoring energy consumption. Base year was set as 2016. Electricity generation, natural gas, and coal consumption were aimed to be reduced at least 5% in three years period. More than 15% of energy and cost savings were achieved for one-year period. The main outputs of the energy management system implementation in the factory can be specified as increasing competitiveness in the market, the production losses were reduced with the reduction of troubles; chemical consumption, production, and maintenance costs were reduced. Moreover, 28% of water saving was also achieved in 2016.

Keywords: Energy efficiency, Textile sector, Energy management system (EnMS), Energy saving.

:: Paper No: GCGW - 2018 – P165 ::

IONOMER DISPERSITY IN ELECTRODE LAYER ON FUEL CELL PERFORMANCE AND DURABILITY

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Membrane electrode assembly (MEA) samples were successfully prepared using different catalysts (non-graphitized and graphitized carbon support base) and ionomers (dispersion and solution) to investigate the effects of the ionomer to carbon (I/C) ratio and the solvent composition of the ionomer dispersion or solution on the electrochemical performance and long-term durability. Excess or deficient amounts of ionomer decreased the electrochemical performance, which depended on not only I/C ratio but also the solvent composition. A homogeneous solvent system showed the best electrochemical performance, whereas additional heterogeneous solvent deteriorated the performance

Keywords: Durability, Electrochemical performance, Fuel cells, Hydrogen, Ionomer to carbon ratio.

:: Paper No: GCGW - 2018 – P168 ::

INVESTIGATION OF MODIFIED GRAPHITE AS ANODE MATERIAL FOR LITHIUM ION BATTERIES

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The power generated from renewable energy sources may change depending on the weather conditions, particularly for solar and wind energy. For sunny or windy days, the excess energy will be waste in case of there is no integrated energy storage system. Lithium ion battery technology comes into prominence by providing stability for energy production and efficient use of generated energy. The features such as; high energy storage capacity, high energy intensity (kWh/kg), long life cycle, high charge/discharge efficiency, cost-effectiveness and portability attracts attention to lithium ion batteries. For the anode materials used in lithium ion batteries, the most common material is graphite which is used commercially in many battery technologies. However, the morphology and chemistry of the graphite surface have a significant impact on the formation of the solid electrolyte interphase (SEI), the corresponding irreversible charge losses, and the overall electrochemical anode performance. Therefore, surface properties of graphite need to be enhanced by different modification processes.

In this study, the graphite anode material was modified by oxygen and phosphorus groups and the surface properties have been improved. The materials produced by different modifications such as concentration or temperature, thereafter have been formed to lithium ion coin cells and the effects of these treatments on battery performances have been observed by galvanostatic measurement techniques. The discharge capacity of pure graphite was measured as 436 mAh/g. It was observed that, doping with oxygen groups has a minor effect on the first discharge capacity of Li-ion batteries with the value of 445 mAh/g. After treatment with NH_4PF_6 and H_3PO_4 the discharge capacity increased remarkably up to 1126 and 1043 mAh/g, respectively.

Keywords: Energy storage, Li-ion batteries, Surface modification, Graphite anode.

:: Paper No: GCGW - 2018 – P169 ::

A NUMERICAL INVESTIGATION OF VALVE LIFT EFFECTS ON MARINE DIESEL ENGINE AND EMISSION PREDICTION

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Diesel engines are widely used in the world for trade and human transportation because of their efficiency and economical aspects. Approximately thirty percent of the greenhouse gases that cause global warming in the world are due to the transportation sector. Many institutions and regulations, such as the International Maritime Organization (IMO), International Convention for the Prevention of Pollution from Ships (MARPOL) and the EU, have recently introduced several new regulations to reduce emissions from diesel engines, as the biggest part of the transport sector is maritime transport. In recent studies, to minimize amount of emissions, some of the researchers work on engine geometry parameters, while others study on fuel used in diesel engines. Studies which are based on motor geometry are accomplished by changing of diesel engine piston geometry, valve timing, nozzle geometry and valve lift.

The purpose of this study is to examine the effect of four-stroke single-cylinder diesel engines on combustion characteristics and exhaust gas emissions by changing both intake and exhaust valve lifts. Combustion analysis and visualization of analysis results at different valve lift values were applied with ANSYS-FORTE, which is a commercial software, using computational fluid dynamics (CFD) for combustion system analysis. The visualization and simulation are shown that CO, NO_x, maximum pressure, temperature and other combustion parameters depend on crank angle. Numerical analysis results were compared with previous experimental data and parametric studies were applied based on verified model.

Keywords: Marine diesel engine, Computational Fluid Dynamics (CFD), NO_X emissions, Valve lift.

:: Paper No: GCGW - 2018 – P170 ::

EXERGOECONOMIC ANALYSIS OF AN INDUSTRIAL COGENERATION COOLING SYSTEM OPERATING WITH REFRIGERANT R-410A POWERED BY NATURAL GAS FUEL

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Recent progress showed that, energy production and usage are important concept in proportion to increasing energy demand for the developing world. It is a very important fact that the energy should be efficiently used as possible as. For this reason, technical and economic problems related to the production and consumption of energy should be solved. The most efficient use of the available energy is the most economical and clean solution. This study is related with the exergoeconomic analysis and optimization of the use of the energy and exergy of the cogeneration system that is used in heating and cooling of sports hall. The cogeneration system is used natural gas as a fuel. The thermodynamic efficiency and exergoeconomic of the energy production of a cogeneration system is investigated. The losses and gains in the existing systems are investigated. For this purpose, all lower and upper processes used in the production of energy are evaluated extensively by thermodynamic approximations. The performance of each process is evaluated according to the best possible performance of that process. Economic investigation of the system is based on exergy analysis that is named exergoeconomic analysis. The performance analysis of the system including enthalpy, entropy, and specific heat for fuel that must be related to the thermophysical properties for the fuel. Exergoeconomic analysis and optimization are performed. The obtaining results are compared by using thermodynamic and economic performance criteria.

Keywords: Cogeneration, Thermodynamic analysis, Exergoeconomic analysis.

:: Paper No: GCGW - 2018 – P171 ::

OPTIMUM ENERGY EVALUATION AND LIFE CYCLE COST ASSESSMENT OF A HYDROGEN LIQUEFACTION SYSTEM ASSISTED BY GEOTHERMAL ENERGY

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The aim of this study is to investigate, optimize and analyze the life cycle cost of a system thermodynamically modeled in a computer environment using thermo-economic methods in a comprehensive way for the use of geothermal energy in hydrogen liquefaction. In this study, a liquid geothermal resource with a temperature of 200°C and a flow rate of 100 kg/s is used for electricity generation and this electricity is used as a work input in the advanced liquefaction unit to liquefy the hydrogen. When the necessary thermodynamic assumptions are made, and the system is run in a computer environment with a simulation program, the network requirement is calculated to be 10 kWh/kg H_2. Geothermal water is used for as an energy source of the liquefaction system. The unit energy cost of electricity is calculated to be 0.0107 $/kWh. Hydrogen liquefaction from the system is calculated to be 0.053 kg/s as the produced electricity is used directly to produce liquid hydrogen in the liquefaction unit. The unit cost of liquefied hydrogen is calculated to be 1.439 $ / kg H_2. As a result of the life cycle cost analysis of the system, Net Present Value (NPV) is calculated to be 59,580,000 $. The levelized annual cost with the annual cost method (LAC) is calculated to be 6,998,000 $/yr. Simple payback period (N_{sbp}) of the system is calculated to be 2.903 year and discount payback period (N_{dbp}) is calculated to be 3.598 years, respectively.

Keywords: Geothermal energy, Hydrogen liquefaction, Life Cycle Cost (LCC).

:: Paper No: GCGW - 2018 – P172 ::

ASSESSMENT OF NO_X EMISSIONS OF THE SCIMITAR ENGINE AT MACH 5 BASED ON A THERMODYNAMIC CYCLE ANALYSIS

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The Scimitar engine is a novel advanced propulsion system that is designed to propel the aircraft A2 of the Long-Term Advanced Propulsion Concepts and Technologies (LAPCAT) project. It is a hybrid engine that utilizes the features of turbofan, ramjet and turborocket engines for various flight phases from take-off conditions to hypersonic flight conditions at Mach 5. The Scimitar cycle consists of three fluids. Hydrogen is the fuel of the engine while air is the oxidant which provides the necessary thrust for all flight phases. Helium is used to transfer heat from the hot incoming air to the hydrogen via a precooler specifically designed for the Scimitar engine. Since high levels of temperatures around 2700 K are achieved in the combustion chamber of the engine, dissociation and formation of chemical species becomes an important issue for an accurate determination of performance parameters and NO_x emissions. In this study, we present a thermodynamic cycle analysis of the Scimitar engine for the assessment of NO_x emissions. The combustion of fuel is studied in detail with an equilibrium model taking into account various dissociation and formation reactions. The NO_x emissions of the engine at Mach 5 and the effects of fuel flow rates on these emissions are presented by solving a nonlinear system of equations that is formed through our novel thermodynamic model.

Keywords: Scimitar engine, Hydrogen fueled aircraft, NO_x emissions, Thermodynamic analysis.

:: Paper No: GCGW - 2018 – P173 ::

NUMERICAL ANALYSIS OF A MODEL SOLID OXIDE FUEL CELL (SOFC) BY USING LOW CALORIFIC VALUE COAL GASES

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Solid oxide fuel cell (SOFC) is a high-efficiency power generation component that is a large fuel option and converts chemical energy directly into electrical energy. In this study, the parameters affecting the performance of a cathode supported SOFC by using low calorific value coal gases (Generator gas and water gas) have been numerically investigated by developing a finite element method (FEM) based SOFC model involving conservation of mass, momentum, species and energy with ionic and electronic charge transfer. Effects of fuel compositions, oxidizer, temperature and pressure on the performance of the developed SOFC have been examined by using a FEM code Comsol. These effects of parameters are shown by the concentrations, polarization and power curves.

A comprehensive mathematical model has been described for the performance of a cathode-supported SOFC with low calorific value coal gases derived from Turkish coal. It is predicted that the performance of cathode-supported SOFC is higher than that of electrolyte-supported SOFC for all fuels. Another advantage of cathode-supported SOFC is the relatively low cost of cathode supporting materials such as strontium-doped lanthanum manganese. The performance of SOFC for water gas is higher than that for generator gas. This may be because of the higher hydrogen content in the water gas compared with the generator gas. As a result of the study, it can be concluded that the low calorific value coal gases can be used in the SOFC and the performance of the SOFC increases with increasing hydrogen content, porosity, temperature and pressure values.

Keywords: Cathode-supported SOFC, Low calorific value coal gases, Performance, Numerical analysis.

:: Paper No: GCGW - 2018 – P174 ::

NETWORKS AS A TOOL FOR COPING WITH CLIMATE CHANGE CLIMATE ACTION NETWORK (CAN)

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This article aims to make an analysis on climate networks and their role to cope with climate change. For this purpose, after studying the conceptual aspect of networks in the first section. In the second section, it scrutinizes the Climate Action Network (CAN) as a case study of the research. Thirdly, it examines the strengths and weaknesses of its functioning. Finally, it discusses the lessons learnt through the analysis.

Keywords: Climate change, Network, Climate Action Network (CAN).

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SOLAR ENERGY FOR STEAM REQUIREMENT OF CONCENTRATED SOUR CHERRY JUICE PRODUCTION

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In this study, the ability to supply steam requirement for concentrated sour cherry juice production of Concentrated Solar Power (CSP) system was examined. For this purpose, a parabolic trough collector (PTC) system of 1 MW was designed to be located in the area of the fruit juice plant and steam quantity was calculated during the production period of concentrated sour cherry juice. Also, what percentage of the steam needs can be met with this CSP system was analyzed.

Keywords: Solar process heat, CSP, Concentrated fruit juice, Sour cherry juice.

:: Paper No: GCGW - 2018 – P176 ::

KINETICS AND MECHANISM OF REACTION BETWEEN CARBON DISULFIDE AND NEW AQUEOUS AMINE SOLUTIONS

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The mechanism and kinetics of carbon disulfide (CS_2) capture by aqueous solutions of well-known alkanolamines (monoethanolamine (MEA) and diethanolamine (DEA)) and novel cyclic mono- and polyamines (morpholine (MORP), piperazine (PZ), n-methyl piperazine (NMPZ) and n-hydroxyethyl piperazine (NHEPZ)) were investigated by stopped-flow apparatus with conductivity detection. The observed reaction rate constants were obtained for a temperature range of 298-313 K and it was found that cyclic amines react much faster than others. A modified termolecular reaction mechanism was used to analyze the experimental kinetic data. The activation energies for all systems were also obtained by evaluating the Arrhenius equation.

Keywords: Carbon disulfide capture, Absorption kinetics, Stopped flow, Cyclic amines.

:: Paper No: GCGW - 2018 – P177 ::

TREATMENT OF PALM OIL MILL EFFLUENT FROM PALM OIL PROCESSING INDUSTRIES TO PROVIDE CLEAN WATER AND SUSTAINABLE SOCIAL BENEFIT IN INDONESIA

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Water is the main component that is necessary to support living beings, as well as providing clean water for all human life. Clean water is a vital component to meet the needs of all communities in supporting their daily activities, because it provides improvements in life quality especially for sustainable social benefit. Based on statistical data for Indonesia water supply capacity in 2015, the percentage of access to clean water in Indonesia is 70.97%, access to sanitation is 62.14%, and availability of water supply facilities and infrastructures is 70.70%. A limited source of clean water is one of the main obstacles to providing clean water to all communities in Indonesia, especially in rural areas. However, industries in Indonesia are growing rapidly, including the palm oil industry. The deployment of its territory is diverse and usually in areas away from cities. With the rapid production of crude palm oil by the industry, it can be concluded that the activities always generate waste, either in liquid or solid form. To produce 140 – 200 kg of crude palm oil, the process will produce 600 – 700 kg of POME (palm oil mill effluent) which is wastewater. Wastewater can be processed to produce clean water that can be reused and also can be distributed to communities around the area of production. POME utilization can also provide many benefits besides as a clean water resource: it can be utilized as an energy source and also an alternative fertilizer as well. The utilization of POME can provide several advantages for both the company – to increase productivity – and for communities around the production area – to provide sustainable social benefits.

Keywords: Wastewater, Waste, Palm oil processing industries, Sustainable social benefit.

:: Paper No: GCGW - 2018 – P178 ::

THERMODYNAMIC AND ENVIRONMENTAL ASSESSMENT OF COAL GASIFICATION BASED MULTIGENERATION SYSTEM

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A novel coal gasification based integrated system for multigeneration is developed and presented to generate some useful outputs, such as power, heating, cooling, fresh water and hot water. The energetic and exergetic analyses are utilized to investigate the performance of investigated process, and the impacts of different process indicators on energetic and exergetic performances of the whole integrated system and its sub-systems are investigated. The whole energetic and exergetic performance of integrated system are calculated as 52.1% n 59.7%, respectively. Also, the exergy efficiency, exergy destruction rate, and environmental impact assessment of coal gasification based integrated system components are investigated for analyzing the irreversibilities in integrated system components, system performance and potential carbon dioxide reduction for sustainable development.

Keywords: Coal gasification, Energy, Exergy, Environment, Sustainable development.

:: Paper No: GCGW - 2018 – P179 ::

CLIMATE CHANGE AND HEALTH: PREPAREDNESS AND PERCEPTIONS OF HEALTH PROFESSIONALS

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Global climate change will influence the functioning of many ecosystems, it is a significant and emerging threat to public health. Physicians should assume their traditional roles as medical professionals, health educators, and community leaders. Through medical societies at the state, local, and national levels, physicians could take an active interest in issues related to climate change. A sample of 191 health professionals in a four hospital was surveyed on their preparedness, attitudes and perceptions towards global warming, climate change and health risks and the ways protecting health from climate change. The main objectives were to; assess current knowledge of health professionals on the health risks of climate change, assess the current level of preparations of health departments to manage health risks and identify resource and training needs, describe activities to reduce carbon dioxide and other greenhouse gas emissions, identify action that can be taken at individual, organizational, community, national and international levels to reduce the effects of climate change, define the role of health workers as global citizens for health. According to the results; the most important health effect of the climate change is the increase of epidemic diseases, awareness should be raised, and the participants' climate change-related diseases knowledge were found sufficient. However, knowledge levels of participants on the attempts that will be made on climate change related disease, were found insufficient. They are aware of their role in raising awareness and attention should be drawn. The institutional structuring of the relationship between global warming and climate change and their health effects in our country is inadequate. Health care organizations should draw attention and make initiatives to raise awareness and increase sensitivity and make investments. They are worried about the current preparations of health care organizations; health professionals should be educated about global warming and climate change related issues.

Keywords: Global warming, Climate change, Health, Environment, Sustainability in health.

:: Paper No: GCGW - 2018 – P180 ::

ENERGY AND EXERGY ANALYSES OF TWO-STAGE R744 CYCLE WITH INTERCOOLER

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The Montreal Protocol prohibits the commonly used refrigerants such as CFCs and HCFCs because of their global warming (GWP) and ozone depletion (ODP) values. In addition, according to the report of the European Commission (COM643 2012) to aim to substantially reduce the emissions of fluorinated gasses over the next 20 years. For this purpose, the carbon dioxide (R744) appears to be the most promising refrigerant in terms of ODP and GWP values. In this study, the energy and exergy efficiency of two-stage cycle with incorporating compressor intercooling are presented. The R744 refrigerant is used as working fluids in the proposed cycle. In addition to that, the effects of some design parameters on the energy and exergy performance for the integrated system are investigated. The energy and exergy efficiency of cycle are calculated as 1.06 and 17.25%, respectively.

Keywords: Cooling, energy, exergy, R744.

:: Paper No: GCGW - 2018 – P181 ::

SIMULATION OF TECHNOECONOMICAL AND ENVIRONMENTAL IMPACT OF BIOGAS USAGE IN GAS ENGINE COGENERATION APPLICATIONS

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In Turkey, 33% of installed electricity power capacity and 35% of generated electricity is produced from natural gas combined cycle plants. When it is thought that the natural gas used in these plants is imported, it is seen how Turkey is foreign dependent in energy sources. Due to negative effects of fossil fuels to the environment and to be self-sufficient in energy production, there are various incentives on renewable energy to meet the increasing energy need within today's technology. However, due to the high availability of natural gas combined plants, it is certain that it will continue to gain a seat at the total installed capacity. In this context, in addition to the increase renewable sources, it is now necessary to consume energy generated from fossil fuels in a more efficient and clean way. In this study, the techno-economic and environmental effects of obtaining electricity from single cycle natural gas energy plant at given capacity and heat from boiler are compared with natural gas input cogeneration systems and biogas input cogeneration systems. In this context, a mathematical model was created, feasibility simulation and analysis were made. The results of these analyzes have been evaluated and

these three different situations are discussed in terms of economic and environmental terms, energy production, investment and operating costs into considerations.

Keywords: Biogas, Gas engine, Cogeneration, Simulation, Carbon emission.

:: Paper No: GCGW - 2018 – P182 ::

SUSTAINABLE TRANSPORTATION SYSTEM DESIGN FOR UNILEVER TURKEY

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As reducing the carbon footprint became one of the topmost concerns of many of the companies all over the world, after starting production of home and personal care products in Konya factory, Unilever Turkey has a goal of reducing their yearly carbon emission levels by five percent, calculated in related key performance indicator (KPI). The aim of this study is to suggest solution strategies that will reduce carbon emissions of Unilever, by creating a well-designed transportation network through the detection of carbon emission causes. After evaluating the transportation system of Unilever Turkey, various causes of carbon emissions were found, and those causes were classified under two different categories as: route-based problems and fleet-based problems. In this context, to reduce route-based carbon emissions, a Location Routing (LR) model and an Alternative Fuel Routing (AFR) model were formed. These two different models concentrated on creating a whole new transportation network with more utilized use of cross-dock locations within Turkey by using the current Unilever fleet and considering compressed natural gas (CNG) as an alternative fuel in some of the vehicles in their transportation. On the other hand, to reduce the fleet-based carbon emissions, an improvement on the aerodynamic design of the vehicles was suggested and by analyzing the real-life simulations, appropriate tire pressure, velocity and acceleration levels were determined that will give the nearest optimal carbon emission values in the systems.

Keywords: Sustainable transportation, Carbon emission reduction, Location routing problem, CNG, Cross-docking, Alternative fuel routing.

:: Paper No: GCGW - 2018 – P183 ::

EXERGETIC PERFORMANCE OF BUILDING ATTACHED PHOTOVOLTAIC POWER PLANT SETTLED IN OLIVE OIL PRODUCTION COMPANY

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Solar energy is one of the most available and sustainable renewable sources. In recent decades, solar energy-based applications are growing up to generate electricity for industrial purposes. The main objective of this study is to evaluate the performance of a building attached photovoltaic plant (BAPV) that is installed on the roof of the olive oil production company located in Izmir, Turkey by using energy and exergy analysis. The plant having a capacity of 701.2 kWp is designed as a grid-connected model. BAPV system consists of strings having 21 monocrystalline solar modules connected in series which produces electricity more efficient than polycrystalline ones. In order to carry out the exergetic performance analysis of the system, the data such as total insolation of solar energy, panel surface temperature, ambient temperature, electricity production, etc. were collected from SCADA. The values of energy and exergy efficiencies, exergy destructions and sustainability indexes are determined due to ambient temperature during the year of 2017. Accordingly, the exergy efficiency of the plant was calculated as 12.49-15.76%. Meanwhile, the sustainability indexes of BAPV plant were found as between 1.14-1.19, respectively.

Keywords: Solar energy, Building attached photovoltaic power system, Exergetic efficiency, Exergetic destruction, Sustainability index.

:: Paper No: GCGW - 2018 – P186 ::

NOVEL CO_2-CAPTURE SOLVENTS COMPRISING CARBONIC ANHYDRASE AND STERICALLY HINDERED AMINES: KINETIC STUDIES

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Carbon dioxide (CO_2) emission into atmosphere is a global concern due to its direct connection with global warming. Currently, there are three proven methods; namely, membrane separation, adsorption and absorption/desorption for post combustion CO_2-capture. The absorption with reversible reaction of carbon dioxide into amine solutions is today the most mature technology and has found widespread application for capturing carbon dioxide. However, research on novel solvents capable of economical carbon dioxide capture gained importance due to rising fuel costs. For this purpose, in the scope of this project; carbonic anhydrase (CA) activated sterically hindered amine blends, which can react with carbon dioxide at high reaction rates and have unstable carbamates, were formulated and the reaction kinetics of carbon dioxide with these amine blends were investigated.

In this study, the use of CA as a catalyst was examined for the first in order to radically increase the speed of steric hindrance amine systems with relatively low reaction rates. Aqueous solutions of sterically hindered amines (2-Amino-2-methyl-1,3-propanediol (AMPD), 2-amino-2-methyl-1-propanol (AEPD) and 2-amino-2-hydroxymethyl-1,3-propanediol (AHPD)) were selected for the CO_2 capture process. The "intrinsic" reaction rates of the CA-activated sterically hindered aqueous amine solutions with CO_2 were measured experimentally by a "stopped-flow" technique for a temperature range of 283–303 K. The reaction mechanism was determined to comply with termolecular reaction mechanism and pseudo-first order behavior was observed. The catalytic effect of CA was examined by changing the concentration. The activation energies of the reactions were also reported. In addition to the results of this homogeneous reaction system, heterogeneous gas absorption experiments were conducted on a newly designed, locally-engineered mini-gas liquid reactor where the gas and liquid phases can be manipulated independently by separately mixing gas-side and liquid-side resistances. The absorption capacities and the initial absorption rates have been obtained in a gas-liquid contact reactor at 313 K. The reproducibility and reusability of the solvent and the enzyme deactivation were also analyzed by Fourier transform infrared spectrometry (FTIR).

Finally, the observed reaction rate constants inferred from heterogeneous gas absorption rates –through estimated solubility and diffusivity – were compared with the homogeneous – intrinsic – reaction rate constants obtained by a rapid mixing technique, namely stopped-flow conductimetry.

Keywords: Carbon dioxide capture, Global warming, Sterically hindered amine, Stopped flow, Carbonic anhydrase.

:: Paper No: GCGW - 2018 – P187 ::

EVALUATION OF ELECTRICITY GENERATION OPTION FROM ANIMAL WASTE IN TRAKYA REGION OF TURKEY

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Biomass-based electricity generation is a promising option in reducing the environmental impacts of the energy supply and the fossil fuel dependency. Renewable energy sources as an important component of sustainable development bring global benefits as mitigating greenhouse gases (GHGs), reliable energy supply, economic use of natural resources, utilizing organic wastes as feedstock. Energy recovery can be a sustainable option for animal waste that would otherwise create GHG emissions.

The aim of this study is to determine the electricity generation potential from animal biogas and investigate and the applicability of necessary investments in Kırklareli and Edirne Cities. The biogas potential is determined according to the laboratory analysis of the livestock wastes (from cattle, small ruminant and poultry) in the two cities based on 2015 data. Initially annual accessible waste amount and total volatile solid substance is calculated according to animal quantity. Later producible total methane gas is obtained from the laboratory analysis results of the manure as unit methane potential (m^3 CH_4/ton VSS). The feasibility of the plant is obtained from the net producible electricity and heat energy calculated from the annual obtainable methane amount. Capital cost, annual operation and maintenance costs of the energy production plant and incomes obtained from energy and fertilizer are taken into account for the feasibility study. Payback period is calculated according to the optimum localizations of the possible plants. The expected utility of the study is to contribute sustainable development of Turkey via usage of the renewable energy sources, mitigation of the greenhouse gasses (GHGs), protection of the environment and development of regional agriculture and livestock farming economically.

Keywords: Biogas potential, Electricity generation, Sustainable development, Greenhouse gasses (GHGs).

:: Paper No: GCGW - 2018 – P188 ::

CLIMATE CHANGE AS A FORCING FUNCTION IN AGRI-FOOD AND ENERGY INNOVATION

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Climate change is occurring globally, and climate projections predict that the change will continue for many more decades to come. Climate change mitigation and adaptation are however offering major business opportunities, especially for companies operating in the built environment, agri-food and energy production and supply, water infrastructure, finance, and health and climate services. With the extent and severity of heat waves, the demand for cooling is expected to rise and accelerate, placing additional demands on energy supply and increasing the risk of electricity black outs. Similarly, the projections provide warnings about increased drought risk in many regions around the world; and it is also reported that it will be necessary to produce 60% more food globally and 100% more in developing countries by 2050. As a result of increasing and competing demands, exacerbated by pollution and climate change-driven impacts, available freshwater resources are becoming increasingly stressed. Consequently, reducing the vulnerability of agri-food production systems to climate change and strengthening the adaptive capacity are important to protect and improve the livelihoods of billions of people around the world. Furthermore, reducing emissions due to fossil fuels production and consumption that contribute to global warming is crucial to securing global wellbeing; and agri-food and energy sectors have tremendous potential for reducing emissions and inefficiencies while at the same time playing their important roles in poverty reduction, and food and energy security. Both sectors are facing significant climate change-driven challenges, which provide ample opportunities for cutting-edge knowledge, and innovative products, processes, services and policies.

Keywords: Climate change, Innovation, Agri-food, Energy, Greenhouse gas (GHG) emissions.

:: Paper No: GCGW - 2018 – P189 ::

ESTIMATION OF EMISSIONS FROM CROP RESIDUE BURNING USING REMOTE SENSING DATA

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The agricultural sector is one of the drivers of the economic development worldwide. Nearly one-fourth of the population in Turkey works in the agricultural sector. One common problem in agriculture is crop residue burning which is the way to handle crop residues after harvesting due to its adverse effects on human health, air and soil. In this research, a pilot area of 15x15 km^2 in Southeastern Anatolia Region of Turkey, where crop residue burning is most prevalent, was selected as the study area. Sentinel-2 satellite images of the pilot area were obtained and processed in order to find the spatial distribution and total area of the agricultural parcels where crop residues are burned on the field. Analysis were conducted to find out spatial distribution of burned areas and identify crop type for each agricultural parcel to be used for subsequent emission estimates. Emission calculations were applied for the detection of the influence of stubble/crop residue burning on air quality for different types of crops.

Keywords: Crop residue, Stubble burning, Agriculture, Remote sensing, Air quality.

:: Paper No: GCGW - 2018 – P190 ::

COMPARATIVE LIFE CYCLE ASSESSMENT OF A GASOLINE, FUEL CELL AND TWO NEW ELECTRIC VEHICLES

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In this study, the environmental impacts of a conventional gasoline vehicle, fuel cell vehicle and two new electric vehicles is analyzed, assessed and compared via a comprehensive life cycle assessment approach. The first new vehicle comprises a proton exchange membrane fuel cell, Li-ion battery and photovoltaic panels. The second vehicle consists of a proton exchange membrane fuel cell, Li-ion battery, photovoltaic panel and ammonia electrolyzer to produce hydrogen onboard. Life cycle phases such as the development phase including raw material extraction, products manufacturing chains, the production phase, vehicle use phase incorporating fuel and electricity usage during the operational life of the vehicle and recycling phase are included. The emission that are incorporated in this study are carbon dioxide, methane, sulphur oxides, and nitrogen oxides. Furthermore, the environmental impact categories that are considered in this study are global warming potential, eutrophication, acidification and damage to ozone layer.

Keywords: Life cycle analysis, Vehicles, Greenhouse gases, Electric vehicles, Fuel cell vehicles.

:: Paper No: GCGW - 2018 – P191 ::

COST FORMATION OF EXHAUST EMISSIONS FOR GE90 TURBOFAN ENGINES USED ON COMMERCIAL AIRCRAFTS

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Aviation sector brings significant benefits, both directly through the jobs it creates and indirectly through the facilitation of global trade and tourism. However, its activities also contribute to climate change, noise and local air quality impacts, and consequently affect the health and quality of life of public. The main aircraft engine emission pollutants are carbon dioxide (CO_2), nitrogen oxides (NO_x), sulphur oxides (SO_x), unburned hydrocarbons (UHC), carbon monoxide (CO), particulate matter (PM) and soot. In this study, the exhaust emissions and their cost formation rates of GE90 series turbofan engines used on Boeing 777 aircrafts are investigated for Take-Off (T/O), Climb-Out (C/O), Approaching (APP) and Idle (IDL) flight phases. The emissions of UHC, CO, and NO_x are taken into account. The emission values of the engines that have the Standard Dual Annular Combustor (SDAC) and Low Emission Dual Annular Combustor (LEDAC) are analyzed separately. The results of the study indicate that the GE90-85B turbofan engine with SDAC has the total maximum emission values of UHC and CO with 9.52 kg/h and 120.51 kg/h while the GE90-92B turbofan engine with SDAC has the total maximum NOx emission value with 1259.7 kg/h. On the other hand, the GE90-85B turbofan engine with SDAC has the total maximum cost rate of UHC and CO emissions with 32.13 $/h and 16.27 $/h while the GE90-92B turbofan engine with SDAC has the maximum NOx emission cost rate with 6657.51 $/h. The LEDAC system reduces the UHC emission rates and cost rate in the range of 77.68% to 84.05%, the CO emission rates and cost in the range of 64.23% to 82.74%, and the NOx emission rates and cost in the range of 5.75% and 8.96% in accordance with the engine series.

Keywords: Commercial aircraft, Turbofan engine, Exhaust emission rate, Emission cost rate.

:: Paper No: GCGW - 2018 – P192 ::

ENERGY AND ECONOMIC FACTORS AFFECTING CARBON DIOXIDE EMISSIONS IN SUDAN: AN ECONOMETRIC ANALYSIS (1969-2015)

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The objective of this study is to investigate the effects of some energy and economic factors on CO_2 emissions in Sudan using annual time series data over the period 1969-2015. The OLS estimated model shows that GDP per capita, oil, energy use, trade openness and FDI significantly affecting CO_2 emissions. The estimated model indicates a proper negatively signed coefficient of relationship between the squared GDP and CO_2 emissions but insignificant. However, the ARDL results do not confirm existence of an EKC, but it shows that oil and energy use per capita as the main deriving factors behind CO_2 emissions in Sudan. Economic growth, energy use and CO_2 emissions are found to have a cointegration long run relationship. Granger causality test shows existence of bidirectional relationship running from GDP per capita and the squared GDP per capita to CO_2 emissions. Oil and FDI are found to be Granger causing CO_2 emissions indicating pollution haven. Policy recommendations that could be applicable to mitigate CO_2 emissions regarding energy sources and uses are provided accordingly.

Keywords: Energy use, GDP, CO_2 emissions, Cointegration, ARDL, Sudan.

:: Paper No: GCGW - 2018 – P193 ::

EFFECTS OF H_2O CONTENT ON A NON-PREMIXED BIOGAS FLAME CHARACTERISTICS AND EMISSIONS

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This study is concerned with combustion characteristics of a biogas under varying H_2O content conditions in a combustor. Water (H_2O) vapor content in the biogas have been changed from 0% to 10%. Numerical investigations have been performed by using a CFD code. PDF/Mixture Fraction combustion and k-Ɛ standard turbulence models were used for modellings. The effect of the H_2O addition into the biogas on combustion performances of the biogas has been also studied in the present study. Findings show that changes in H_2O content highly affect the flame temperature and emission profiles of the biogas through the combustor. Especially, the flame temperature zones move to the downstream of the burner. It may also be said that the flame temperatures of the biogas increase as H_2O content is changed due to better fuel-air mixture. In addition to these findings, It can be demonstrated that the axial temperature levels decrease as the H_2O is added into the biogas.

Keywords: Biogas, Combustion, Emission, H_2O content, Modelling.

:: Paper No: GCGW - 2018 – P195 ::

CONVERSION OF MODEL CELLULOSE INTO VALUE ADDED PRODUCTS USING DEEP EUTECTIC SOLVENT FORMED BY CHOLINE CHLORIDE AND OXALIC ACID

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In this study, conversion of micro granular cellulose to valuable products such as 5-HMF, lavulinic acid or furfural in microwave and conventional reactors was investigated. Deep eutectic solvent (DES) formed by choline chloride and oxalic acid was used as catalyst and solvent in the experiments. The experiments were performed at 130-160 °C and varying reaction times (1 to 120 min) with respect to the type of the reactor. The highest levulinic acid (LA) and 5-hydroxymethyl furfural (5-HMF) yields were 69.51 wt.% and 3.73 wt.% at 160 °C and 7.5 min reaction time at microwave reactor, respectively. And also, for conventional batch reactor, the highest levulinic acd and 5-HMF yield was calculated as 43.64 wt.% and 2.86 wt.% at 160 °C for 1 h, respectively. The highest carbon efficiency was found to be 87.55 % for microwave reactor at 160 °C and 7.5 min reaction time.

Keywords: Deep eutectic solvents, Microwave reactor, Cellulose, 5-HMF.

:: Paper No: GCGW - 2018 – P199 ::

BIOGAS PRODUCTION FROM SUNN HEMP

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Sunn hemp *(Crotalaria juncea L.)* is a plant that grows rapidly and is frequently used as a cover crop and as a green manure to enhance the soil organic matter and nitrogen content. Anaerobic digestion of sunn hemp and co-digestion of sunn hemp with cow dung were studied in semi-continuous single-stage reactors. The 5 reactors of 5-liter working volume were operated using five-day feeding with the slurry of sun hemp: cow dung: water at a feeding rate of 625 ml/5 days giving rise to a hydraulic retention time of 40 days. Mixed ruminal microorganisms from cows of approximately 17.92 g mixed liquor volatile suspended solids/liter were used as inoculum. The average CH_4 content produced from the substrate slurry of sun hemp: cow dung: water proportions of 20:0:80, 16:4:80, 13:7:80, 10:10:80 and 7:13:80 was 47.57%, 47.74%, 50.44%, 51.71% and 52.67%, respectively, and the CH_4 yield produced was 180, 183, 216, 228, 228 L/kg COD degraded, respectively. Co-digestion of sunn hemp mixed with cow dung increased the CH_4 content in the biogas and increased the CH_4 yield. This study showed another beneficial property of sunn hemp as a renewable energy source for biogas production.

Keywords: Anaerobic digestion, Biofuel, Biogas, Co-digestion, Cow dung, Greenhouse gas, Methane, Renewable energy, Sunn hemp.

:: Paper No: GCGW - 2018 – P200 ::

APPROPRIATE PROPELLERS WITH DIESEL ELECTRIC PROPULSION SYSTEM TO REDUCE EMISSIONS

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The increasing use of fossil fuels to require the energy needs and the increasing harmful emissions of exhaust gases have brought about environmental problems. New regulations, which reduce these effects from fossil fuel use and effort to create new technologies that can adapt, have led researchers to increase the use of alternative energy sources and to make existing systems work with higher efficiency and fewer exhaust emissions in some regimes. Most of trade transportation, which is 84 % of the total volume in the world have occurred, is actualized by the marine transportation. The fact that it is one of the biggest sources of harmful gas emissions from ships presents the importance of reducing the emissions. In the case of environmental damages, it is one of the issues which should be resolved. To solve this problem, electric propulsion systems have emerged as a very attractive alternative in vehicles in the transportation sector. While electric motor and battery systems used in land vehicles today can replace conventional systems very quickly, the range limits of the systems used, and the charging times are too long, there is a real problem as to the adaptation of these systems to the vessels. The fact that the existing technologies have not yet reached adequate levels of development for adaptation to the shipping sector is viewed as an area that offers many opportunities for the development of new technologies. As a solution in this phase, diesel-electric propulsion systems have emerged as an infrastructure that enables the use of electric propulsion systems on ships. It should be taken into consideration that the diesel-electric propulsion systems will greatly facilitate the adaptation of renewable energy to ships and the development of new systems. In the study, the effects of propeller systems which can be used with diesel-electric propulsion systems will be investigated.

Keywords: Diesel-Electric, Propulsion system, Propeller, Emission, Air pollution.

:: Paper No: GCGW - 2018 – P201 ::

CALCULATING LAND SURFACE TEMPERATURE USING LANDSAT 8 DATA

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Climate change or global warming is the phenomenon in which temperatures on a global scale are changing rapidly and unpredictably. Climate change can cause negative effects on the environment, human society, and nature. With the development of satellite remote sensing which acquires information about the Earth's surface, subsurface and atmosphere, there have been major advances in understanding the climate system and its changes. One of the most important factors in global climate change is the Land Surface Temperature (LST) and its behavior. The LST can be retrieved from many satellites including Landsat`s latest launched satellite, Landsat 8, providing thermal data that has opened new possibilities for observing and understanding climate change events. In this study, a simple tool has been developed in ERDAS Imagine software in order to calculate and map the LST using Landsat 8 satellite data. Although Landsat 8 has two thermal bands, due to Band 11s larger calibration uncertainty, only Band 10 was included in the algorithm. LSTs estimation further depends on the albedo, the vegetation covers, and the soil moisture. The tool developed in this paper is practical and does not require any background knowledge in remote sensing so environmental scientists can use it very easy in their researches.

Keywords: Remote Sensing, Land Surface Temperature, Global warming, Climate change.

:: Paper No: GCGW - 2018 – P207 ::

THE CAUSES OF GLOBAL WARMING ON A SHORT TIME SCALE AND THE LAW OF GLOBAL CLIMATE CHANGE ON A LONG TIME SCALE

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The issue of global climate change is now extensively debated around the world. Although many people have accepted with half-believing and half-doubting the view that human's emission of greenhouse gases is the primary factor in global climate change, many scientists including NIPCC are skeptical about this view, they have refuted this view with plenty of evidence, and they believe natural driving is the main factor for global climate change, but they haven't found such a convincing natural driving force yet. So the author has researched deeply into various natural forces that could affect climate change, and has found that global climate change has a close relation with the formation and evolution of Earth's atmosphere: with the growth of Earth's mass, Earth's atmosphere become thicker gradually; especially the Solar System is currently in the periphery of the Milky way, due to the higher density of gas, dust and other interstellar matter in the periphery, both the Sun and the Earth can capture more and more gas, dust and other interstellar matter, making the Sun and the Earth's atmosphere become thicker, and the heat produced by the Sun increases correspondingly; due to the thickening of Earth's atmosphere, the greenhouse gases from both the cosmic space and human production is difficult to escape, and the heat radiates from the Sun to the Earth is also unlikely to lose, finally enhancing greenhouse effect, causing global warming. But on a long time-scale, the twentieth century global warming is essentially the normal warming process of the transition from glacial period to interglacial period, and the warming magnitude is not abnormal. With the Solar System moving into the inner parts of the Milky Way, especially when it is close to a massive star, lots of greenhouse gases and dust from the Solar System would be swallowed by the giant star, making the Sun and the Earth's atmosphere become thinner, therefore the heat of the Sun be reduced and the heat radiates from the Sun to the Earth be easy to lose, finally causing the Earth's temperature drops greatly, making the Earth enter a great glacial period.

Keywords: Global climate change, Atmosphere, Galaxy movement, Glacial period, Interglacial period.

:: Paper No: GCGW - 2018 – P210 ::

INVESTIGATION OF ENERGY EFFICIENCY ON VOYAGE AND NEW TECHNIQUES

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The maritime industry has been under pressure in recent years due to the restrictions on the mitigation of greenhouse gas emissions and heavy increase of fuel prices. Additionally, fuel consumption costs have important share in total shipping costs. Due to these reasons, performance and energy efficiency become one of the major issues in the maritime sector for ship management companies who have been working on cost reduction and environmentally friendly ship operations.

In the front-end phase of this study, data regarding greenhouse gas emission sourced from maritime industry and studies made on this subject in the presence of IMO are mentioned. Necessity of energy efficiency is emphasized in this conjuncture. Energy efficiency operational indicator and main engine fuel consumption per nautical mile are considered as main performance indicators.

The objective of this project is to analyze fuel consumption figures before and after hull and propeller cleaning and determine how these activities affect fuel consumption of ships. This research also aims to determine the effects of different environmental conditions such as sea state, wind and wave direction on ship's speed.

Additionally, national legislation adaptation is also to be formed for obtaining energy efficiency improvement in Turkish Flag ships by pointing out high increase rate in greenhouse gas emission in Turkey. Operational data are used in calculations. SEEMP Analysis was carried out.

Keywords: Energy efficiency, Fuel consumption, Ship efficiency.

:: Paper No: GCGW - 2018 – P212 ::

NUMERICAL INVESTIGATION OF SOLIDITY EFFECTS ON A 3 BLADED VERTICAL AXIS WIND TURBINE

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The estimation of aerodynamic forces around a vertical axis wind turbines (VAWT) is so important in order to generate energy applications. In this study, energy performance and aerodynamic forces of NACA4412 airfoil type on a vertical axis wind turbine have been investigated numerically at different *solidities*. The *solidities* of air foils have selected as 0.37, 0.50 and 0.75 respectively. Numerical calculations have been conducted in 2-D form with the Fluent CFD code, using the k-ε Realizable model. The optimum values have been obtained. However, effects of *solidity* rate on turbine performance have been seen quite important.

Keywords: Aerodynamic, VAWT, *Solidity.*

:: Paper No: GCGW - 2018 – P213 ::

FOLLOWING CARBON DIOXIDE CONCENTRATION AND CONSEQUENCES OF ITS ZERO EMISSION ON THE ENVIRONMENTAL ECOSYSTEM

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This research is to monitor the concentration of carbon dioxide (CO_2) in the atmosphere and to investigate the effect of zero emission of CO_2 on the ecosystem. The research methodology depends on the data from international research laboratories, which record the concentration of CO_2, such as National Oceanic and Atmospheric Administration (NOAA), USA, and Mauna Loa Observatory in Hawaii. The concern about CO_2 concentration was started in the last century. The industrial revolution did not consider the impact from pollution on the environment. The impact on the environment was noticed only after clear disturbance in the ecosystem. The concentration of greenhouse gases in the atmosphere, especially, CO_2, is daily, monthly and yearly monitored. There are different sources of CO_2 emission, such as cars, factories, forests burning etc. In fact, CO_2 has a dual effect. It has a harmful effect. It is one of the main reasons for the global warming. It has a useful effect because of the important role in the photosynthesis process. We need to reduce the emission of CO_2 but not to reach zero emission, because there will be no photosynthesis process, which means there will be no life on the earth.

Keywords: Carbon dioxide level, CO_2 zero emission, Ecosystem, Photosynthesis, Global warming.

:: Paper No: GCGW - 2018 – P215 ::

ESTIMATING PUBLIC HEALTH PREPAREDNESS FOR GLOBAL WARMING

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Looking at the trend of CO_2 emissions of the countries, the overall trend is significantly increasing; Iran is not an exception. Also, looking at the number of hospital beds per 1000 people in the countries, the overall trend is not either decreasing or increasing in the world. Here, again Iran is not different. However, by looking at the health consequences of climate change, not all the countries are affected similarly. For example, Iran is expected to be affected dramatically; hence, it is more crucial for Iran, in comparison with other countries, to be prepared for the health impacts of climate change and global warming.

Temperature-rise is detected in almost all parts of the country; therefore, hotter summers cause more heat waves that can lead to heart and respiratory issues. Another reason for dramatic health consequences in Iran is the urban population of 74.4%, which causes water and resource management challenges as well as urban heat islands in the cold seasons. The possibility of epidemics in the densely populated areas, as well as non-communicable diseases due to the low outdoor air quality, are other health issues that need to be considered when it comes to the health system preparedness and the number of beds for the patients.

In this paper, as a measure of preparedness for the health impacts of climate change, we consider the ratio of CO_2 emission per capita (as a proxy of global warming) to hospital beds per capita. Then we evaluate the adaptive capacity of Iran's health system by comparing its measure of preparedness with the global results.

Keywords: Global Warming, Climate Change, CO_2 emission, Public Health.

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INDIRECT HEALTH EFFECTS OF CLIMATE CHANGE IN IRAN: A NARRATIVE REVIEW

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Climate change and its consequences are the main concerns of humanity and a serious problem in achieving Sustainable Development Goals (SDGs). Climate change is called "the biggest global health threat of the twenty-first century". It likely would affect health of millions of people around the world by changes in the pattern of diseases. Iran, as one of the major countries in the Middle East region, is strongly influenced by these effects. The diseases pattern in Iran has been changed from infectious diseases to non-communicable diseases (NCDs).

The most important infectious diseases associated with climate change in recent decades are malaria, leishmaniasis and Crimean-Congo Haemorrhagic Fever (CCHF) as vector-born diseases and diarrhea, cholera as water-born diseases in Iran. The number of registered infectious diseases cases in the infectious diseases surveillance system has seasonal patterns of incidence and have been largely dependent on the climatic variables such as rainfall, temperature and humidity.

Among NCDs, cardiovascular diseases (CVDs) are responsible for 45.7% of all deaths. There is a strong and significant correlation between the CVDs and the increase of the maximum temperature and decrease of the minimum temperature. Air pollution is increasingly responsible for raising the burden of NCDs in Iran as well. About 4000-5000 of Tehran citizens die due to air pollutants such as SO_2, CO, PM10 and NO_2 per year. Also, almost 15% of all cancers are skin cancer due to the environmental factors such as ultraviolet radiation as an etiologic agent of all types of skin cancer.

Developing and implementing strategies to reduce the greenhouse gases and to adapt to the impacts of climate change at different levels of the community and all sectors, including the health system, can reduce the adverse health effects of climate change.

Keywords: Climate change, Health effects, Non-communicable diseases, Infectious diseases.

:: Paper No: GCGW - 2018 – P218 ::

URBAN HEAT ISLAND ANALYSIS USING THE LANDSAT 8 SATELLITE DATA: A CASE STUDY IN FETHIYE, TURKEY

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Urban heat island (UHI) is documented instance of anthropogenic climate change. UHI occurs when natural surfaces, are replaced by heat-trapping human activities. The urban area of Fethiye, Turkey, has been rapidly rising in the past few years. In this paper, the effects of UHI in Fethiye has been analyzed in the summer period of 2017, using Landsat`s latest launched satellite, Landsat 8. Using the thermal data collected from Landsat 8, Land Surface Temperature (LST) has been retrieved and it was compared with the land cover of the study area. For this purpose, both Normalized Difference Vegetation Index (NDVI) and Normalized Difference Build-up Index (NDBI) were calculated in order to explore the impacts of the vegetated and the build-up areas on the UHI. The results showed a negative correlation (-0.54) between LST and NDVI, indicating that the vegetated areas can lower the effect on the UHI. However, the positive correlation (0.57) between LST and NDBI, indicates that the build-up areas can strengthen the effect of UHI in the study area. The results that can be collected from these indexes can be helpful for decision making on the management of the urban areas.

Keywords: Climate change, Global warming, Land surface temperature, Remote sensing, Urban heat islands.

:: Paper No: GCGW - 2018 – P220 ::

CHARACTERIZING RIPARIAN WETLAND SOILS FROM AN AGRICULTURAL WATERSHED: IMPLICATIONS FOR CARBON STORAGE

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Carbon, a primary component of the most significant greenhouse gases, is sequestered or stored in forests, agricultural soils, and wetlands. Wetlands have highest carbon density and diffuse source of humic substances among all terrestrial systems. Amount of carbon storage in wetlands plays a crucial role in global biogeochemical cycles although wetlands only comprise about 4 % of Earth's land area. An estimated 20-30 % of the world's C sequestered in soils is stored in wetland soils.

In this study, organic matter and carbon properties up to 70 cm below the surface from the San Joaquin River National Wildlife Refuge, which receives seasonal agricultural drainage from irrigated cropland has been investigated. Two intact cores (permanently and seasonally flooded areas) were collected using AMS Multi-stage Sludge and Sediment sampling kit from the San Joaquin River National Wildlife Refuge. The cores were analyzed for organic matter content by loss on ignition and total carbon/organic carbon by elemental analysis method.

The carbon concentration in the permanently flooded wetland is consistently higher than those of the seasonally flooded wetland. In the first 5-15 cm from the surface, both of the wetlands show an initial rapid decline in carbon. However, carbon concentrations declined to approximately 30 % of surface concentrations in seasonally flooded areas but remained at approximately 70 % of surface values in permanently flooded areas. The combination of both anaerobic conditions and ecosystem productivity that makes permanently flooded wetland soils highly organic.

Keywords: Carbon storage, Climate change, Organic matter, Organic carbon, Wetlands.

:: Paper No: GCGW - 2018 – P221 ::

HEAT TRANSFER AND EXERGY STUDY ON A ROTARY-TYPE MAGNETIC COOLER

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Environmentally-friendly and efficient are the main constraint in any refrigeration systems. Magnetic cooling is a good candidate to overcome these constraints. There are two types of magnetic cooling system such as rotary and linear. In this study, a rotary-type magnetic cooling system with a defined geometry is designed and exposed to heat transfer simulation. Gadolinium (Gd) is selected as a magnetocaloric material (MCM), and heat transfer between Gd and the working fluid is considered as volumetric energy generation. A rotating disk with 10 mm thickness, 150 mm inner radius, and 200 mm outer radius was selected. MCM was simulated to be implemented on the disk covering a 90° radial sector. Magnetic field distribution over the disk was obtained using ANSYS. Cooling capacity and COP of the system were calculated. Second law analyses were conducted for quantifying the losses. Conductive heat transfer through the thickness of the disk was not found to be significant compared to the convective heat transfer through the top surface.

Keywords: Rotary magnetic cooler, Magneto-caloric effect, Gadolinium, Heat transfer.

:: Paper No: GCGW - 2018 – P222 ::

PARAMETRIC INVESTIGATION OF SUPERCRITICAL REFRIGERATION CYCLE FOR R744 AND R170

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Proposing environmentally-friendly and efficient refrigeration systems is of primary constraint in every design. The European Directive 2006/40/EC and EU Regulation No 517/2014 has put so strict limitations on the global warming potential (GWP) values of the currently available refrigerants that people from the sector have to find new environmentally-friendly working fluid alternatives fulfilling the requirements of the legislation. In this study, performance of the low-GWP and high-pressure refrigerants, namely R744 (carbon dioxide, CO_2) and R170 (ethane), are investigated in the supercritical refrigeration cycle. Common points regarding these two refrigerants are their low critical temperatures resulting in high operation pressures. The main objective of this study is comparing these two environmentally-friendly refrigerants considering the basic operation parameters. In addition to the performance comparison, percentage exergy destruction in the expansion valve is displayed according to the same parameters. Percentage exergy destruction comparison is conducted to have a broad idea about the improvement potentials of these two high-pressure refrigerants in the ejector expansion cycle concept. All in all, comparing R744 and R170 individually would be beneficial from the viewpoint of two respects. Firstly, the best performance ranges of the refrigerants would be presented parametrically within the defined operation conditions. CO_2 blends are commonly investigated due to the necessity of decreasing operation pressures and increasing the performance. Secondly, the performance characteristics of each blend component should be understood one by one in detail to estimate the operation ranges for the mixture yielding the best performance.

Keywords: R744 (Carbon dioxide), R170 (Ethane), Global Warming Potential (GWP), Supercritical (Transcritical) refrigeration cycle, Expansion losses.

:: Paper No: GCGW - 2018 – P226 ::

SOLAR RADIATION ESTIMATION MODEL AND DESIGN OF A TWO AXIS SUN TRACKER FOR DOKUZ EYLUL UNIVERSITY CAMPUS AREA

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The most important parameters that enable the energy efficient operation of solar energy systems are to ensure that the system is kept steady at the sun rays, to provide the output voltage around the point where the highest power can be obtained, and to provide effective storage methods with closed loop control techniques. Due to the absence of displacement in stationary solar energy systems, directing the system to the sun rays is more effective in increasing efficiency. Solar trackers become a significant technology in renewable energy because solar tracking systems which enable to know the angle of the sun to the surface for every day of the year and every hour of the year and to direct the system to the sun rays according to weather conditions increase system efficiency. In this study, it was aimed to design and produce a system which directed itself to the sun rays for a system that provides energy production from the sun and to provide an optimal angle orientation by using different control techniques.

First, the global solar radiation data in Tınaztepe, Izmir was analyzed using statistical methods then compared with the data that recorded from photovoltaic panels by loggers. The results gave a mathematical model. Using the extracted mathematical model and linear and nonlinear control methods, the solar tracking system was designed according to the radiation values and the instantaneous weather conditions. A two-axis solar tracking system has two freedom degrees, so it can track the sun rays from the sunrise to sunset. For this purpose, a sun tracker which involves a battery, motor, maximum power point tracker and motor driver designed.

Keywords: Renewable energy, Solar radiation, Solar tracker.

:: Paper No: GCGW - 2018 – P227 ::

THERMODYNAMIC ASSESSMENT OF EJECTOR EXPANSION REFRIGERATION CYCLE UNDER REVERSIBLE EJECTOR ASSUMPTION

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Ejectors are used in many systems from nuclear reactors, chemical industry, aerospace testing equipment to the drying of medical drugs and food items. Utilization of the ejectors in the refrigeration systems is one of the most remarkable application areas. Among variety of different ejector refrigeration cycle configurations, heat-driven ejector refrigeration cycles and ejector expansion refrigeration cycles (EERC) are two of the widely known concepts. To comprehend the performance of these cycles, thermodynamic modelling is a quick and simple approach since they consider only inlets and outlets of the ejector sections and refrigeration system components although they are insufficient to provide with the flow details. However, for practical comparisons and performance evaluations, these kinds of models could be useful. The main objective of this study is comparing the performance of the EERC under reversible ejector assumption. Low-global-warming-potential (GWP) refrigerants in main having high throttling losses are selected according to the European Directive 2006/40/EC and EU Regulation No 517/2014 (F-gas Regulation) and analyzed making use of thermodynamic modelling approach. The investigation of these environmentally-friendly refrigerants under the reversible ejector assumption would be a valuable contribution to the literature since maximum performance improvement that could be obtained through medium of an EERC is presented as the principal outcome. Diffuser outlet pressures of the refrigerants necessary to compare an EERC with constant section efficiencies and EERC operating with a reversible ejector are defined according to optimum operation conditions calculated with respect to constant pressure mixing ejector theory. Mathematical models are established in MATLAB® and thermodynamic properties of the refrigerants are calculated through REFPROP version 9.1.

Keywords: Ejector expansion refrigeration cycle, Global Warming Potential (GWP), Expansion losses, Constant pressure mixing ejector, Reversible ejector.

:: Paper No: GCGW - 2018 – P228 ::

PLASTICS RECYCLING AND ENVIRONMENT

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In this advanced or progressive time, plastic is most accepted and favored material among all other materials. There are several uses of plastics and one of the use or we can call it a fact or its nature that plastic is non-biodegradable it means we can recycled it and give it a new shape or product and take advantage of that new product. Global world or global environment is attempting to recycle more plastic other pollutants like solid waste that is constantly threatening our environment. Plastics that we abandon or dispose-off in our daily routine or life, disposed plastics are becoming noticeable execration or curse for our environment like lands and oceans, more than half world are facing through these problems. This world contains more than half countries that are under developed and there we can see utmost parts have heaps or gyre of plastics and other waste and with time rate of wastage of plastic is increasing which can be observe by seeing oceans. It is hard now to clean them up at this stage because it is not as easy as it seems. Plastic containers, bottles and other products made of plastic have turned our beaches and livers into litter wasteland. Nearby water that we drink, it is extremely dangerous which creates many problems of health for human. It is a nature of a plastic that when it reveals to the heat or sunlight it starts discharging harmful poisonous chemical or it is not wrong to say germs which can easily attack to our environment air that we breathe and other living things. It takes approximately thousand years for plastic to degrade, so dumping them in ocean or in landfill does not mean they will be gone, but they will be here after centuries. In our research paper, we actually concluded that by recycling plastics we could improve our environment. We also emphasize on importance of process of recycling of plastics, and we discussed 'why recycling of plastics is necessary for our environment'. We cannot end these harmful impacts but can reduce.

Keywords: Gyre, Recycling, Discarded, Biodegradable, Plastic, Waste.

:: Paper No: GCGW - 2018 – P229 ::

ECONOMIC AND ENVIRONMENTAL ANALYSIS OF THE THERMAL INSULATION APPLICATION ON THE ROOF OF INTERNATIONAL HASAN POLATKAN AIRPORT

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HVAC systems use the largest share of energy consumption in airport terminal buildings. Thus, the efficiency of the HVAC system and the performance of the building envelope have great importance in reducing the energy used for heating and cooling purposes. In this study, the application of thermal insulation on the roof of the Hasan Polatkan Airport terminal building was investigated from energy, environment and cost aspects. Calculations were performed using the TS 825 "Thermal insulation requirements for buildings" standard. The life cycle assessment (LCA) method was used to assess whether the decrease in energy consumption after applying the insulation balanced the environmental effects during the period between the production and application of the thermal insulation material. Environmental payback periods were calculated depending on applied insulation thickness. The global warming potential (GWP) were evaluated based on IPCC100. LCA results were obtained by processing data taken from ecoinvent 3 database present in the SimaPro 8.3.0.0 software. Applying thermal insulation on the roof of the terminal building was found to decrease heat loss significantly. In addition, the analyses showed that the environmental payback periods for the thermal insulation were shorter than the economic payback periods.

Keywords: GWP, Thermal insulation, TS 825, Airports.

:: Paper No: GCGW - 2018 – P231 ::

TRANSITION TO RENEWABLE ELECTRICITY AND HEATING PRODUCTION IN SIX EU COUNTRIES

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The present work analyses policies for renewable and efficient heating, cooling and electricity generation in the target countries (Austria, Czech Republic, Germany, Denmark, Portugal and Romania) until 2050. The assessment is based on linking three tools: Invert/EE-Lab model was used for modelling energy demand in buildings, FORECAST-Industry for industrial heating and cooling (H/C), while power and district heating (DH) sectors were represented in TIMES models. The resulting CO_2 emissions, demand for energy carriers and share of renewable energy were assessed for the current policy scenario and an ambitious policy scenario. The ambitious policy scenario includes rising CO_2 prices, stricter building codes, cheap financing of renewables, extension of the ETS, etc.

The results show that the current policies lead to a remarkable decarbonisation of heating and cooling in buildings but are still behind the Paris Agreement targets. An important measure to reach this is an intensified renewable energy obligation for newly constructed and renovated buildings.

The current industrial policies do not lead towards decarbonisation in the analyzed countries. Deep emission cuts require substantial changes in the iron and steel, cement and chemical industries. The ambitious policy scenario achieves substantial emission cuts; however, it is still lagging behind the Paris Agreement targets.

Austria and Denmark can switch to renewable electricity only because of decreasing costs of renewables and fossil fuel taxes, while the others require higher CO2 prices and support for renewables. Except for Denmark, higher CO2 prices and more favourable financing is needed to reach 100% renewable district heating.

Keywords: Model coupling, Invert/EE-Lab, FORECAST-Industry, TIMES models, District heating.

:: Paper No: GCGW - 2018 – P233 ::

THE EFFECT OF DRIVING PATTERNS ON THE LIFECYCLE ASSESSMENT AND FUEL CELL DEGRADATION ON HYDROGEN FUEL CELL VEHICLES

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This research paper deals with the modeling and simulation of hydrogen fuel cell vehicle and development of the lifecycle assessment (LCA) tool to calculate and compare the environmental impacts of hydrogen fuel cell passenger vehicle with conventional vehicle. Since fuel cell vehicles are equipped with regenerative braking, it can recover a good portion of the energy which is being wasted in the braking system. Thus, the driving cycle can significantly affect the performance of fuel cell vehicles. Fuel cell degradation, on the other hand is another major problem of fuel cell vehicle which is caused by the start/stop, acceleration/deceleration and high load of the engine. This paper tries to model the LCA and investigate the effect of driving cycle and fuel cell degradation. The results showed that UDDS driving cycle has approximately 1124 kg lower total lifecycle emission. The results also indicate that fuel cell degradation negatively affected the average fuel economy of the vehicle by about 2.3

Keywords: Fuel cell vehicle, Driving patterns, Degradation.

:: Paper No: GCGW - 2018 – P234 ::

4-E (ENERGY, EXERGY, EXERGOECONOMIC, AND EXERGOENVIRONMENTAL) ANALYSIS OF A PARABOLIC TROUGH COLLECTOR USING A CONVERGING-DIVERGING RECEIVER TUBE

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The current study presents a novel 4-E (energy, exergy, exergoeconomic and exergoenvironmental) analyses of a parabolic trough collector (PTC) using a converging-diverging absorber tube. The results of the analysis show that the converging-diverging geometry obtained a higher performance of 65.95% and 38.24% for thermal and exergetic efficiencies respectively at 650K and 200L/min. The exergy destruction from the sun to the receiver accounted for 59.7% in the converging-diverging tube at 350K and 54.7% for the smooth absorber tube at the same temperature. The exergoeconomic study presented a cost rate of destruction of 0.35$/hr at 650K inlet temperature and the environmental study yielded an exergoenvironmental impact factor of 0.31 and 261 for the exergoenvironmental impact coefficient.

Keywords: PTC, Exergy, Exergy Destruction, Exergoeconomic, Exergoenvironmental.

:: Paper No: GCGW - 2018 – P236 ::

LIFE CYCLE SAVING OF THE BUILDINGS IN TURKEY RELATED TO ENERGY CONSUMPTION DUE TO OUTER WALL INSULATION

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In this study, firstly, for five different climate zones which specified on Turkey building thermal insulation standard (TS 825) depending on the different thermal insulation materials, minimum insulation thickness and life cycle saving, and payback period of energy consumption for ten years are found. Secondly, the optimum insulation thickness for the degree-day values base on the heating system efficiency and the cooling performance coefficient value (COP), the life cycle saving, and payback period of the energy consumption are investigated. Minimum insulation thickness and optimum insulation thickness are compared for life cycle saving according to energy consumption. Extruded Polystyrene (XPS), Expanded Polystyrene (EPS), Glass Wool, Rock Wool and Polyurethane are used as a thermal insulation material and electrical are used as an energy source. As a result, according to TS 825, the minimum insulation thickness for five climatic zones which depends on the different insulation materials, minimum insulation thickness, life cycle saving of energy consumption and payback period are calculated between 0.011-0.069 m, 8.797-68.144 $/m^2, 0.67-2.33 years respectively. The optimum insulation thickness for different degree-day values and depending on different insulation materials are calculated between 0.036-0.216 m. Life cycle saving of energy consumption and payback period are calculated between 13.225-82.098 $/m^2, 1.56-3.93 years respectively. Depending on these results, it is necessary to increase the minimum insulation thickness values for outer walls which specified in TS825.

Keywords: Life cycle saving, TS 825, Optimum insulation thickness, Energy consumption.

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SPATIO-TEMPORAL VARIABILITY OF TEMPERATURE EXTREMES IN THE MARMARA REGION (NW TURKEY)

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In this study, the long-term variability of climate extremes was investigated for the region Marmara (NW of Turkey). Based on the 21 meteorological stations, Mann-Kendall rank statistic test and fitted ordinary least squares regression method was implemented to the ten indices of extreme temperature for the period 1960-2006. In regional perspective for temperature indices, statistically significant increasing trends ($p<0.05$) are shown in the warm days and nights, warmest day and warmest/coldest night while cold, frost and summer days together with coldest day have non-significant increasing trends. Only cold nights show non-significant decreasing trends in the study. The possible impacts of the extremes on particular sub-basins were also evaluated in the study. The results can give valuable opportunity for policymakers and stakeholders in focusing on the eco-environment management strategies in the Marmara Region.

Keywords: Marmara, Climate extremes, Indices, Trends.

:: Paper No: GCGW - 2018 – P238 ::

THERMODYNAMIC MODELLING OF AN ORC SYSTEM UTILIZING WASTE HEAT OF A MARINE VESSEL

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Organic Rankine cycle (ORC) is a well-known waste heat recovery and electricity-generation technology. It may be used in geothermal power plants, solar power plants, sewage/sludge disposal plants, and facilities that produce waste heat at appropriate conditions. In the field of marine engineering, research on using ORC in maritime applications have started only a decade ago. ORC systems have been rapidly developing in order to increase the energy efficiency of marine vessels since then. In this study, waste heat resources in an engine room of a container ship are first defined. Then, a thermodynamic model of the processes within a proposed system that can utilize these resources using an ORC system is developed. Real data sets of waste heat resources are collected from a reference ship which worked on 40% MCR (maximum continuous rating) engine load of 11060 kW main engine. Solving the equations of this model was done using EES (Engineering Equation Solver) software. Parametric studies are conducted by changing the thermal oil type, refrigerant type, and mass flow rates. The results show the amount of electrical energy production by using the waste heat resources of the reference ship.

Keywords: Waste heat recovery, organic Rankine cycle, thermodynamic modelling, energy efficiency

:: Paper No: GCGW - 2018 – P239 ::

CORRELATIONS BETWEEN THE WATER LEVELS OF LAKES BEYSEHIR AND MARMARA WITH SUNSHINE DURATION AND TIME SERIES OF SUNSPOT NUMBERS

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Solar irradiation is the most important external driver of the climate system and sunshine duration is a key proxy record for solar irradiation on the earth surface. Sunspots mainly affect the extraterrestrial solar irradiance, and some studies assess the link between climate variability and sunspot cycles. The sunspots data is commonly available. Sunshine duration is widely measured all around the world and available for more than 60 years in some meteorological stations located in Turkey. Lake water level fluctuation records from Lakes Beysehir and Marmara of Turkey span over 100 and 50 years, respectively. In this study, we compared yearly-based data of the lake water level with sunshine duration and sunspot numbers with an aim of reconstructing the solar irradiation variations within the last 100 years. We found a moderate level of correlation between the water level of Lake Beysehir, and sunshine duration of the nearest station, named Karaman, since 1970s. For the sunspots, there was also a correlation since 1960s with Lake Beysehir's water level though it was weaker than the correlation with sunshine duration. Interestingly, correlation between the sunshine duration and sunspot numbers was very weak. Conversely, we could not observe any significant correlation between the Lake Marmara's water level, and the sunshine duration data of the nearest station, which is located in Izmir and sunspot numbers. The differences in results for the two lakes might be attributed to the hydrological properties of the Lakes Beysehir and Marmara. Lake Beysehir is in a closed basin and therefore effect of precipitation might probably be more dominant on the water level than in Lake Marmara. Based on the above analyses, we developed a methodology to reconstruct the yearly solar irradiation amount for Lake Beysehir-Karaman region before 1970s.

Keywords: Water levels of lakes, Sunshine duration, Sunspot numbers, Climate system.

:: Paper No: GCGW - 2018 – P241 ::

GEOTHERMAL AND SOLAR ENERGY BASED MULTIGENERATION SYSTEM FOR A DISTRICT

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In this study, parabolic trough collector with an integrated source of geothermal water is used with Regenerative Rankine cycle with an open feedwater heater, an electrolyzer, and absorption cooling system. The absorption fluids used in the solar collectors were Al_2O_3 and Fe_2O_3 based nanofluids. Detailed energetic and exergetic analysis are done for the whole system including all the components. A comparative analysis of both the used working fluids is done and plotted against their different results. The parameters that are varied to change the output of the system are ambient temperature, solar irradiance, the percentage of nanofluids, the mass flow rate of the geothermal well, the temperature gradient of the geothermal well had an effect on the net power produced, the outlet temperature of the solar collector overall energetic and exergetic efficiency. Other useful outputs by this domestic integrated multigeneration system are the heating of domestic water, space heating (maintaining the temperature at 40 to 50°C) and desalination of sea water (flash distillation). The hydrogen production rate for both the fluids diverge with each other but both producing average from 0.00490 g/s to 0.0567 g/s. The hydrogen production is considered to be very effective as it is considered salient for many processes like the production of fertilizers (Haber's process), hydrogenation of fats and oil, providing as a fuel for hydrogen cells and also as welding.

Keywords: Solar, Geothermal, Exergy, Hydrogen, Freshwater, Cooling, Power.

:: Paper No: GCGW - 2018 – P242 ::

THE EVALUATION OF SAFETY BARRIERS USING THE METHOD LOPA CASE: HAOUD BERKAOUI IN SONATRACH

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The objectif of this paper is to evaluate the performance of the safety barriers using layer of protection analysis (LOPA). It was applied on Haoud Berkaoui in Sonatrach one of the leading companies in oil and gas industry, we have chosen the new flared gas recovery project as the subject of our study as its new and no previous work has been done on this subject, we have identified the most critical system on it and it was the separator V-160, this separator is crucial to the hole operating station, as it holds all the condensate at the end of the operation.

Keywords: The safety barriers, Companies of oil and gas, LOPA.

:: Paper No: GCGW - 2018 – P243 ::

METHODS TO RECOVER THE FLARED GAS AND ITS IMPACT ON THE CLIMATE CHANGE

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The natural gas is among the sources of energy which knew a clear progress of use since the 1970s. Because of its economic and ecological advantages, the natural gas becomes more attractive every day for many countries. The properties of this product, as for example, the low interval of combustion characterizes this source of energy, by making it one in the most used sources and the most known. At present, it represents the second usable source of energy after the oil.

Every year, more than 150 billion cubic meters of natural gas are burned in the torch and rejected in the atmosphere; it is equivalent to 25% of the consumption of gas of the United States, and 30% of the European Union.

In Africa, the annual volume of the flared gas is estimated at 40 billion cubic meters, which is the equivalent of half the energy consumption of the continent.

Besides, the gas flaring has an impact on the climate change at the global scale, because it represents an additional volume of CO_2 emissions, about 390 million tons a year, a figure bigger than the potential volume of the annual reductions of emissions associated with the projects newly proposed by the mechanisms of Kyoto.

The objective of our study is to focus on the methods to recover this gas, because the reduction of flared gases has a big importance to reduce the carbonic emissions and use rationally the natural gas.

Keywords: Natural gas, Climate change, Renewable energy, Air pollution, Environmental impact.

:: Paper No: GCGW - 2018 – P244 ::

PERFORMANCE ANALYSIS OF A COMBINED HEAT AND POWER SYSTEM DRIVEN BY STIRLING ENGINE AT DIFFERENT ROTATIONAL SPEEDS

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In this paper a combined heat and power (CHP) system with beta-type Stirling engine as a prime mover is proposed for residential applications. The analysis used in this paper for Stirling engine was non-ideal adiabatic analysis. The non-ideal adiabatic analysis is performed using a developed numerical code in MATLAB software. The use of the CHP systems in building applications will be more common if they have significant advantages from the primary energy consumption point of view, pollution emission and operational cost in comparison with the other conventional systems. For this purpose, the effect of Stirling engine rotational speed on efficiency, primary energy saving (PES), carbon dioxide emission reduction (CO_2 ER) and operational cost reduction (CR) were analyzed. The modeling results showed that at low rotational speeds, the engine has better performance than other rotational speeds for the CHP system. In addition, the maximum amounts of efficiency, PES, CO2ER and CR in CHP system have been happening at rotational speed of 1500 rpm.

Keywords: CHP, Stirling Engine, Non-ideal Adiabatic, CO_2 Emission Reduction.

:: Paper No: GCGW - 2018 – P245 ::

INFLUENCE OF THE NATURE OF HEAT TREATMENT ON CATALYSTS BASED ON GOLD NANOPARTICLES IN THE SELECTIVE OXIDATION OF ORGANIC MOLECULES

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The clay minerals are abundant natural materials, clean and inexpensive, which can be used in catalysis. These materials have a high adsorption capacity that is particularly interesting for the deposition of catalytic noble metal particles, in the interlamellar space of clay.

Furthermore, gold, which is a noble metal, has long been regarded as catalytically inactive. In 1987 the group of Dr Haruta discovered the catalytic properties quite remarkable of gold nano-particles at low temperature.

In our work, gold particles of nanometer size, catalytically active, are deposited on Fe and Al pillared montmorillonite - Na^+, by deposition - precipitation. The objective is to study the Influence of the nature of heat treatment in the selective oxidation of cyclohexane. The characterization by XRD shows the expansion of the interlamellar distance of clay after intercalation by Fe or Al. Characterization by UV-Vis shows that most gold particles are smaller; the maximum absorbance band is shifted to smaller wavelengths.

The catalytic activity of the catalysts was tested in the oxidation reaction of cyclohexane by tert-butyl hydro-peroxide. Several parameters have been studied: the nature of heat treatment (H_2, O_2 or H_2 + O_2), treatment temperature and also the solvent effect.

The catalysts studied in this work lead to the selective production of cyclohexanone, compared to cyclohexanol: the catalysts reduced under H_2, which seems to have the smallest particles, leads to the highest cyclohexanone production. A yield of 38% has been observed with the catalysts reduced at 200 ° C compared to those reduced at 500 ° C (18%).

Keywords: Gold nanoparticles, Montmorillonite, Heterogeneous catalysts, Oxidation, Cyclohexane.

:: Paper No: GCGW - 2018 – P246 ::

ADAPTATION OF A PLANT SPECIES IN THE FACE OF CLIMATE CHANGE

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Ecological disturbances of different origins cause a loss of biodiversity, a decrease in forest potential and threaten the plant genetic heritage of the Tlemcen coastline. Climate plays a major role in the organization of vegetation structures; according to the results obtained from the analysis of climatic data, the two stations of study are currently in the semi-arid. The increase of temperature, and the decrease of the rain-water quotient, which constitutes the most significant synthesis for the Mediterranean climate, has shown that the landscape drifts towards arboreal and shrubby Matorrals, which is confirmed by the detachment of the second station lower sub-humid stage towards the semi-arid. This work contributes to the study of the species Nicotiana Glauca G. (Solanaceae) in two regions of the north-west coast of Algeria.

The Algerian north-west coast is an integral part of Mediterranean ecosystems characterized by several ecological constraints that can influence the morphology of the species. Histological sections made by the technique of double staining, allowed us to describe the different tissues of the species and their arrangement at the stem and root. Histometry remains an essential means to see the size of each tissue, at the level of the two organs studied, in order to understand the behavior of species in the face of climate change and how it develops its tissues in the face of drought in a xeric environment. Finally, the results of the study allowed us to know the different tissues of Nicotina glauca G. their size and their arrangement and the relationship between them to understand the adaptation of this taxon to its surrounding environment.

Keywords: Tlemcen coastline, climate change, ecological disturbances, histological sections, Nicotiana Glauca G.

:: Paper No: GCGW - 2018 – P247 ::

ADVANCEMENT OF ENVIRONMENTAL SUSTAINABILITY IN INSTITUTIONAL BUILDINGS THROUGH WASTE TO ENERGY TECHNOLOGY: CASE STUDY

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Disposal of municipal solid waste (MSW) in landfills has an excessive impact on the environment (soil, air, water). This can be reduced by incinerating the waste to generate energy that can then be used to generate steam for heating or electricity while MSW is eliminated from harming the environment. The principle objective of this study is to investigate the feasibility of utilizing waste-to-energy (WTE) technology at the district energy plant for the main campus of University of Idaho (UI) located in Moscow, Idaho, USA. An assessment of production, composition, and the energy content of the solid waste on campus is conducted. It is found that the waste generated on campus can only support 2% of steam requirements. Expanding the collection of MSW to the surrounding community would be meet 42% of steam production requirements. The heating value for the MSW generated on campus is 13.67 MJ/kg, slightly above the national average. The use of WTE to produce steam has the potential to save over $500,000 annually over the biomass fuel currently used, and over $1.5 million compared to natural gas exclusively. Besides the financial benefits of WTE, environmental sustainability increases by eliminating MSW from landfills.

Keywords: Waste to energy, District heating and cooling, Municipal solid waste.

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ORAL AND POSTER SESSIONS

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SUSTAINABLE FILTRATION OPTIONS FOR COOLING TOWERS

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Scarcity of water is crucial thread to the life on the Earth. Though, sustainable approach to water consumption is key to conserve water resources. Cooling towers as part of cooling systems release millions of tons of water every year into atmosphere. Therefore, finding methods to capture vapors from cooling towers would be a substantial for water sustainability. However, recycling vapor in the cooling cycles needs a proper filtration otherwise fouling and corrosion can cause serious problems in pipes, pumps, and other equipment. In this study filtration options for the district heating and cooling in the University of Idaho (UI) is proposed. Palouse Region aquifer is depleting faster than it can replenish though recovering water in cooling tower is key project for the UI. There are three filtration options presented in this paper, 1) updating the current system by integration to a heat exchanger and Reverse Osmoses (RO) 2) retrofitting the UI district heating and cooling plant with an optimized membrane filtration arrangement, 3) to use a proprietary technology. These options are compared from point of performance and costs in the different stages. Advantages and disadvantages of each system are presented in this study for the UI facility management to make decision for implementing any of filtration options depends on the budget availability and other policies of the UI. Before a decision can be made regarding the optimal option for the district heating and cooling plant a cost analysis, an energy efficiency analysis, and an exergy analysis needs to be completed for each of the three options.

Keywords: Sustainability, Filtration, District heating and cooling.

:: Paper No: GCGW - 2018 – P249 ::

ENVIRONMENTAL CONSERVATION OF SIACHEN GLACIER THROUGH TRANSBOUNDARY PEACE PARK: AN ATTITUDINAL CONFLICT RESOLUTION APPROACH

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The Siachen glacier is the longest outside the polar regions of the globe. Military presence, lack of appropriate environmental protection and conservation management has imperiled the ecosystems of the glacier. Moreover, it has also endangered the species at the lower elevations of Karakoram range. The most important feature of this glacial area is the storage of the huge amount of freshwater that is an important feature of the hydrologic balance especially for the major countries of South Asia. Melting of glacier due to military activity coupled with the global warming as a result of climate change calls for careful monitoring and attention. The Siachen conflict needs solution. The present study analyzes the proposal of transboundary peace park and other possible strategies for demilitarization and disengagement in glacier region by using the system engineering decision analysis approach. The authors propose an attitude-based conflict analysis in the framework of Graph Model for Conflict Resolution (GMCR) to find out suitable and acceptable solution of the conflict. The analysis considers the attitudes of India and Pakistan and examine how their attitudes towards each other affect the outcome of the conflict and how their positive attitudes towards each other lead to possible and acceptable solution(s). In addition to this, the role of China as third-party mediator is also analyzed by considering China's attitude towards India and Pakistan. The solution of the Siachen conflict would not only preserve a spectacular mountain region and hydrologic balance in the region, but it would also add to global environment protection efforts. Moreover, it would defuse the armed stand-off easing the tensions in the region. Furthermore, it would further open the avenues of future constructive agreements and would save the tremendous resources of these economies.

Keywords: Environment conservation, Climate change, Global environment, Peace park, Conflict resolution.

:: Paper No: GCGW - 2018 – P251 ::

INNOVATION PLATFORMS AS AN APPROACH TO ADDRESS ENVIRONMENTAL IMPLICATIONS OF CROP STUBBLE BURNING IN PAKISTAN

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Punjab and Sindh province of Pakistan are famous for their "Paddy and wheat cropping pattern (PWS)". Despite their importance for production of main staple food and maintaining food security in the country, the farmers of these provinces are main cause of haze & smog caused by burning of rice straw and stubbles after reaping season. This practice not only cause emission of greenhouse gases like CO_X, CH_4, NO_X, SO_X but also pollutant materials (PM10 and PM2.5) which, not only, has severe health consequences like eye irritation and dryness, chest congestion, obstructive pulmonary disease (COPD), but also, are main cause of closure of highways, airports, delays in railways, and road accidents due to poor visibility. Punjab government introduced a ban on burning of crop residue in October 2017 that could be ineffective without alternative means and consultation of farmers. There is growing need of incorporating ecosystem approaches for establishing innovation platforms for using these residues for alternative uses to avoid burning. Such integrated approach could include value upgradation. Using farmers preferences integrated with market externalities an ecosystem is suggested. Such National innovation platform not only could link all stakeholders for common objective of environment protection and but could ensure value upgradation for common peasants. This research provides appropriate mechanism and policy suggestion to address the environmental impacts.

Keywords: Rice residue management, Pollution, Innovation Platform, Pakistan.

:: Paper No: GCGW - 2018 – P252 ::

NEW GEOTHERMAL AIR-COOLER: APPLICATION IN THE REGION OF BISKRA, ALGERIA

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This work concerns a new technological solution to avoid the malfunctioning of the cooling system when the ambient temperature passes its operating limits especially during scorching temperatures of summer. The principle of this solution is the use of an air mixer to couple a finned tubes heat exchanger (condenser, dry cooling tower) with a shallow geothermal source (Earth-Air Heat Exchanger, EAHE). The air mixer and the EAHE present the new Geothermal Air-Cooler (GAC) investigated in this paper. The GAC consumes a low additional renewable electrical power source, for supplying the EAHE exhaust fan, and makes the conventional cooling systems cleaner by enhancing its functioning. The aim of this paper is to present the GAC and to test its applicability in the region of Biskra, Algeria.

In this study, a mathematical calculation methodology is proposed to design the GAC components. An original model is used to estimate the soil radius, surrounding the pipes, required to the EAHE design. The calculation design of the EAHE is validated using experimental data obtained from the literature. A case of study, in the region of Biskra, was conducted by designing the GAC coupled to a dry cooling tower found in the literature. The design was made by applying an extreme ambient air temperature. Results related to the dry cooling tower showed that the GAC is is able to reduce the temperature of the mixture of air about 14 °C compared to the ambient temperature. The GAC can increase the operating-temperature limit of the conventional air conditioning systems to reach 57°C. Furthermore, it has been shown that several EAHEs can be used in the case of big heat transfer area of the finned tubes.

Keywords: Dry cooling tower, air cooler, condenser, earth-air heat exchanger, Geothermal Air-Cooler.

:: Paper No: GCGW - 2018 – P254 ::

VALIDATION OF FORECASTED SOLAR RADIATION BY WRF AND CALCULATED BY LIBRADTRAN MODELS USING MERRA-2 DATABASE

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Solar radiation is a crucial parameter for different solar systems; hence, it is of economic importance to renewable energy. Forecasting solar radiation will lead to determinate the predicted production by solar system. Determining the predicted production will help electricity manager in their decision. However, solar radiation prediction can go up to 72 Hours, with one-hour step.

Recently, we conducted a study were solar radiation was predicted using the radiative transfer model namely libRadtran, taking as input the vertical profiles of the atmosphere, predicted by WRF model. As input for the WRF model, GFS analysis data are downloaded from the NCEP server.

In this study, a validation of the results we got from our model (libRadtran) was achieved. Actually, data from the NASA called the Modern-Era Retrospective analysis for Research and Applications, Version 2 (MERRA-2) are downloaded and used in order to make the confrontation. The analysis data are given in latitude and longitude coordinate with a resolution of 0.5 degrees. Note that libRadtran model output are interpolated according to data we got from MERRA-2. Besides, statistical parameters were determined, respectively, correlation coefficient, the bias and root mean square error. In one hand, for situations where the sky was clear and for the synoptic meteorological clouds system, the comparison has shown good agreement with the results obtained from the predicted model. In other hand, the NWP model gives bad forecasts for the situations with broken and isolated clouds. Moreover, the quality of the statistical results drops. Note that further simulations remain essential in order to consolidate our results.

Keywords: MERRA-2, Renewable energy, Solar radiation, Weather prediction models.

:: Paper No: GCGW - 2018 – P255 ::

EFFECT OF USING PHOTOVOLTAIC POWER SYSTEMS IN SUSTAINABLE ENERGY ACTION PLAN OF A BIG COUNTY MUNICIPALITY IN TURKEY

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Integration of urban planning with flows of energy is one of the strengths of local administrations in their fight against the global warming threat. "Covenant of Mayors" which is the most extensive association of local governments in the world, has started serious works on fighting against climate change and required the local governments' preparation of Sustainable Energy Action Plans (SEAP). Bornova Municipality has calculated its reference greenhouse gas emission inventory as 31432 tons of CO_2 in the SEAP delivered to the "*Covenant of Mayors*" (CoM) on February 7th, 2013. In accordance with the CoM goal, it has committed to reduce its greenhouse gas emission value by 25% by 2020 and brought into being the installation of a 300 kWp photovoltaic power system (PVPS) n 2013 as the most important project. The main objective of this study is to use the real-time data of 300 kWp plant and evaluate its contribution to the reduction of greenhouse gas emission. Moreover, usable potential roof surface areas of the service buildings of Bornova Municipality have been calculated and the contribution of the increase of the PVPS capacity to the goal of greenhouse gas emission reduction by 2020 has been studied.

Keywords: Sustainable energy action plan, Greenhouse gases, Photovoltaic power systems, Covenant of Mayors.

:: Paper No: GCGW - 2018 – P257 ::

AN AIRCRAFT FUEL SYSTEM ENERGY AND EXERGY ANALYSIS WITH TWO DIFFERENT PRECOOLER SETPOINT

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In this study, the energy and exergy exchange of an aircraft fuel system is investigated if the precooler temperature intervals interacting with the aircraft fuel system are 121 °C and 251 °C, respectively. Both precooler temperature settings and the flight profile of the aircraft and aircraft maneuvers which are departure, acceleration, horizontal cruising and landing phases taking into account to investigate the energy and exergy analysis in the aircraft fuel system.

Keywords: Aircraft fuel system, Precooler, Aircraft maneuvers, Energy and exergy.

:: Paper No: GCGW - 2018 – P258 ::

TECHNO-ECONOMIC OPTIMIZATION OF GRID-TIED HYDROGEN-RENEWABLE-BASED POWER PLANT WITH MANAGEMENT STRATEGY

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In the present work, grid tied hybrid renewable hydrogen production system (HRHPS) is completely modeled and optimized from the techno-economic point of view. HRHPS consists of a PV array and wind turbines (WT) for the production of clean energy. Electrical grid can be utilised as a backup energy source and/or virtual energy storage system (VESS) as it is the case in building integrated PV systems. This can be contributing to reduce the cost of energy storage. Energy and hydrogen management strategy (EHMS) is proposed according to the system functionality and the possibility of operating electrolyzer at partial load or steady-power.

Economic optimization is carried out based on the net present cost (NPC) method used to determine the total annual cost (ACT), cost of energy (COE) and cost of hydrogen (COH). These two latter parameters are calculated using the total annual amount of energy and hydrogen produced. In the case study, meteorological data taken from the meteorological and radiometric station of CDER at Algiers and a typical demand profile of hydrogen are utilized. Results show that the values of COE and COH are 0.42 $/kWh and 25.17 $/kg, respectively.

Keywords: Grid connected, Renewable energy, Hydrogen production, EHMS, Cost assessment.

:: Paper No: GCGW - 2018 – P259 ::

OPTIMIZATION OF ENERGY CONSUMPTION FOR OIL REMOVAL FROM AQUEOUS SOLUTION USING ELECTROCHEMICAL PROCESS

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In this study, D-Optimal experimental design of response surface methodology has been employed to evaluate the individual and interactive effects of three independent parameters, namely current density (A): 5–35 mA/cm^2; initial pH (B): 5–11; and reaction time (C): 6–30 min on the electrical energy consumption. The results have been analyzed using Pareto analysis of variance (ANOVA). Analysis showed a high coefficient of determination value (R^2 = 0.998) and satisfactory prediction for second-order regression model. Energy consumption was found depend on the current density and reaction time. As a result, it was seen that energy consumption for oil removal by electro-coagulation method could be minimized at optimum conditions. The electrical energy consumption for maximum COD removal is observed to 4.5 kWh/m^3 at the optimum conditions.

Keywords: Cutting oil emulsions, Electro-coagulation, Energy consumption, D-optimal design, Modelling.

:: Paper No: GCGW - 2018 – P263 ::

URBAN GREEN ROOFS FOR GLOBAL WARMING PROBLEMS

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The rapid developments of countries and competition between nations have influenced the world to worse direction. This case enhances the demand for energy and people are racing to find low-cost energy sources like as fossil fuels. By burning fossil fuels generate greenhouse gases emission at the same; this situation accelerates the global warming. Decision makers force the scientist and engineers to explore a better solution for mitigating the effects of global warming in the world.

World population currently lives in urban areas more than 50% and this ratio will increase. Climate changes due to anthropogenic activities that have role changing the ecosystems and their associated fluxes of energy. Variations in land use patterns could be directly influenced by energy and water and mass fluxes. In actually, urban areas need more energy and water than rural areas and these requirements are increasing tremendously.

Green roofs define growing vegetation on rooftops and so could save green spaces in urban areas. This coverage areas offer many environmental, ecological, and economic advantages such diminish storm water runoff, alleviate urban heat island effects, absorb dust and smog, sequester carbon dioxide, produce oxygen, create space for food production, and provide the natural habitat for animals and plants.

Keywords: Climate change, Energy, Global Warming, Green roof.

:: Paper No: GCGW - 2018 – P264 ::

SUSTAINABILITY STUDY OF AMMONIA COMBUSTION IN A GAS TURBINE

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Low carbon economy is of great importance in decreasing global warming effects of energy systems. Ammonia, if produced in a sustainable way, can be seen as a new renewable energy source, producing of only water vapor and nitrogen is possible in certain combustion characteristics. In this paper, effects of combustion of ammonia blends with methane in a gas turbine engine is the main concern. Performance, heat release and emission analysis of different blends of the two fuels have been carried out. The gas turbine has been modelled with the software EBSILON® Professional and is used for ground operations.

Keywords: Ammonia, Gas turbine, Global warming, Emissions.

:: Paper No: GCGW - 2018 – P265 ::

COMPARATIVE STUDY BETWEEN DRY AND WET MODES IN A HYBRID COOLING TOWER FOR A SOLAR ADSORPTION COOLING SYSTEM

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This study investigates the applicability of a hybrid cooling tower (HCT) of solar adsorption cooling machine in the hot working conditions of the region of Biskra, Algeria. A programming code is developed to size the cooling tower, to define the main characteristics of the sprayed water and to see the effect of humidification on the external and overall heat transfer coefficients, for both dry and wet modes. It was shown that the wet mode presents the best solution. It increases the ambient operating temperature limits from 33°c for the dry mode system to an ambient temperature of 51°C (for the wet mode). At this level of operating temperature, it is found that 0.036 kgs^{-1} of maximum mass flow rate of sprayed water is sufficient to operate this system. Calculation results are compared with experimental results from the literature and good agreement is found.

Keywords: Solar adsorption, Hybrid cooling tower, Sprayed water.

:: Paper No: GCGW - 2018 – P266 ::

PHYSICO-CHEMICAL CHARACTERIZATION AND STUDY OF THE ADSORBENT CAPACITIES OF A BIOMATERIAL. APPLICATION FOR THE ELIMINATION OF INDUSTRIAL POLLUTANTS

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Nature and living beings are increasingly suffering the consequences of pollution with industrial development and population growth. Pollution of water affecting rivers, seas, groundwater and lakes is the result of untreated sewage discharge or insufficient treatment: This causes ecosystem degradation, including some chemical of industrial origin (hydrocarbons, heavy metals ...) or agricultural (pesticides, fertilizers ...) likely to create significant nuisances. Many methods and techniques of depollution are developed to face this problem. These techniques include chemical precipitation processes, flocculation, ion exchange, electrochemical processes: electrolysis, electrocoagulation, membrane processes and adsorption. The latter has the advantage that it can be applied to the treatment of various effluents and thus provides responses to regulatory requirements for the protection of the environment where several adsorbents are used for the treatment of aqueous effluents.

The aim of this study is to find solutions which limit the toxicity effect of a pollutant (pesticide) used in agriculture, to protect certain food and fruits against insects. This work is therefore a contribution to find mechanisms to limit the effects of these pollutants. We opted for adsorption and choose two biomaterials adsorbents: industrial activated carbon and animal bone carbon: this last is prepared in the laboratory. The results showed some physical chemical characteristics similarity of the two carbons: the maximum yield (or adsorption equilibrium) is similar for both: the equilibrium is obtained after seven days. The equilibrium isotherm equation check of Freundlich gave a value of slope n=0.907 for animal coal and n= 0.937 for industrial coal. The elimination method chosen to carry out this work is sample and could be used without greet expense to clean up waste or contaminated water. This process involves the uses of solid inert biomaterials.

Keywords: Pesticide, Acetampirid, Animal bone carbon, Activated carbon, Pollutant.

:: Paper No: GCGW - 2018 – P267 ::

ENERGETIC AND EXERGETIC ANALYSIS OF A NOVEL MULTI-GENERATION SYSTEM USING SOLAR POWER TOWER

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This paper introduces a novel thermodynamic system to produce electricity, heating, and cooling simultaneously using renewable energy source. The proposed multi-generation system consists of a solar energy driven Brayton cycle, a Rankine cycle, a space heater and a single effect absorption chiller uses LiBr-H_2O as working fluid. The molten salt ($NaNO_3$-KNO_3) is utilized in the solar block as the heat transfer fluid. Thermodynamic analysis was carried out on the overall system to analyze its performance. The system design parameters are varied to observe their effect on the energy and exergy efficiency of the overall system. The exergy destruction and heat transfer rates of each component of the system were carried out. The engineering equation solver (EES) software is used to analyze the performance of the integrated system. The results show that the system has an overall energetic and exegetic efficiencies of 56.57% and 33.48% respectively. The COP and exegetic efficiency of the absorption chiller (AC) are determined as 0.8377 and 0.3434 respectively. The increase in evaporator temperature observed to increase the COP alongside the cooling capacity of the absorption cycle. It is also seen that the central receiver has the highest exergy destruction followed by the heliostat field.

Keywords: Solar tower, Energetic, Exegetic, Multigeneration, Absorption chiller.

:: Paper No: GCGW - 2018 – P268 ::

INVESTIGATION INTO THE ENERGETIC ALGERIAN SAHARA POTENTIAL FOR COOLING SYSTEMS APPLICATIONS; FEASIBILITY, OBSTRUCTIONS AND SUSTAINABLE SOLUTIONS

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In the current study; firstly, we give a quick look at the various cooling systems mentioned in the literature and their feasibility in the harsh Saharan summer climate of Biskra city. Then, we present the major obstacles that could prevent the functioning of these systems in the region of Biskra. Thus, we purpose a number of solutions specific to this region, based on the two-major solar and geothermal potentials as sustainable, economic and clean solutions for the overall problems that might encounter these cooling systems. Our choice is carried on desiccant cooling systems, this selection is not arbitrary, but Based on our experiences and scientific understanding acquired on the enhancement of thermal performances of solar water and air heaters, cooling and geothermal systems

Keywords: Air conditioning, Solar collectors, Desiccant cooling, Sorption, Saharan climate.

:: Paper No: GCGW - 2018 – P269 ::

CFD ANALYSIS OF A BOREHOLE HEAT EXCHANGER PERFORMANCE

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Borehole heat exchangers are generally coupled with ground source heat pumps, which greatly reduce heating and cooling energy cost of buildings. U-type and coaxial (pipe in pipe geometry) types are among the most preferred borehole heat exchanger alternatives. Heat can be extracted from or rejected to ground by borehole heat exchanger depending on the operational mode (heating and cooling) of the heat pump system. Thermal performance, installation and operational cost of such systems are significantly affected from pipe installation type (vertical or horizontal), geometry (diameter, length, distance between the pipes, etc), material, ground and working fluid thermal properties (conductivity, temperature, viscosity, flow rate, etc). In this study, thermal performance of a downhole U-tube borehole heat exchanger is analyzed for heating applications. For this purpose, a borehole heat exchanger with a depth of 50 m is taken into account. The working fluid for the heat exchanger system is selected as water and ethylene glycol (30%). Parametric studies using a computational fluid dynamics program (CFD) are performed for the evaluation of the performance of the heat exchanger.

Thermal conductivity of the ground (dependent on soil type, moisture content, temperature etc.) as well as pipe geometry, working fluid viscosity and flowrate are taken as variables in the study. As a result, the heat transfer rate per unit length of the heat exchanger is calculated for all evaluated cases using CFD simulations. The results revealed that higher flow rate and pipe diameter give a superior heat transfer rate, while higher soil conductivity provides a better heat transfer performance. Finally, water as a working fluid provides a better heat transfer rate compared to the case when ethylene glycol (30%) is used as a working fluid.

Keywords: Borehole heat exchanger, CFD, Renewable energy, U-type.

:: Paper No: GCGW - 2018 – P270 ::

GLOBAL WARMING ARE WE MISSING SOME IMPORTANT FACTORS

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Finding solutions to global warming has never been more urgently needed, we are all aware of the devastating effects unfolding in our world today. Our atmosphere needs balance, we are sucking air out, faster than nature can replenish our air supplies. The known process photosynthesis is natures atmosphere builder. My research of energy, has found some interesting comparisons to natures building blocks, my proposed journal investigates the importance of maintaining a balanced healthy atmosphere, highlighting results from calculations, showing the vast amounts of air, we need to sustain our modern way of living, could we be overlooking the most important factor?

As well as highlighting the causes of global warming, my journal investigates what we need to put in place to address the imbalances, proposing the unfolding of an experiment, operation re-nature. In order to implement this, I need to write my journal in a format that everyone can understand, minimizing the use of scientific wording, as this experiment requires the involvement of people from all walks of life. Hopefully a clearer understanding will encourage them to take part.

Keywords: Over use of oxygen, Atmospheric gasses, Operation re-nature.

:: Paper No: GCGW - 2018 – P272 ::

MODELING, CHARACTERIZATION AND OPTIMIZATION OF TORREFIED PINE WOOD FOR HIGH ENERGY YIELDING AND REGRESSION MODEL ANALYSIS

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Torrefaction process occurs in oxygen free atmosphere, between 250°C-350°C of temperature value and residence time between 10 – 60 minutes. Biocoal obtained by this process can be burned in pulverized coal firing plants and cement mills. Many parameters affect the torrefaction process; such as the temperature and residence time in the reactor, the heating rate and the particle size and the composition of the feedstock. In this study; pine wood torrefaction process investigated parametrically in a continuous feed torrefaction production system (screw type). The experiments were carried out at four torrefaction temperatures (250, 275, 300, 350 °C) and three residence times (5, 15, 30 min). Modelling and optimization of the torrefaction process was respectively carried out by Design expert program and numerical technique under response surface methodology. Temperature values and residence times of torrefaction process were taken as independent parameters while biocoal mass yield, energy yield, carbon%, higher heating value, H/C, O/C and HGI were chosen as dependent parameters. The optimal torrefaction temperature and time were estimated to be 299.71 °C and 28.4 min respectively. These optimum values of temperature and time gave mass yield 56.10%, energy yield 75.49%, higher heating value 26761.9 kJ/kg, H/C ratio 0.099, O/C ratio 0.31, and HGI 91.76. Biocoals obtained after torrefaction at around 300 °C and 30 minutes have properties close to selected Turkish lignites in terms of their mass yield, energy yield, higher heating value, H/C, O/C ratio and grindability. Produced biocoals under these conditions will be combusted together with the selected Turkish lignites in circulating fluidised bed combustion systems for further studies. The developed quadratic models were checked using ANOVA (analysis of variance) technique for their validity and degree of fitness. The high values of 'Adequate precision', R^2 and its negligible difference with 'AdjustedR^2' as well as 'PredictedR^2' for each model indicated that the fitted empirical models can be used for prediction with reasonable precision. The quadratic models revealed strong interaction between torrefaction temperature and time towards preparation of biocoal. It was further observed that desirability of torrefaction temperature (0.88) is more than torrefaction time (0.53). Comparison of Van Krevelen diagram of present biocoal with the selected Turkish lignites fuels showed that prepared biocoal has better fuel properties in comparison to biomass which open its way for direct consumption in coal fired boilers and increases the co-firing potential of biomass in coal-fired power plants.

Keywords: Biomass, Torrefaction, Biocoal, Regression.

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AN IMPROVED SYSTEM DESIGN FOR SOLAR BOATS

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Rapidly increasing population and limited energy resources cause a tendency to use the energy more efficiently and the alternative energy systems. In maritime industry like many sectors, adaptation of this tendency is becoming a necessity. The number of studies in the field of marine transportation, which contain hybrid or alternative energy propulsion systems, is increasing gradually. Among the alternative energy systems, solar powered systems have an important place. Because of sustainability and cleanness, the solar energy is becoming more and more popular in the maritime sector. The solar power can be a solution for the high fuel costs therefore; it is believed that the number of solar powered boats or ships will have a remarkable usage percentage in the maritime industry. For these reasons, solar powered boat studies should be carried a step further immediately. The objective of this study is to make improvements on a solar powered boat. Firstly, super capacitors are added the system to supply the maximum power from batteries to electric motor. This provides higher acceleration, and the desired velocities are obtained in a shorter time. Secondly, the optimization strategies are applied to the solar panel, battery and motor connections. Also, the range increment is acquired. By means of these objectives, we aim to improve the maximum speed and endurance of solar powered boats.

Keywords: Solar energy, Solar powered boat, Super capacitor, Performance optimization.

:: Paper No: GCGW - 2018 – P275 ::

DEVELOPMENT OF A METHODOLOGY FOR APPLYING INDUSTRY 4.0 TO INDUSTRIAL TUNNEL FURNACE FOR SUSTAINABLE PRODUCTION

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In this paper; the phases in the conversion of a conventional tunnel kiln to an intelligent one are investigated, bringing a methodology in the application of industry 4.0 to the tunnel kilns. With this intellectual structure, the operation of the tunnel will be proactive in the efforts to reduce the atmospheric emissions. Bothering the energy efficiency and emissions will help maintaining the sustainability of the production. It is apparent that sustainable production systems will be competitive in the long term. These intelligent systems that help the survival of our earth by less emissions, will be the ones to be supported by the regulations.

Keywords: Tunnel furnace, Energy efficiency, Industry 4.0, Emissions.

:: Paper No: GCGW - 2018 – P276 ::

HEAT EXCHANGE EXPERIMENT FROM LIQUID TO GAS

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As our demands for energy grow year after year, the need to find more efficient ways to reduce our consumption of energy resources has never been greater. I have invented a radiator that increases gas volume, via heat exchange from water to gas, the following observation will help you understand how it works. Put a cigarette lighter in the fridge for an hour, take it out and ignite the flame, observe how small the flame is, now warm the lighter up in your hand, when the lighter is warm ignite the flame again, observe how the height of the flame increases significantly, this observation prompted me to investigate further, my proposed short paper highlights some promising results gained from an experiment, exchanging heat from water to gas at various temperatures, to determine the increase in volume gained, results were not perfect due to flame adjustments, however graphs and charts will show an increase in volume, of approximately 3 times more when gas was heated.

This discovery could dramatically reduce our consumption of gas, no additional energy is needed as the gas first heats the water, then the hot water heats the gas, applications include, gas powered generators, gas central heating systems, gas powered cars etc.

Keywords: Heat exchange liquid to gas, Reduced gas consumption, Increased volume.

:: Paper No: GCGW - 2018 – P278 ::

EXPERIMENTAL INVESTIGATION ON HEAT TRANSFER COEFFICIENT AND THERMAL EFFICIENCY OF SOLAR AIR HEATERS HAVING DIFFERENT BAFFLES

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This work presents an experimental study of heat transfer in solar air heater (SAH) with several baffles (Type I, Type II) and without baffles (Type III). Experiments were performed to determine heat transfer coefficient and thermal efficiency for forced convection air flow in the SAH channel duct. The measured parameters are the inlet and outlet temperatures of air, the absorbing and the bottom plate temperatures, the solar radiation and the ambient temperature. These measurements are performed at air mass flow rates range from 0.01 kg/s to 0.04 kg/s. The effect of baffles geometries on the heat transfer coefficient and thermal efficiency are compared. The results show that the heat transfer coefficient between the absorber plate and air can be considerably increased by using artificial roughness on the bottom plate of the SAH duct.

Keywords: Heat transfer, Thermal efficiency, Absorber, Baffles, Mass flow rates.

:: Paper No: GCGW - 2018 – P280 ::

A CRITICAL REVIEW OF THE IMPACT OF GLOBAL WARMING ON OVERHEATING IN BUILDINGS

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Over the last century global average temperatures have increased up to 1°F. Indeed, since records of comprehensive global temperatures were available as early as 1880, the evidence suggests that 2001-2010 decade has been shown to be the warmest. This change is having a direct impact in terms of an increase in extremely hot days and warm nights and a decrease in cold days. Evidence suggests that different parts of the world are warming at a faster rate than others. However, research predicts that the long-term impact of global warming is only set to increase.

One of the major contributors of global warming is the impact of carbon emissions and in an effort to reduce these emissions the UK Government implemented changes to UK regulations, such as Part L conservation of heat and power that dictates improved thermal insulation and enhanced air tightness. The UK is fully committed to achieving its carbon targets under the climate Change Act 2008. However, there is a caveat that comes with these changes, as coupled with climate change they are likely to exacerbate the problem of overheating in buildings. And because of this growing problem the health effects on occupants of these buildings may well be an issue. Increases in temperature can perhaps have a direct impact on the human body's ability to retain thermoregulation and therefore the effects of heat related illnesses such as heat stroke, heat exhaustion, heat syncope and even death can be imminent.

This review paper presents a comprehensive evaluation of current literature on the impact of global warming/climate change on overheating in buildings. Firstly, an overview of the topic will be presented followed by an examination of global warming/overheating research work from the last decade. These papers will form the body of the article and will be grouped into a framework matrix summarizing the source material identifying the differing methods of analysis of the impact of global warming on overheating. Cross case evaluation will identify systematic relationships between different variables within the matrix.

Keywords: Global warming, Climate change, Overheating, Health.

:: Paper No: GCGW - 2018 – P281 ::

ENVIRONMENTAL IMPACT EVALUATION OF AN INTEGRATED ENERGY SYSTEM FOR A SUSTAINABLE COMMUNITY

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As the energy demands in the world increase due to the developing countries continuous and rapid growth and increase in the global population, the need for renewable and sustainable energy is increasing. Currently, most of the world's power production is fossil fuel based. This paper evaluates the environmental impact of a renewable energy based integrated system relative to conventional fossil fuel-based systems. The studied bi-generation system consists of a wind turbine, PV/T units, and an electrolyser/fuel cell. The system produces hydrogen using excess electricity throughout the day from both the solar PV and wind turbines. The excess hydrogen is compressed and stored in a tank, to offset energy demand. The system is built to service a community of 2000 houses, and each house consumes an average amount of 750 kWh of power a month. Both systems are evaluated using identical parameters.

Keywords: Environment, Greenhouse gas emissions, Hydrogen, Solar, Wind, Fuel cell, Electrolyzer.

:: Paper No: GCGW - 2018 – P282 ::

MUNICIPAL SOLID WASTE BASED MULTIGENERATION SYSTEM FOR DIFFERENT DISTRICTS OF KARACHI

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In this study, a novel multi-generation system comprising of municipal solid waste powered Rankine cycle, solar parabolic trough collector, absorption chiller, electrolyzer and reverse osmosis, all integrated together to produce useful outputs namely electricity, drinkable water, heating, hot water, cooling, dry air and hydrogen production, is proposed and thermodynamically assessed. Energy and exergy analysis has been carried out by setting up multiple parameters. System performance for different districts in Karachi is then investigated by performing a parametric study by changing system parameters such as municipal solid waste input, calorific values, and ambient temperature, the corresponding changes in system outputs and efficiencies are then compared. The system's average energy and exergy efficiencies are found out to be 88.6% and 60.3% respectively.

Keywords: Energy, Exergy, Efficiency, Multi-generation, Karachi, Solar, Biomass, Power.

:: Paper No: GCGW - 2018 – P283 ::

DESIGN AND FABRICATION OF AUTOMATIC ROTI MAKER

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Roti is very popular in south Asia as it constitutes a major source of dietary protein and calories. On average its consumption is about twice to thrice a day. With increase in industrialization the demand of roti is increasing day by day, as most of the workers need it for their proper diet. Automation has made notable impact on this present era, giving new dimensions to the life. Keeping in pace of this trend our main aim is to design and fabricate an efficient, compact and user-friendly automatic roti machine for the benefit of mankind. It will not only save time but also increase the quality of life. The machine will cater all the existing problems and difficulties in cooking of roti. This machine has three main chambers comprises of dough ball formation chamber, pressing tower and cooking chamber. All these chambers are interlinked with one another, which consists of several mechanisms. The input is kneaded flour and final product is healthy and puffed roti.

Keywords: Roti, Dough Ball, Cooking, Automatic Roti machine.

:: Paper No: GCGW - 2018 – P284 ::

A STUDY ON THE REVIEW AND EVALUATION OF OPERATIONAL METHODS USED TO REDUCE GREENHOUSE GAS EMISSIONS IN EXISTING SHIPS

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The reduction of air pollution caused by a ship is a process that begins with the early design and the construction stages of the ship. Because the ship's hull design, selection of appropriate propeller, propulsion system and all other factors effect reduction of air pollution caused by ships. However, it is possible to achieve significant emission reductions in service life of ships with some operational methods and some retrofits. Also; it is very important that these existing ships in the world maritime trade fleet should use these methods as soon as possible, since every single step must be taken urgently to prevent global warming and climate change. This study examined methods that enable to reduce green gas emissions operationally in the existing ships. Due to research limitations, the study is focused on methods that have the highest potential for emission reduction and can be used generally in the maritime Industry. Hull coating and speed reduction methods have the highest potentials in terms of providing energy efficiency and CO_2 emissions reduction. Although implementation of speed optimization depends on some conditions, it has great potential to reduce CO_2 emissions.

Keywords: Air pollution, Maritime transportation, Prevention methods.

:: Paper No: GCGW - 2018 – P285 ::

EFFECT OF CLIMATE TRANSITION ON THE VEGETATIVE CYCLE OF CROPS IN SETIF REGION

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The high Sétifian plains are characterized by a semi-arid climate with cold to mild winters. The analysis of climatic data for the last ten years (between 2006 and 2016), and their comparison with the averages of the series from 1980 to 2005, show a marked change in climate, characterized by a decrease in rainfall, more severe irregularity in the distribution of rainfall, and higher maximum and minimum temperatures.

The objectives of this study is to present the effects of this new climatic situation, which has disrupted the vegetative cycles of crops and the usual calendars of agricultural practices in the study area. The planting or sowing of rainfed crops, which occupy nearly 80% of cultivated areas, such as wheat and barley, is delayed by lack of autumn precipitation, and their vegetative cycle accelerated because of the increase in temperatures. Irrigated vegetable crops require more water because of increased evapotranspiration.

This period of climate transition has had a direct effect on the drop-in crop yields practiced in the study area and requires a reflection on the implementation of a strategy of adaptation to the future climate by the choice of new crop techniques and adapted varieties.

Keywords: Climate transition, Vegetative cycle, Rainfed crops, Vegetable crops, Setif region.

:: Paper No: GCGW - 2018 – P286 ::

ENERGY AND EXERGY ANALYSIS OF A COMBINED SOLAR AND GEOTHERMAL ENERGY-BASED INTEGRATED SYSTEM FOR MULTIGENERATIONAL PURPOSES

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The objective of this system is to achieve practical outputs (space heating, cooling, hot water, H_2 production, freshwater and power production for a district by using an optimized solar geothermal integrated system.

Hot water at 230°C is pumped up from ground and injected to the turbine after passing through separator. The high-pressured steam rotates the turbine with a capability of generating 94.12 kW power. Geothermal steam leaves turbine as saturated vapor which is then flashed with tap water. Thus, we get "hot water" at condenser outlet as desired which can also be used for heating purposes. Then geothermal water is further heated by means of concentrated parabolic collector (CPC). This heat energy is replenished by generator of Li-Br Absorption cycle through geothermal water which is then grounded. Tap water is passed through the condenser of the single effect LiBr-H_2O absorption cycle which becomes saturated vapor and is condensed to give freshwater for drinking purposes. The complete energy and exergy analyses are performed using Engineering equation solver (EES). All input values are realistic as taken from numerical problems of thermodynamics and renewable energy. The parameters that are varied and plotted are mass flow rate & temperature of geothermal water against turbine output, inlet temperature of coolant (Air) & heat input to generator against efficiency of absorption cooling system to optimize performance of integrated system. Hence, we have designed an integrated system using geothermal and solar resources for getting outputs which are essential for daily life.

Keywords: Geothermal, Exergy, Freshwater, Space heating, Power.

:: Paper No: GCGW - 2018 – P287 ::

NUMERICAL INVESTIGATIONS OF HYDROGEN-RICH SYNGASES UNDER DISTRIBUTED COMBUSTION CONDITIONS

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This study examines the effect of hydrogen-rich syngases derived from Turkish coal on distributed combustion characteristics. Numerical modellings were carried out using Ansys Fluent computational fluid dynamics code to predict temperature and emission distributions of the hydrogen-rich syngas under distributed combustion conditions. A mixture of 90 % nitrogen and 10 % carbon dioxide simulated hot reactive gases that were added into the fresh mixture prior to ignition in order to seek distributed combustion. The distributed combustion conditions provided far more uniform thermal field that resulted in much reduced NOx emissions. The results showed much reduced temperature differences between maximum temperature and exit temperature from the combustor of only 200 K. In addition, the predicted NOx emission of the hydrogen-rich syngases were reduced to nearly zero under high intensity distributed combustion conditions to support the available experimental data. The results showed that enhanced thermal field uniformity and much reduced NOx emission can be achieved from combustion of hydrogen-rich syngases under distributed combustion condition.

Keywords: Distributed combustion, High temperature air combustion (HiTAC), Hydrogen-rich syngases, Modeling.

:: Paper No: GCGW - 2018 – P288 ::

HEAVY METALS POLLUTION OF SURFACE WATER AND SEDIMENT OF WATARI RESERVOIR, KANO STATE, NIGERIA

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Watari reservoir is one of the largest man-made dams in Northern Nigeria. It was constructed for the purpose of irrigation, drinking water supply, recreation and limnology. To assess the pollution status of the reservoir, water and sediment samples were collected in three seasons of the year; November - February (cold season); March - June (dry season) and July - September (rainy season) from five sampling sites. The samples were analyzed for heavy metals; Cd, Cr, Co, Cu, Fe, Pb, Mn, Ni and Zn using Atomic Absorption Spectrophotometer (AAS). The result obtained was found to be comparable to those reported for tropical reservoirs. Fe recorded the highest mean values of 6.53 mg/L in water and 12.21 mg/kg in sediment which is above the acceptable limit. Cr was BDL in water and 0.79 mg/kg in sediment. Statistical analysis shows that the values obtained in sediment were higher than those of water samples with significant difference $p<0.05$ which is due to the fact that sediments serve as sink for heavy metals. The high concentration of Fe may be due to natural origin and the presence of these metals in sediments may be an indication of anthropogenic pollution. The result of HPI, 17.98, indicates that Watari reservoir has an excellent water quality and can be used for irrigation and domestic purposes.

Keywords: Reservoir water, Heavy metals, pollution, Watari reservoir, Sediment.

:: Paper No: GCGW - 2018 – P289 ::

QUANTITATIVE DETERMINATION OF HEAVY METALS IN SOME COMMONLY CONSUMED HERBAL

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Evaluation of heavy metals in twelve commonly consumed herbal medicines/preparations in Kano State, Nigeria, was carried out. The samples comprised of five unregistered powdered medicines, namely, Zuwo, (ZW); Rai Dorai, (RD); Miyar Tsanya, (MTS); Bagaruwar Makka, (BM); and Madobiya, (M); five unregistered liquid herbal medicinal concussions for pile (MB), yellow fever (MS), typhoid (MT), stomach pain (MC), sexually transmitted diseases (STDs); and two registered herbal medicines; Alif Powder (AP) and Champion Leaf (CL). The heavy metals evaluation was carried out using Atomic Absorption Spectroscopy (AAS) and the result revealed the concentrations (ppm) ranges of the heavy metals as follows: Cadmium (0.0045 – 0.1601), Chromium (0.0418 – 0.2092), Cobalt (0.0038 – 0.0760), Copper (0.0547 – 0.2465), Iron (0.1197 – 0.3592), Manganese (0.0123 – 1.4462), Nickel (0.0073 – 0.0960), Lead (0.185 – 0.0927) and Zinc (0.0244 – 0.2444). Comparing the results obtained in this work with the standards of the World Health Organization (WHO), the Food and Agricultural Organization (FAO) and permissible limits of other countries, the concentrations of heavy metals in the herbal medicine/preparations are within the allowed permissible limits range in herbal medicines and their use could be safe.

Keywords: Herbal medicines, Registered, Unregistered, Kano State

:: Paper No: GCGW - 2018 – P290 ::

LETHAL DOSE DETERMINATION IN SOME COMMONLY CONSUMED HERBAL MEDICINES IN KANO STATE, NIGERIA

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Twelve commonly used herbal medicines and preparations in Kano Metropolis, Kano State, Nigeria, comprising of four unregistered (powdered), namely, *Zuwo*, (ZW); *Rai Dorai*, (RD); *Bagaruwar Makka*, (BM); and *Madobiya*, (M); Five unregistered (liquid) concussions for pile (MB), yellow fever (MS), typhoid (MT), stomach pain (MC), sexually transmitted diseases (STDs); and one registered (powdered); *Champion Leaf* (CL) were evaluated for their acute toxicity (LD_{50}). Three different solvents comprising of pet-ether, chloroform and methanol were used for the extraction. The result of the acute toxicity test (LD_{50}) of the herbal medicines/preparations extracts showed no mortality in any of the experimental groups for up to four weeks after the oral administration of the highest dose of 5000mg/kg of each of the twelve extracts. From the results of the acute toxicity testing it showed that the herbal medicines/preparations could be safe.

Keywords: Herbal medicines, Registered, Unregistered, Kano state

:: Paper No: GCGW - 2018 – P291 ::

UNDERSTANDING AND PERCEPTIONS OF CLIMATE CHANGE: A PERSPECTIVE OF UNIVERSITY STAKEHOLDERS

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One of the main the targets of Sustainable Development Goal 13 set in the 2030 Agenda for Sustainable Development of the United Nations (UN), the prominent role of "the improvement of education, awareness-raising and institutional capacity on climate change mitigation, adaptation, impact reduction and early warnings" is strongly acknowledged. For achieving this goal, comprehensive and properly planned actions that include awareness campaigns/activities in the wide range covering managerial/political awareness, public awareness and targeted strategy development are believed to yield effective outcomes, especially in university communities since universities are expected to be innovation centers acting towards sustainable development through education and research efforts as well as the production and transfer of knowledge. In line with this purpose, understanding and perception of the climate change (i.e. drivers, practices, outcomes) from the perspective of Dokuz Eylul University stakeholders (students, academicians and administrative staff) are explored through in-depth interviews. Sample size is determined in the purpose of ensuring the representation of the population of each stakeholder (35 students, 11 academicians, 5 administrative staff, in total 51 people) in Tınaztepe Campus of Dokuz Eylul University, through stratified and convenience sampling. According to the comprehensive literature review and the results of the in-depth interviews; drivers of climate change, importance of the issue, attribution of responsibility, knowledge and awareness, personal behavior, temporal distance, campaign recall variables, negative emotions, ecological and societal impact are found as the main themes of the content analysis. These themes represent issues such as; factors affecting climate change, factors contributing to climate change, knowledge and awareness about climate change. This is a pioneer study discovering the perceptions and understanding through a qualitative research which provides a very comprehensive view about climate change in a Turkish University.

Keywords: Climate change, Perceptions, Content analysis.

:: Paper No: GCGW - 2018 – P292 ::

GEOTHERMAL AND SOLAR ENERGY AMALGAMATED MULTIGENERATION SYSTEM ESCORTING DIVERSE NEEDS OF A DISTRICT

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In this scrutiny, a parabolic trough collector (PTC) with meshed source of geothermal water accompanying dual flash is used with Rankine cycle, an Electrolyzer and absorption cooling and heating system. A pattern of PTC's are used for solar heating phenomena. Detailed energetic and exergetic analysis are done for the whole system including all the components individually. Different analysis and iterations are done and plotted against their different results. The parameters that are variegated to change the output of the system are ambient temperature, solar irradiance, mass flow rate of the fluid, temperature gradient of the geothermal well; temperature had an upshot on the net power produced by the Turbines HPT and LPT, outlet temperature of the solar collector all-inclusive energetic and exergetic efficiency. Variant utilitarian outputs of this domestic meshed diverse generation system are the heating of the domestic water, space heating in a favorable temperature range constrain and fresh water provision. The effective difference in the temperature across the collector ranging from 70°C – 85°C favor's in a number of variable ways since energy is wasted for temperature upgradation in the industry and domestic applications. Hydrogen production rates are also varied since hydrogen is considered salient for processes like production of agricultural fertilizer (Haber's Process), production of plastics, oil-refinery process, fuel for hydrogen cells and hydrogenation of fatty acids. The power output and efficiency of the geothermal dual flash system varies and shows heterogeneous results as inputs are varied; variation in power accompanies domestic power needs and empowering industry.

Keywords: Solar, Geothermal, Dual flash, Energy, Exergy, Hydrogen, Cooling, Power.

:: Paper No: GCGW - 2018 – P293 ::

ECONOMIC ASSESSMENT OF PHASE CHANGE MATERIALS IN BUILDINGS

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Buildings are one of the big consumers of energy and resources and are sources of greenhouse gas emissions. There are a number of building technologies to decrease heating and cooling loads and minimize the necessary mechanical space-conditioning systems. The most common and accepted method of reducing energy expenditure in a building in any climate zone and most of the building regulations is the addition of resistive thermal insulation material to the building envelope. However, in hot climates, the addition of insulation and the design of the building can cause overheating problem; therefore, cooling loads are becoming more significant. In addition, the effects of climate change are slowly becoming evident with extreme climate conditions, which also cause a general trend in an increase of building cooling loads. Thus, the effect of insulation, its economic and ecological connotations need to be more thoroughly studied.

The integration of phase change materials (PCMs) into the building envelope is another promising method, especially in decreasing the cooling loads of buildings. This integration involves its working together with the other building materials including resistive thermal insulation since PCMs act as capacitive insulation and can enhance the thermal performance of the envelope. Our paper analyses this effect within a conventional aerated brick wall under Mediterranean climate for a hot summer day for two cases; one containing only resistive thermal insulation, and one containing both resistive and capacitive thermal insulation. It makes use of a commercial CFD solver ANSYS-FLUENT to calculate the required cooling load via simulation of heat transfer through the wall with coded user-defined scripts. Thus, an economical assessment is made involving the price of electricity, coefficient of performance (COP), energy saving ratio and payback time of the proposed PCM integration.

Keywords: Phase change material (PCM), Cooling, Economic assessment, Passive thermal controller, Mediterranean climate.

:: Paper No: GCGW - 2018 – P295 ::

BIOHYDROGEN PRODUCTION FROM ACID HYDROLYZED WASTEWATER TREATMENT SLUDGE BY DARK FERMENTATION

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Waste generation and processing, sustainable energy production and global warming issues are related to each other and solutions to these issues should include them all. Waste water treatment sludge are one of these waste materials which can be used for energy generation. In the light of this fact, the study aimed to determine the pretreatment and hydrogen production condition from waste sludge by dark fermentation. The sludge was hydrolyzed by acid, then, solid and liquid (filtrate) phases of sludge were used as substrate for biohydrogen generation. Two-factor factorial experimental design method for pH and reaction time was used to optimize hydrolysis conditions. TOC, COD, total sugar (TS), NH_4-N, PO_4-P and protein concentrations obtained after hydrolysis were determined. Hydrogen production potentials were evaluated in terms of hydrogen percentages, yield and rate. Statistical evaluation of hydrolysis experiments indicated that pH significantly affects carbon content and nutrient concentrations while hydrolysis time is a significant factor for only carbon content. Optimization for the most effective or economical hydrolysis conditions showed that conditions should be pH=2 and t= 1440 min. Maximum hydrogen volume from filtrate and sludge were V_{H2}=11 ml and V_{H2}=5 ml, repecetively, obtained at hydrolyzed sludge at pH=4. Although, nutrient and organic matter content of filtrate was high at hydrolysis pH= 2, the hydrogen volume was V_{H2}=6 ml which was lower than that of obtained at pH=4. The maxiumum production yields were Y=24 mmol g^{-1} TS^{-1} at hydrolyis pH=5 and it was Y=41 mmol g^{-1} TS^{-1} for sludge hydrolyzed at pH=6.

Keywords: Biohydrogen, Dark fermentation, Global warming, Waste sludge, Renewable energy.

:: Paper No: GCGW - 2018 – P296 ::

EXPERIMENTAL INVESTIGATION OF EFFECTIVENESS IMPROVEMENT VAPOR COMPRESSION CYCLE WITH FLASH-GAS BY-PASS

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Today, selection of refrigerant is more important problem due to F-gas regulations. Beside of direct emissions due to leakages of refrigerants, indirect emissions of the systems (heat pumps, refrigerators etc.) have importance to slowdown global warming. So, the refrigerants had lower GWP are used in the systems. However energetic effectiveness of the systems must be improved.

In this study, R32 has been selected as the refrigerant due to its lower GWP than R410A. An experimental set up has been developed. This set up has been designed as one stage vapor compression refrigeration system with a micro-channel evaporator. As an alternate solution to improve energetic effectiveness of the system, flash-gas by-pass method has been added. Experimental measurements have been made with same conditions. The energetic effectiveness of the system with flash-gas by-pass is presented. Energetic effectiveness improvement ratio between conventional cycle and flash-gas by-pass cycle has been calculated with same compressor speed.

Keywords: R32, flash-gas by-pass, vapor compression, refrigeration, effectiveness improvement.

:: Paper No: GCGW - 2018 – P297 ::

CONTINUOUS DARK FERMENTATIVE BIOHYDROGEN PRODUCTION BY ANAEROBIC SLUDGE IMMOBILIZED ON POLYESTER FIBER BEADS IN PACKED BED BIOREACTOR

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This study aimed to investigate the effect of hydraulic retention times on continuous dark fermentative biohydrogen production. The reactor was packed with polyester fiber beads (diameter 0.5 cm) as support materials for immobilization. Heat-pretreated anaerobic sludge (boiled at 100 ^{0}C for 1 hour) was used as inoculum and fed into reactor. Glucose was used as substrate and initial total sugar concentration (TS) was adjusted to around 15 g glucose/l. Upflow packed bed bioreactor was operated at T= 48 ± 2 °C and varying HRTs (HRT= 6 h, 5 h, 4 h, 3 h, 2 h). pH of the medium was adjusted to pH=5.5-6. Operation was ended when hydrogen production was reached to steady state condition. The system reached to steady state conditions within 5 days at HRT=6 h, 4 days at HRT=5 h, 7 days at HRT=4 and 3 h, 2 days at HRT=2 h. Hydrogen production volume varied between 4331-6624 ml, volumetric hydrogen production rates (VHPR) were obtained as 3.09-4.73 l H_2/l-day, hydrogen production yields (HY) were 481-1228 ml H_2/g TS depending on HRT. Maximum hydrogen volume (6624 ml) and VHPR (4.73 l H_2/l-day) were obtained at HRT=6 h, while the maximum HY (1228 ml H_2/g TS) was attained at HRT=2 h.

Keywords: Biohydrogen, Immobilization, Continuous dark fermentation, Packed-bed reactor, Hydraulic retention times.

:: Paper No: GCGW - 2018 – P300 ::

THE EFFECTS OF EQUIVALENCE RATIO ON A DOWNDRAFT PLASMA COAL GASIFIER

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In the numerical modeling of a plasma gasification system, the effects of plasma reactions are generally neglected. Magnetohydrodynamic (MHD) simulations are used to obtain physical properties and ionization degree of the plasma gas. However, the coupling of MHD and gasification reactions in a gasifier results in a very difficult set of equations. For the numerical modeling of plasma gasification, plasma is considered as hot gas and the effects of ionization reactions are neglected for simplification.

In this study, the effects of plasma reactions are considered in a 3D numerical gasifier model. The effects of plasma reactions on syngas properties, temperature distribution, and velocity vectors are investigated. The reactions for plasma phase are added to conventional gasification reactions to determine their effects. The temperature of the reactor is decreased due to endothermic plasma related reactions. In addition, H_2 content of the syngas is decreased but CH_4 content is increased. The results show that increasing equivalence ratio from 0.20 to 0.45 decreases the lower heating value from 1536.6 kcal/m^3 to 751.8 kcal/m^3.

Keywords: Gasification, Plasma gasification, Numerical analysis, Equivalence ratio, Downdraft gasifier.

:: Paper No: GCGW - 2018 – P301 ::

STREAM NETWORK MODELLING FROM ASTER GDEM USING ARCHYDRO GIS: APPLICATION TO THE UPPER MOULOUYA RIVER BASIN (EASTERN, MOROCCO)

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This paper discusses the integration between GIS and hydrological models and presents a case study relating to the upper section of Moulouya River Basin (UMRB) situated in the east of Morocco. The Basin is an inland watershed with a total area of approximately 10,000 km2, stretching in the junction between the Middle Atlas, the High Atlas Mountain and the Middle Moulouya basin. From ArcGIS ArcHydro framework data models, different parameters of the Moulouya River and its catchment area have been defined. DEM based ArcHydro model was run on Aster-GDEM V2 data at a horizontal spatial resolution of 30 meters. Several raster and vector products of the Upper Moulouya River and its catchment area have been defined at the end of the model. Final results of the models were discussed and compared with the reality. These results can be used in baseline for advanced hydrology and geomorphology research on the catchment area. They can support for decision making on ground and surface water resource, distribution and management.

Keywords: Hydrological modelling, Aster-GDEM V2, ArcHydro, Upper Moulouya Basin, East Morocco.

:: Paper No: GCGW - 2018 – P302 ::

EXERGETIC ANALYSIS OF A GEOTHERMAL POWER CYCLE USING ALTERNATIVE WORKING FLUIDS

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In last decade, organic Rankine cycle is proposed as an efficient application to convert low grade heat energy to electricity. Nowadays, n-pentane is widely used in geothermal power cycles. However, the idea of using alternative fluids in Low Grade Organic Rankine Cycles (ORC) has gained due to the safety class of n-pentane (A3).

In this study, R1233zd(E) and HFO1336mzz(Z) were selected as the working fluids due to their safety properties. R1233zd(E) has A1 safety class and HFO1336mzz(Z) is non-flammable. Thermodynamic analyses were made for these fluids in ORC at the same working conditions. Analysis solution was made with EES (Engineering Equation Solver) software. Results were presented with graphics and tables. A comparison was presented in the point of view efficiency and safety.

Keywords: R1233zd(E), HFO1336mzz(Z), Geothermal, Power cycle.

:: Paper No: GCGW - 2018 – P303 ::

DETERMINATION OF THE CARBON FOOTPRINT OF PORTS

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The pursuit of sustainable development entails a strategic policy decision for all modern countries. Greenhouse gas abatement, the utilization of renewable energy sources, and energy efficiency represent the main pillars of sustainable development. As a yield of efforts in the international climate policy and emerging consumer awareness there is a growing interest for the quantification of corporate level carbon footprints. Consequently, it is very important to quantify and report their Carbon Footprint (CF) for implementing national and international policies/strategies aimed at mitigating and adapting these concerns.

This work aims to calculate the carbon footprint of the port which is located in the city center based on emission sources of ships. Carbon footprint that was entered our lives with global warming and greenhouse effect were analyzed. The inventory analysis mainly uses primary data collected from the port. The number of ships coming to the port and their types of engines and amount of fuels were taken into account in the calculation of the carbon footprint. Every type of engine has different operation modes. While calculating carbon footprint of main engines only two operation modes which are transit mode and maneuvering mode were used. Results of this study show that the port has a carbon footprint 65043 tonnes CO_2 equivalent per year. Container ships has the highest rate of carbon footprint which is 43728.8 tonnes CO_2 equivalent per year. To the authors' knowledge, this is the first study to report the carbon footprint of the port in Izmir and to compare it with other ports and harbors

Keywords: Global warming, Greenhouse gases, Carbon footprint, Ports.

:: Paper No: GCGW - 2018 – P304 ::

CAN NUCLEAR ENERGY BE CONSIDERED AS A VIABLE ALTERNATIVE WITHIN THE CONTEXT OF GLOBAL WARMING?

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Nuclear energy has been one of the most controversial topics of the energy-environment nexus in the past two decades. After World War II, nuclear power has been put into civil service and has progressively become a dependable source for electricity generation in many countries around the world. Particularly after the 1973 OPEC Oil Crisis, the use of nuclear energy for power generation has dramatically increased and reached to a share of about 24% in overall electricity generation of the world during 1990-2000 era. Parallel to its proliferation, numerous problems started to emerge including but not limited to accidents, radioactive leakages and spent fuel disposal, which eventually led to a strong opposition to its use for power generation. Following Chernobyl and Fukushima disasters in 1986 and 2011, respectively, this opposition has reached its maximum level and environmental lobbies have started to convince governments to cease construction of new plants and decommission the existing ones. On the other hand, ever-increasing atmospheric carbon dioxide levels due to fossil fuel combustion and the resulting climate change phenomena has led to a conflicting paradigm with regards to the overall sustainability of life on earth. Serious debates are now underway in scientific and political arenas as to whether nuclear power can serve as a viable remedy to the increasing carbon emissions from other fossil fuel-based energy generation techniques.

Based on this premise, this study aims to discuss the pros and cons of nuclear energy generation from a carbon-oriented point of view. We intend to present the conflicting views of the nuclear advocates such as the International Atomic Energy Agency (IAEA) as well as environmentalists and supporters of competing renewable industry lobbies. Thus, comparisons are made based on carbon emissions and assessments are made as to whether nuclear power plants can be considered as a significant solution to prevent climate change by avoiding all radical ideas and views. The comparisons are not only made with regards to carbon emissions of electricity generation but also on other uses of energy such as district heating etc. The releases of carbon occurring from all alternative sources are estimated under different scenario conditions and the effectiveness of nuclear power on decreasing global carbon emissions are quantified.

Keywords Global warming, Climate change, Nuclear energy, Renewable energy, Radioactivity.

:: Paper No: GCGW - 2018 – P305 ::

FROM THE END OF KYOTO COMMITMENT TERM TO PRESENT THE WORLD AND TURKEY WIND POWER INSTALLATION AND EVALUATION OF WIND ENERGY FUTURE

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Kyoto Protocol; being aware of global warming and as well as being the first written agreement, took renewable energy technologies forefront to reduce CO_2 emissions. Under favour of Kyoto Protocol acceleration of consciousness and technological researches that has continued to increase in renewable energy resources after Kyoto 1. commitment period (2008-2012) to nowadays. In this process, wind energy seems to be one of the most interested renewable energy sources. Between 2012-2016, the increase in the World wind power was 27%. During this period, the percentage increase is the continued in Turkey installed wind power has been more than 10 times the world average by 263%. Wind energy, which is one of the renewable energy sources, will continue to increase in the future with the increasing level of consciousness and usage by Kyoto Protocol. Turkey is in the same direction and aimed to achieve 20 MW installed wind capacity in 2023.

In this study, the changes in the installed wind power and investment costs were examined, and the share of renewable energy sources that emerged as a solution to global warming and the share of wind power generation in 2050 and electricity generation pavement were examined and the situation against fossilized energies was examined in spite of the development process in current and future scenarios.

Keywords: Kyoto Protocol, Wind energy, CO_2 emissions, Global warming.

:: Paper No: GCGW - 2018 – P307 ::

COMMUNITY RISK AWARENESS AND PERCEPTIONS TOWARDS NATURAL DISASTERS: AN ASSESSMENT OF AWARAN EARTHQUAKE AFFECTED COMMUNITIES OF BALOCHISTAN

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Pakistan faced several natural disasters particularly flood and earthquake affected the people of Pakistan the most. in recent past Balochistan a province of Pakistan faced severe earthquake which were devastating for the communities and affected their socio-economic conditions. this study is an assessment of rick perception of community of Awaran district of Balochistan who had faced earthquake to know their perceptions towards disasters and how they coped up with earthquake, this is also an attempt to assess the adaptation options and livelihood of people of Awaran districts.

Keywords: Earthquake, Livelihood, Vulnerability.

:: Paper No: GCGW - 2018 – P308 ::

FATE AND TRANSFORMATION OF EDC IN WASTEWATER TREATMENT PLANTS AND THEIR POSSIBLE ADVERSE EFFECTS ON DIFFERENT ORGANISMS

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Endocrine disrupting chemicals (EDCs) are chemicals with potential to elicit negative effects on the endocrine systems of humans and wildlife. They exert their effects by mimicking endogenous hormones, antagonizing normal hormones, altering the natural pattern of hormone synthesis or metabolism, or modifying hormone receptor levels. EDCs have been found in freshwater, estuarine, and marine environments, raising the possibility that EDCs impact organisms living in these aquatic environments. Various natural and synthetic chemical compounds have been identified that induce estrogen-like responses; including pharmaceuticals, pesticides, industrial chemicals, and heavy metals. In the past few decades, research efforts to combat this problem have grown immensely. Key to the solution for this problem is the identification of EDCs, the accurate measurement of their presence in aquatic systems, and development of methods for their elimination from the environment. Existing wastewater treatment plants were mainly, designed for carbon, nitrogen, and phosphorus (CNP) removal with may partial EDCs removal simultaneously. Indeed, although transformation or degradation processes may eliminate some EDCs from wastewater at variable levels, a large ambiguity persists on the occurred EDCs removal processes mechanism. The other problem is the metabolites that generated after degradation in the treatment plant or in the natural environment of surface water, soil or sediment. This paper mainly reviews recent research studies about the fate and transformation of EDC in biological wastewater treatment plants and their potential adverse effects on different life forms and thereby on human.

Keywords: Endocrine disrupting chemicals, Wastewater, Treatment, Biodegradation.

:: Paper No: GCGW - 2018 – P309 ::

OPTIMIZATION OF TORREFACTION CONDITIONS OF SUNFLOWER SEED WASTES FOR IMPROVING SOLID CHARACTERISTICS

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The use of biomass as a renewable fuel is becoming more interest in the recent years. In order to use biomass economically in large-scale power systems needs to increase its chemical and physical properties. These properties may be improved by torrefaction which is thermally pre-processing. Torrefaction is an important pretreatment process, which is similar to pyrolysis but occurs at lower temperature (around 200-350°C) to provide energy enriched solid fuel which named as bio coal. In addition to temperature, there are many parameters that affect the torrefaction process. These; residence time and heating rate, as well as raw material particle size and composition. In this study, bio coal was produced from sunflower seed wastes in stainless-steel 1 L vertical pyrolysis reactor which was a fixed bed design. The operating conditions were selected at three different temperatures (250, 300, 350 °C) and two residence time (10-30 min). Around 55% yield of biochar with calorific value of 23456 kJ/kg was achieved at optimum temperature 300 °C with low residence time. Important fuel properties (proximate, ultimate analysis and heating value) of raw and torrefied biomasses were characterized. The results showed that reduction of mass and energy yields with increasing temperature and improvement in heating value was observed. In addition, the effect of temperature is greater than residence time.

Keywords: Torrefaction, Biomass, Sunflower seed, Bio coal.

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FUGITIVE METHANE EMISSION MEASUREMENT FROM REGULATORS AND COUNTERS OF URBAN CUSTOMERS

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This article presents the results of a methane leak detection and measurement program, which was performed on natural gas customers' equipment of Valiasr town in Isfahan Gas Company. The aim of this study was to identify the sources of fugitive methane emission in above-ground facilities (regulators and counters), measuring the leakage rate and statistical analyzing of obtained data. Leak detection was performed by flame ionization detector (FID) to gain gas concentration in ppm and the volumetric flow rates of emission in L/min were then measured by Hi-Flow Sampler™. This procedure was separately carried out for different parts of facilities, including four localities associated to regulators (locker valve, lower nut, upper nut and regulator body) and four localities related to counters (nipple, primary nut, secondary nut and counter body).

The results revealed that regulators and counters of customers' equipment were leaking by 77% and 35%, respectively. Majority of these equipment had more than one leaking localities, so that 4581 and 2657 leaking localities were identified in 1829 and 7549 regulators and counters, respectively. It was also found that the various localities of regulators have almost the same share in their total emission, while primary and secondary nuts in counters are the main emission localities by 37% and 38%, respectively.

Hi-Flow Sampling the leaking points helped to assess the local emission factors for each locality and calculate the total fugitive emission of the town, as well as, correlating the gas concentration in ppm into leakage rate in L/min. It was found that local emission factors of regulators are generally higher than counters, which could be associated to the higher pressure of gas in regulators. Lower nut and primary nut were identified as the most emitting localities among regulators and counters, respectively, with 0.455 and 0.149 L/min.

Moreover, the gas concentration range (0-1,000,000 ppm) was divided into eight spans, to which, an average emission rate was accrued, based on numerous experimental data. Hence, emission rate of a leaking locality can be calculated by knowing ppm only, without need to Hi-Flow Sampler measurement, in the future.

Final calculations revealed that the total methane emission from regulators and counters of Valiasr town was 655,622 m^3 per annum.

Keywords: Methane, Emission, Leakage, Regulator, Counter.

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PAST AND PROJECTED VARIATION OF AEROSOL (DUST), TEMPERATURE AND PRECIPITATION OVER EASTERN MEDITERRANEAN BASIN

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The Eastern Mediterranean basin is one of the most effected regions for aerosol events. The basin is under the influence of desert dusts originating from Africa and the Middle East due to its geographical location. The Intergovernmental Panel on Climate Change (IPCC) accepts mineral dusts as a major component of atmospheric aerosols which is also one of the major climate variables. For this reason, it is important to examine the past and projected changes of aerosols as well as other meteorological parameters like temperature and precipitation. In this study, firstly, to examine past changes, we used aerosol data from NASA/Aqua satellite observations and used temperature and precipitation data from climate reanalyser platform at the region. Secondly, we used RegCM model to downscale GFDL-ESM2M global climate model by considering RCP4.5 scenario. We also included mineral dust dataset as input parameter to demonstrate projected (2016-2099) dust variation. As a result, observed mean AOD data for past show that highest AOD values are concentrated over east part of Syria, most part of Iraq, east part of Saudi Arabia and Persian Gulf. Besides, AOD trend for the basin shows an increasement until 2008 year, but a decreasement after. According to the projection results for dust, it is seen that the dust AOD shows significant increase especially in the autumn months, and this will expand towards the summer months after 2040 year. Besides, in general, there is an increase in temperature projections at whole regions of Eastern Mediterranean basin and both decrease and increase in precipitation projections regionally.

Keywords: Dust variation, temperature projections, MODIS satellite, RegCM model.

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1D, 2D AND 3D SIMULATIONS OF A DIRECT METHANOL FUEL CELL TO STUDY METHANOL AND WATER CROSSOVER THROUGH THE MEMBRANE

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The effects of methanol crossover and operating parameters such as the methanol concentration and the cell temperature on the performance of a single cell of direct methanol fuel cell (DMFC) has been studied experimentally and numerically. The model developed solves the conservation of charge, mass, momentum and species (methanol, water and oxygen) equations, simultaneously. The results showed that the crossover of methanol decreases at low methanol concentrations and high current densities. In addition, the polarization curve is in agreement with experimental data. The numerical simulations with two parallel-serpentine channels were done by using Comsol Multiphysics software.

Keywords: Direct methanol fuel cell, Comsol Multiphysics, Methanol crossover, modeling

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CAN FEEDWATER REPOWERING INCREASE THE EXERGETIC EFFICIENCY OF A COAL FIRED THERMAL POWER PLANT?

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Increasing thermal or electrical efficiency of a thermal power plant decreases the fuel consumption and combustion related emissions, mainly greenhouse gases. Repowering of an outworn thermal power plant can be an alternative method to decrease the emissions per installed capacity. Feedwater heating, hot windbox, parallel, and gasifier integration are repowering alternatives for the coal fired thermal power plants. A gas turbine and heat exchangers are added into the cycle to utilize available exhaust heat of gas turbine instead of taking bled steam from steam turbine (feedwater heating repowering) or using directly hot exhaust gas in combustion chamber (hot windbox repowering). It was shown that it is possible to increase the electrical efficiency and decrease the emissions per installed power via repowering methods.

In this study, an exergetic comparison is given when feedwater repowering method is used in a thermal power plant. Design data for Soma A thermal power plant is used to calculate the exergetic efficiency. Secondly, the exergetic efficiency calculations are repeated for thermal power plant after feedwater repowering method. It is found that exergy destruction in combustion chamber (boiler) is decreased from 84% to 66%. However, exergy destruction for the combustion chamber of gas turbine is found to be 15%. Total exergy destruction is increased from 54.4 MW to 69 MW. However, total exergy destruction per installed capacity is decreased from 2.3 MW/MW_{el} to 1.99 MW/MW_{el}. In addition, exergetic efficiencies for the design and repowered cycles are found to be 31% and 34%, respectively. The answer for the motivation of this study is, "Yes. Feedwater repowering can increase the exergetic efficiency of a coal fired thermal power plant".

Keywords: Repowering, Exergy, Feedwater, Thermal power plant, Exergetic efficiency.

:: Paper No: GCGW - 2018 – P314 ::

LIFE CYCLE COMPARISON OF SOLID OXIDE FUEL CELLS FED BY NATURAL GAS, HYDROGEN, AMMONIA AND METHANOL FOR COMBINED HEAT AND POWER GENERATION

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This study aims to provide a comprehensive environmental impact assessment of heat and power production through solid oxide fuel cells (SOFCs) fueled by various chemical feeds namely; natural gas, hydrogen, ammonia and methanol. The life cycle assessment (LCA) includes the complete phases from raw material extraction or chemical fuel synthesis to consumption in the electrochemical reaction. Natural gas reserves can be used for clean power production using SOFCs. In addition, there are mostly methanol and ammonia production plants available near the natural gas extraction locations which are used primarily used for petrochemical and agricultural industries. Ammonia and hydrogen, as carbon-free fuels, are two of the significant feed gases for the SOFC systems. Methanol and natural gas can also be used for power production via SOFCs and emit less emissions compared to combustion of these hydrocarbons. Furthermore, the overall conversion efficiency of feed gas into electricity is higher than combustion in SOFC systems. The production pathways of these gases are selected based on mature technologies. Natural gas is extracted from the wells and processed in the processing plant for suitable natural gas production. Hydrogen is generated by steam methane reforming method using the natural gas in the plant. Methanol is also produced by steam methane reforming and methanol synthesis reaction. Ammonia is synthesized using the hydrogen obtained from steam methane reforming and combined with nitrogen from air in a Haber-Bosch plant. The results of this study show that feeding SOFC systems with carbon-free fuels eliminates the greenhouse gas emissions during operation, however additional steps required for natural gas to hydrogen, ammonia and methanol conversion, make the complete process more environmentally problematic. It is also shown that using natural gas and methanol in SOFC rather than combusting in conventional power plant can reduce the CO_2 equivalent emissions.

Keywords: Life cycle assessment, Environmental impact, Electrochemical conversion, Natural gas, Clean power production.

:: Paper No: GCGW - 2018 – P315 ::

FIRST RESULTS OF A SMALL SCALE SORPTIVE COATED HEAT EXCHANGER STRUCTURE

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Dehumidification is of great importance for climate control in residential and commercial buildings. Different methods of dehumidification are available. Moisture removal using an adsorbent is among these methods. In recent years, solid adsorbent coated heat exchangers have been suggested to be used instead of rotary desiccant wheel systems in solid adsorbent systems. These systems are a better tool compared to conventional air conditioning, which provides energy-efficient dehumidification by adsorption that can be performed using a waste heat source or solar energy. The dehumidifier-coated heat exchanger is a key component for such systems.

Desiccant coatings on metal heat exchanger surfaces are reported to confirm significant enhancement, getting over the obstacles such as irreversibility loss and high adsorption heat gain. In this paper, we present first experimental results of the desiccant coated heat exchanger structure coated with CAU-10-H. The purpose of this test facility is to build up structures which are easy to manufacture, cost-effective and the flexibility in the bandwidth of the samples. A detailed analysis of the data has been performed based on mass of adsorbate, dehumidification and regeneration efficiencies and adsorption and desorption heat flows.

Keywords: Dehumidification, adsorption, coating, adsorbent, heat exchanger structure.

:: Paper No: GCGW - 2018 – P316 ::

ELEVATION RELATED CLIMATE WARMING ON THE TIBETAN PLATEAU

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The Tibetan Plateau (TP) is regarded as one of the most sensitive regions to global climate warming. There seems a consensus that high altitudinal regions are warming faster than lower elevations, and the TP has warmed much faster than surrounding areas. However, it is unclear whether the altitudinal warming pattern exists also within the highest plateau in the world. Annual mean of air temperature during 1954–2014 of 65 meteorological stations of China Meteorological Administration (CMA) on the TP are used to calculate the climate warming rate and to analyze the relationship between elevation and climate warming. We divided the TP into 3 latitude zones: <30°N, 30°N-35°N and >35°N. We find that although there is no significant relationship between elevation and climate warming rate on the whole TP, climate warming rates are decrease significantly with elevation increasing in the 3 latitude zones. Beside the latitude effect, we suggest that the reasons are meanly due to the local environmental changes such as urbanization and land cove change (over grazing) at lower elevation area and the glacier and permafrost melting at high mountain environments. This study suggests that faster warming at higher elevations may be not a general pattern at least at some regional scales. Further studies are needed to clarify the underlie mechanisms controlling altitudinal warming rates at local scales.

Keywords: Air temperature, Climate warming rate, elevation, Latitude zone, The Tibetan Plateau.

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IAEA SUPPORT ON NUCLEAR COGENERATION FOR CLIMATE CHANGE MITIGATION

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Nuclear energy is one of the main ready routes for effectively addressing climate change and other associated effects of global warming. It is the promising plausible solution for addressing the worldwide growing energy demands in clean energy and low-carbon economy. The potential of nuclear energy for climate change mitigation is boosted when the cogeneration is considered. The advanced nuclear reactors incorporating cogeneration features are expected to provide more environmentally benign energy systems operating at higher energy efficiency. Furthermore, harvesting the waste heat of nuclear power plants for cogeneration applications (e.g. desalination and district heating) would lead to a direct reduction of the overall plant losses and emissions.

The IAEA conducts several activities to support its Member States interested in the use of nuclear energy for cogeneration and non-electric applications, including: desalination, district heating, hydrogen production and other industrial processes. The IAEA also has developed several tools to investigate the feasibility and techno-economics of nuclear cogeneration plants, mainly for desalination, district heating, and hydrogen production. In addition, the IAEA developed two toolkits on nuclear desalination and nuclear hydrogen production to provide up-to-date information on the current status of related technologies as well as the conducted and considered activities related to these topics. This paper highlights the aspects of nuclear cogeneration for achieving the sustainability in energy and potable water, and highlights the IAEA tools and toolkits, which are developed to provide support to Member States with more understanding on the economic viability of nuclear cogeneration options.

Keywords: Nuclear cogeneration, Hydrogen production, Desalination, District heating

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REGIONAL PLANNING OF NORTH KAYONG REGENCY TOWARD MARITIME AND COASTAL TOURISM AS AN INSTRUMENT TO MITIGATE THE CLIMATE CHANGE AND TO UNLOCK THE POTENTIAL OF ECONOMIC GROWTH IN REMOTE AREA LOCATION

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The North Kayong Regency is one of the new Regency in West Kalimantan Province that is still lack of infrastructure development such as fresh water supply, infrastructure and public amenities. Considering most of the Regency location is in the National Park and separated by Karimata Strait the archipelago district of the Regency which makes contribute to limitation for expand the development of infrastructure and give impact to low level of life in North Kayong Regency. Better planning in utilization of regional resources will influence the social and economic development of North Kayong Regency.

The aim Proposed of this research is to contribute in regional development planning policy through determine appropriate method in maritime and coastal tourism for increasing regional economic growth. Many of those by increase the availability of infrastructure, regulation and guideline. The right way to make spatial and land use correctly utilize to mitigate the impact of climate change through its benefits for maritime and coastal tourism.

One of main development planning policy by regional government which play an important role to enhance regional economic is the Regional Strategic Spatial Planning. Invest economic development for expand the development of infrastructure and coastal & maritime resources for tourism benefits which is still the main problem that the Regency needs to overcome. One way to reach the purpose is through improving regional and infrastructure development to open new accessibility in tourist destination.

The best practice to improve the development planning process is improve better and appropriate policies that might apply through the new methods on practice oriented, focus on strategies, tools and manage the utilization of planning and resources. By maintain strategies, develop solution that integrates different dimension of regional planning and resources in every conceivable way to solve the problem and to overcome the obstacles.

Keywords: Regional development planning, Maritime and coastal tourism, Economic growth, Mitigate the climate change, Remote area location.

:: Paper No: GCGW - 2018 – P320 ::

DESIGN AND THERMODYNAMIC ANALYSIS OF AN INTEGRATED CONCENTRATED SOLAR POWER (CSP) & CONCENTRATED PHOTOVOLTAIC/THERMAL (CPV/T) AND WIND TO THERMAL ENERGY CONVERSION (WTEC) SYSTEM FOR MULTIGENERATION

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This study analyzes a renewable energy-driven innovative multigeneration system, in which wind and concentrated solar energy are utilized in an efficient way to generate several commodities such as hydrogen, oxygen, desalted water, space cooling and space heating along with electricity. The system units are Concentrated Solar Power (CSP), Concentrated Photovoltaics (CPV), Wind Turbines for Wind-to-Electricity Conversion and Wind-to-Thermal Energy Conversion (WTEC), thermal energy storage, hydrogen and oxygen production, reheat Rankine Cycle, thermal desalination, absorption cooling and space heating. A heliostat field is considered to concentrate the solar light onto a spectrum splitter, where the light spectrum is separated into two portions as reflected and transmitted to be used as an energy source in the CSP and CPV units, respectively. The energetic and exergetic performances of the overall system as well as the system units are calculated based on the first and second laws of thermodynamics using Engineering Equation Solver (EES) software. The major portion of the input energy is converted to electricity while the required thermal energy for desalination and absorption cooling is obtained from condenser heat from the Rankine Cycle. A specific portion of the desalted water is used to feed Proton Exchange Membrane (PEM) for hydrogen production. For maintaining higher efficiency of CPV operation, the heat generated on photovoltaic cells is removed to be utilized for supplying thermal energy at 80 ^{0}C to the PEM and space heating units. Thermal energy storage units are also used for eliminating energy fluctuations in the system and for a continuous operation by storing the energy for the time when energy from sun or wind are not available. In brief, generation of multiple commodities is made possible on a continuous-based clean operation by an innovative integration of concentrated solar energy and wind energy systems. After performing thermodynamic analysis over the system, the overall energy and exergy efficiencies are found as 58.5% and 46.0%, respectively.

Keywords: Energy, exergy, efficiency, concentrated solar, wind thermal, multigeneration

:: Paper No: GCGW - 2018 – P321 ::

EXERGY AND ENERGY ANALYSIS OF CONCENTRATING PHOTOVOLTAIC THERMAL (CPVT) SYSTEM USING NUCLEATE BOILING HEAT TRANSFER (NBHT) THERMAL MANAGEMENT FOR MULTIGENERATION

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A multigeneration system using concentrated photovoltaic thermal (CPVT) is designed and thermodynamically analyzed in this paper using exergy and energy analysis. This study proposes a new technique for thermal management of the CPV systems using nucleate pool boiling heat transfer (NBHT) phenomena. The resultant thermal energy from NBHT, is used for the heating and hot water, as well as cooling requirement of the building by employing lithium bromide absorption chiller. Thermal energy storage unit consisting of a phase change material (PCM) is used for the night time requirement. A humidity harvesting system is connected, at the outlet of absorption chiller, to convert humid air into water and ventilation air requirement of the building. The surplus electrical energy is stored by producing hydrogen and oxygen via water electrolysis, which is then utilized in a proton exchange membrane (PEM) fuel cell for the night time electricity requirement and to produce thermal energy for continuous operation of the system in unfavorable weather conditions. The system produces cooling, heating, ventilation, water, and electricity requirement of a residential building in a humid climate. The parametric study results show that with an increase in boiling temperature, electrical efficiency of the CPV system decreases. There is a slight decrease in overall energy and exergy efficiencies however, the maximum concentration ratio ability of CPV system increases significantly. With boiling temperature of 100°C, the system can perform with 64% overall energy efficiency, 25.8% of overall exergy efficiency and the concentration ratio of up to 1490 times. By increasing the Direct Normal Irradiance (DNI), an increase in thermal and electrical energy production can be achieved although there is a negligible effect on exergy and energy efficiencies, while concentration ratio decreases. The system is also capable of producing up to 22.18 liters/hour of dehumidified water in the month with the highest value of humidity.

Keywords: Solar photovoltaics/thermal, Multigeneration system, Renewable energy, net-zero energy building, Efficiency, Desert climate.

:: Paper No: GCGW - 2018 – P322 ::

TRANSPORT ACTIF OF HEAVY METALS BY LIQUID MEMBRANE CONSTITUTED OF A TWO EXTRACTANTS MIXTURE

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The treatment of effluents containing metals has been the subject of many research efforts in recent years, the accumulation of these metals in the environment can affect the health of living beings, the development of processes requires the development of efficient and economical techniques allowing the elimination or the recycling of the metals present in the effluents.

The removal of heavy metal from the environment, especially wastewater, is now shifting from the use of conventional methods to the use of extraction, which may be defined as the binding and concentration of selected heavy metal ions

Membrane processes have been of considerable interest and therefore a judicious choice of new technology for the separation and recovery of metals. This study was used to determine the chemical parameters recovery of copper (Cu^{2+}) contained in aqueous effluents by liquid membranes. We carried out the transport of Copper (II) through a liquid membrane consisting of a mixture of two extractants: di (2-ethyl hexyl) phosphoric acid and tri-n-octyl phosphine oxide (HDEHP-TOPO).

The results obtained are efficient and encouraging, thus, the current status and future directions regarding transport of heavy metals by liquid membrane at an industrial level are examined

Keywords: Transport, Extraction, Copper, Treatment, Environment.

:: Paper No: GCGW - 2018 – P323 ::

POLYETHERSULFONE SUPPORTED CHITOSAN ULTRAFILTRATION-MEMBRANE

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Many mass-transfer applications have used chitosan membranes in separation processes. Chitosan can be crosslinked easily by dialdehydes, such as glutaraldehyde and this process is able to change drastically some macro and micro properties: water absorption, ion permeability, chemical and mechanical properties. In the present study, a new ultrafiltration membrane was prepared by coating chitosan on polyethersulfone fiber support, by the dissolution of chitosan in acetic acid solution and cross-linking by glutalardehyde. The resulting membrane was characterized by attenuated total reflectance Fourier transforms infrared spectroscopy and scanning electron microscopy.

Keywords: Chitosan, Membrane, Polyethersulfone, Ultrafiltration.

:: Paper No: GCGW - 2018 – P324 ::

UTILIZING CULTURAL HERITAGE FOR CLIMATE CHANGE ADAPTATION STRATEGIES

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Cultural heritage encompasses traditional construction systems which have adapted to their surrounding environment and developed through inherited experiences for ages. Such traditional constructions can be evaluated as energy efficient designs, since they utilize local materials and embrace passive acclimatization solutions. The same design approach can be traced in traditional urban and rural settlements as well as landscaping. Cultural heritage assets should not only be evaluated physically as low energy-consuming, nature-friendly and sustainable systems, but also as resilient structures that have survived past climate related changes and disasters. Analyzing physical and social data that cultural heritage embodies reveals a vital opportunity in climate change adaptation strategies. Physical properties, materials in buildings/built environment, building elements, features that increase the resiliency of construction techniques in past disasters/extreme climate events can be derived from the relation between the building with its physical environment. On the other hand, social properties are rooted in the adaptation ability of human societies that have generated cultural heritage for ages. Within this context, traditional construction skills and know-how should also be assessed. Especially the fact that pre-industrial societies established their settlements on self-sufficiency principle clearly reveals that we have a lot to learn from local/indigenous sources. This article focuses on the role of cultural heritage and the adoption of integrated management of cultural and natural heritage sites for adapting our cities to climate change with case studies from around the world.

Keywords: Climate Change, Cultural Heritage, Adaptation

:: Paper No: GCGW - 2018 – P325 ::

BIODIESEL PRODUCTION USING CATION EXCHANGE RESINS AT DIFFERENT IONIC FORMS

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Production of biodiesel from renewable biomass-based sources is an alternative to petroleum diesel. Using homogeneous basic catalysts like KOH or NaOH has some drawbacks such as soap formation during biodiesel production. On the other hand, homogeneous acidic catalysts can cause some undesired side reactions and corrosion in equipment. Additional neutralization of the reaction medium and difficulty in separation of catalyst from the product stream are also other problematic issues of using homogeneous catalyst. On the other hand, utilization of ion exchange resins can be used as heterogeneous catalysts in transesterification reaction for biodiesel production. A better selectivity towards the desired product and reusability of ion exchange resins employed may be the best aspects of considering them as a cost-effective catalyst.

The purpose of this research is to show ion-exchange resin as effective heterogeneous catalyst in the production of biodiesel. In this study, a strong acid type cation exchange resin was used in the transesterification of corn oil to fatty acid methyl esters (FAME). The ion exchange resin was used in its H^+ and Na^+ ionic forms. Effect of ionic form of ion exchange resin on biodiesel yield and composition was investigated using different amounts of ion exchange resin, various mole ratios of methanol to oil and reaction temperatures during transesterification reaction. Free fatty acid (FFA) conversion and ester content were evaluated using various operational conditions. Gas chromatography analysis revealed that FAME is mainly composed of C16:0 (palmitic), C18:1 (oleic), and C18:2 (linoleic) acids of methyl ester, respectively.

Keywords: Biodiesel, Cation-exchange resin, Transesterification.

:: Paper No: GCGW - 2018 – P326 ::

ANAEROBIC FERMENTATION OF WATER LETTUCE (*PISTIA STRATITES L.*) FOR BIOGAS PRODUCTION

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Anaerobic fermentation is a widely practiced biochemical degradation process, obtained from various biomass such as agricultural products. The main product of the anaerobic fermentation process is a mixture of methane and carbon dioxide gases which is used as fuel for power and heat production. Temperature and substrate concentration are the most important parameters affecting the anaerobic fermentation process. Mesophilic (20-40°C), thermophilic (50-60°C) and high thermophilic (65-75°C) conditions are generally used for anaerobic fermentation.

Water lettuce (Pistia stratiotes L.) is an invasive aquatic plant which has high nutrient uptake capacity, fast growth rate, and large biomass production. Considering these properties, water lettuce is suitable for both water purification and biogas production. In this study, anaerobic fermentation of water lettuce harvested after phytoremediation studies performed at ITOB Organized Industrial Zone was carried out at different biomass concentrations. Waste sludge was used as inoculum and obtained from the inlet of the methanization unit of İZSU Çiğli Advanced Biological Wastewater Treatment Plant, Izmir, Turkey. The dried plants were ground to a size of 2 mm. The biogas composition at different biomass concentrations and waste sludge concentrations were determined.

Methane formation has increased with an increase in biomass and waste sludge concentrations. Maximum biogas and methane yields were reached when biomass and waste sludge concentrations were 50 g/L and 100 g/L, respectively. Biogas has a high energy potential with a 60-70% of methane content.

Keywords: Anaerobic fermentation, Biogas, Water lettuce, Waste sludge.

:: Paper No: GCGW - 2018 – P327 ::

PERFORMANCE OF A VENTED SOLAR CHIMNEY

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High energy costs for heating and cooling result in a tendency of reducing ventilation rate in buildings to provide energy efficiency. However, low ventilation rates negatively affect human health, comfort and productivity. Solar chimney is a well-known strategy that considers energy cost, health and occupant thermal comfort aspects in natural ventilation design and can be used as a passive heating device. In this study, heating and ventilation performance of a solar chimney was numerically investigated by using computational fluid dynamics (CFD) technique. Conservation equations for mass, momentum, and energy were solved by the finite-volume solver, ANSYS-FLUENT v18.1. The CFD model was validated through the use of available published numerical data from the literature and good agreement between the published data and the simulation was achieved. In simulations, the effect of solar irradiation rate and ambient air temperature were investigated. The time-dependent transient analysis conducted in a cold winter day shows that solar irradiation is the major driving force in chimney performance and the contribution of solar chimney to space heating is significant in winter since the average mean temperature inside the chimney wall in the daytime is around 44 °C. As further research, the effect of various design configurations on chimney performance to make the chimney more energy efficient can be tested.

Keywords: Solar chimney, Natural ventilation, Computational Fluid Dynamics (CFD), Air movement, Passive system.

:: Paper No: GCGW - 2018 – P328 ::

ASSESSMENT OF CLIMATE CHANGE IMPACT ON SOIL REDISTRIBUTION OVER THE LAST YEARS IN THE NORTHWESTERN MOROCCAN AGROSYSTEMS BASING ON CAESIUM-137 MEASUREMENTS

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Such as several territories in Africa, water erosion is one of the most serious agro-environmental threats encountered in Morocco, particularly in the northern part of the country. It had influenced on the soil and water quality of many watersheds and had already caused the increase of sedimentation of associated dams. The growing demand for water and food triggers more and more the situation. Soil erosion phenomenon is intensified by inappropriate agricultural practices and could be subject to the impact of climate change due to the effects of periodic drought and extreme events. In this regard, concern for the fate of agricultural fields and water reservoirs in the Tangier-Tetouan-Al Hoceima region has led to the launching of this investigation in two watersheds under Mediterranean agro-climatic conditions. Therefore, the aim of this research work is to assess the impacts of climate change, over the last eighteen years, on soil erosion in agricultural fields of two catchments (Nakhla and El Hachef), assuming that there has been no significant change in agricultural practices during this period. The Caesium-137 technique with the re-sampling approach was used to compare soil erosion movement in the study areas over two periods. The preliminary findings show that soil loss rates have decreased from 36 t ha^{-1} yr^{-1} to 29 t ha^{-1} yr^{-1} in Nakhla watershed and from 35 t ha^{-1} yr^{-1} to 31 t ha^{-1} yr^{-1} in El Hachef watershed. At the basin scale, especially for "Nakhla" and according to data on water reservoir sedimentation provided by the "Hydraulic Basin Agency" of the region, soil erosion was significantly reduced due to the implementation of appropriate anti-erosive strategies in some areas to ensure sustainable agricultural development in the Rif Mountains. These results indicate that climate change has not affected the soil loss in this region and could be explained by the beneficial impact of agricultural practices even with a small change. The study will be pursued for a better understanding of the impacts of climate change on soil erosion.

Keywords: Climate change, Agrosystems, Northwest of Morocco, Soil redistribution, Caesium-137.

:: Paper No: GCGW - 2018 – P329 ::

QUANTIFICATION OF WATER EROSION AT THE LEVEL OF THE HIGH ATLAS OF MOROCCO, PILOT STUDY AT THE SCALE OF THE OURIKA BASIN

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Covering an area of 576 square Kilometers, the Ourika watershed is a sub-basin of the great basin of Tensift, it is located in the High Atlas mountain of Morocco. Ourika watershed Exposure to rainy disturbances from the Atlantic Ocean, and it provides the basin ample precipitation, in addition to that, the basin is characterized to have a very rugged topography with little dense vegetation cover and friable substrate. This criterion increases the vulnerability to water erosion. The purpose of this work is to map areas vulnerable to erosion in the Ourika basin and to quantify soil losses in this basin using the SDR (sediment delivery ratio) model of the Integrated Valuation of Ecosystem Services Tradeoffs (InVEST), which takes into account the effects of climate change and human activities. The results obtained show that the Ourika watershed is subjected to a strong climatic aggressiveness ranging from 48.74 and 72.64 Megajoul.mm / hectar.hour.yr. The soil erodibility value (K) ranges from 0.01 to 0.2 t.ha.h / ha MJ mm. The vegetation cover factor ranges from 1 and 0.1, and 11.5% of watershed's area is well protected with a value of C <0.2.

The average value of soil losses (t / ha / year) obtained in the basin is 258.48 t / ha / year. The results indicate also that 44.67% of the study area presents an erosion that does not exceed 44.5 t / ha / year. In fact, 32.84% of watershed's area is subject to soil losses between 44.5-249.7 t / ha / year and 10.01% of watershed's area with losses ranging from 249.7-509, 7 t / ha / year. However, the Soil losses below the tolerance threshold (7 t / ha / yr) represent only 5.035% of the watershed. These results indicate the importance of water erosion phenomena in the Ourika watershed.

Keywords: SDR-InVEST, Vulnerability, Erosion, Semi arid, Ourika basin, Morocco

:: Paper No: GCGW - 2018 – P330 ::

THERMODYNAMIC MODELING OF A NATURAL GAS FUELED HT-PEMFC BASED COGENERATION SYSTEM

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High temperature-proton exchange membrane fuel cells (HT-PEMFCs) that operate between 120°C and 200°C are suitable for use in cogeneration systems. HT-PEMFC based cogeneration systems can be used in residential applications to produce hot water and electricity. In this study, a thermodynamic model of a cogeneration system that includes a HT-PEMFC stack, a steam-methane reformer (SMR), a water-gas shift reactor (WGS), a catalytic burner, and heat exchangers is developed. In this cogeneration system, SMR is modeled using reaction kinetic equations and a semi-empirical model is used for the HT-PEMFC stack. The modeling equations are solved using Engineering Equation Solver (EES) software. Energy and exergy analyses of the system are done to assess its performance. Exergy destructions within each component are calculated. Exergetic efficiency of the system is found for different values of the HT-PEMFC operating temperature, the anode stoichiometric ratio, and the steam-to-carbon ratio at the SMR inlet.

Keywords: High temperature proton exchange membrane fuel cell, EES, Exergy, Cogeneration.

:: Paper No: GCGW - 2018 – P331 ::

CATALYTIC TREATMENT OF OPIUM ALKALOID WASTEWATER VIA HYDROTHERMAL GASIFICATION

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The wastewater from opium processing plant should provide the limits specified in the "Water Pollution Control Regulation (WPCR), 2004" to discharge it safely into the receiving medium. Treatment of opium alkaloid wastewater is not sufficient by the existing combined method of aerobic/anaerobic and chemical treatment. Hydrothermal gasification, HTG (or supercritical water gasification, SCWG) is proposed as an alternative advance treatment in this study. The other aim of this study is to show manufacturability methane and hydrogen as renewable energy sources and determine what extent removal of chemical oxygen demand. Since alkaloid wastewater is complex and resistant to biodegradation, treatment of it with an existing method to the discharge levels could not be possible until now in literature. Discharge region of Eber Lake is contaminated with this and various wastewaters around there. Afyon Alkaloid wastewater has an initial TOC of 11500 mg/L and initial COD of 32050 mg/L.

Hydrothermal gasification studies were carried out in batch autoclave reactor systems without using catalyst, and with original red mud (RM), activated RM, and Nickel impregnated (10%, 20% and 30%) forms of it as catalyst. Reduction with $NaBH_4$ was done to the nickel impregnated forms of red mud to increase catalytic activity. The reaction temperature is selected as 500°C, 0.5 g catalyst and 20 ml of wastewater was fed to the reactor. Methane and hydrogen formation greatly, from 16.8 to 28.6 mole CH_4/kg C in wastewater with 20% Nickel impregnated and reduced red mud and from 20.3 to 33.3 mole H_2/kg C in wastewater with 20% Nickel impregnated and reduced red mud as the highest. COD of the wastewater lowered to 4940-6240 mg/L levels by a removal range of 81-85 % approximately. TOC content decreased at removal efficiency ratios of 85-90%. The effect of catalyst type within the activated state of red mud cannot be seen clearly since the effectiveness is alike.

Keywords: Biomass, Wastewater, Supercritical, Gasification, Hydrogen.

:: Paper No: GCGW - 2018 – P332 ::

TREATMENT OF WELL DAMAGED BY DRILLING FLUIDS THROUGH THE LOWER DEVONIAN RESERVOIR, BIR BERKINE REGION, SAHARAN PLATFORM, ALGERIA

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When production starts some wells have shown a debit decrease compared to the one evaluated in the well drilling tests. Assumed that production lack results from damaged caused by drilling mud, first acidification is done within the well BBK-16 and BBKN-07 using mud-acid Hcl of 6% - Hf of 1.5%. However due to negative results, there was perforated in order to undertake initial potential.

Simulation operation or acid treatment of rock reservoirs (lower Devonian) of Bir Berkine region aims to increase permeability related to wells clogging problems with migration of fined particle, shale swelling and asphelts precipitation.

Effectiveness of thus treatments is based upon petrographical analysis, choice of acid fluid, determination of acidification parameters and results analysis.

In this research article, we found that mud of Invermul and Versapro used during drilling are damaged, the rate of clogging is estimated at 80% within the two wells therefore and acid treatment is requested. Knowing that mineralogical composition of sandstone within the unit C of Siegenian, the mud and the different shifting tests, the Mud-acid «12-2» is considered as a treatment model. Further the use of Mud-acid «12-3» would promote sandstone grains faulting around the two wells.

Keywords: Damage, Stimulation, Acidification, Permeability, Siegenian.

:: Paper No: GCGW - 2018 – P333 ::

CHARACTERIZATION AND MODELING OF THE CAMBRO-ORDOVICIAN TIGHT RESERVOIR IN THE TINRHERT REGION, ILLIZI BASIN, SAHARAN PLATFORM, ALGERIA

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The Illizi basin is located in the south eastern part of the Algerian Saharan platform. It presents the meridional part of the eastern Saharan synclise named Illizi-Berkine province covering superficies of 108 424 km^2.Tinrhert region is located in the North Eastern part of the Illizi basin where big research, exploration and development project is launched by the Algerian national oil company (Sontrach). The Tinrhert project concerns 17 gas plays with oil ring producing mainly from Devonian, Silurian and Cambro-Ordovician reservoirs. The Cambro-Ordovician reservoir was studied and localized within the Alrar south, Alrar center, In Amenas north and In Amenas north horst. This reservoir complex is presented as a big anticlinal structure-oriented NNE-SSW located in the south-east of Tinrhert within the In Amenas perimeter covering a superficy of 1350 km^2. The sandstone reservoirs of the Cambro-Ordovician complexes are composed from bottom to top by: Unit II, Unit III-1, Unit III-3, Unit IV-2 and Unit IV-3 (Fabre, J., 1988). The realization of statistical and geological model is an important step in a petroleum research in order to settle development project. This modelisation study was realized using Petrel software which required the existence of geological, geophysical, petrophysical and petrographycal data. The 3D geological model is the result of the integration of all available data. Results obtained from petrophysical and electro facies interpretation is determined from logs and cores of all wells.

Keywords: Tinrhert, Cambro-Ordovician, Characterization, Modelisation.

:: Paper No: GCGW - 2018 – P334 ::

NUMERICAL MODELING OF A BATCH CATALYTIC REACTOR FOR HYDROGEN PRODUCTION FROM AMMONIA BORANE

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Global energy demand is increasing day by day in parallel with the developing industry. Fossil fuels are still the most widely used resource to meet energy need. Reducing the use of fossil fuels as much as possible and meeting energy demand with the use of environmentally friendly technologies are one of the most important research topics today. Boron compounds, which are called solid hydrogen storage materials, can easily be hydrolysed. This reaction results in a high amount of hydrogen and some by-products which are completely harmless to the environment. In this study, a completely environmentally friendly batch catalytic reactor was designed to produce hydrogen through catalytic dehydrogenation of ammonia borane (AB). A three-dimensional and non-isothermal catalytic reactor was modelled in COMSOL Multiphysics environment. In the model, the reaction kinetics, as well as the turbulent flow, heat, and mass transfer processes, are included in the calculations. The effect of reaction temperature and substrate concentration on the amount of hydrogen production was investigated.

Keywords: Hydrogen production, Boron compounds, Ammonia borane, Catalytic reactor, 3D modeling

:: Paper No: GCGW - 2018 – P339 ::

BIOCHAR FROM OLIVE WASTES

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In this study, pyrolysis of olive tree pruning was studied at different pyrolysis temperature and duration. The effect of process conditions on the yields and properties of biochar were investigated in order to utilize as solid fuel. It was found that the temperature was much more effective on biochar yield than duration. Biochar obtained at lower temperatures, even at 250 °C, has nearly same calorific value with lignite. Demethanation and de hydrogenation reactions became dominant at the pyrolysis temperatures higher than 350°C, resulting in lower H/C ratio. Combustion behavior of biochars exhibited that holocellulose which is easily combusted into volatiles, still remains in the biochar obtained from pyrolysis where the temperature is up to 350°C. Besides, high energy content gas can be produced at the temperatures of 400°C and above.

Keywords: Pyrolysis, Biochar, Olive tree pruning.

:: Paper No: GCGW - 2018 – P340 ::

SILVER (I) REMOVAL FROM AQUEOUS MEDIA: INVESTIGATION OF PHYSICOCHEMICAL PARAMETERS OF ADSORPTION ONTO POLYMERIC ADSORBENTS FOR WATER TREATMENT

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Silver (I) ions were removed from aqueous media by adsorption technique. Magnetite attached crosslinked polymers were used as an adsorbent. Adsorption processes were followed by ion selective electrodes. Thermodynamic, kinetic and isothermal studies were conducted in order to specify the use of the adsorbent for water treatment.

Keywords: Adsorption, Silver (I) removal, Polymeric adsorbents

:: Paper No: GCGW - 2018 – P341 ::

NUMERICAL ANALYSIS OF DIESEL ENGINE PERFORMANCE AND EXHAUST EMISSIONS WITH DIESEL-ETHANOL FUEL BLENDS

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Increasing oil prices, reducing the damage caused by fossil fuels, has prompted researchers to use new renewable resources. Diesel engines use huge amount of fuel as an alternative fuel. Ethanol, used as an alternative fuel for diesel engines, is one of the most common types of renewable fuels used in diesel engines in recent years to reduce exhaust emissions.

In this study, the effects on the diesel engine of 5%, 10% and 15% ethanol diesel fuel blends at constant revolution (2200 rpm), in which the maximum torque value of a four-stroke single cylinder diesel engine is obtained, are examined. As a result of the study, the effects of diesel-ethanol mixture used as fuel in the diesel engine, performance parameters such as engine cylinder pressure, cylinder temperature, power, torque, as well as NO_x, CO, unburned hydrocarbons amounts were obtained. The study was modeled as a 90° sectioned numerical domain of the diesel engine according to the number of injectors. Engine performance and emissions were estimated by Ansys-Forte software

Keywords: Alternative fuels, Computational fluid dynamics, Diesel engines.

:: Paper No: GCGW - 2018 – P342 ::

PHYSICOCHEMICAL RESEARCH FOR ADSORPTION OF ACID RED-114 FROM AQUEOUS SOLUTION WITH NOVEL POLYMER MICROSPHERES

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In this study, we investigated the adsorption of Acid Red-114 material which is an organic contaminant, to the suspension of novel polymer microspheres.

Various parameters such as adsorbent concentration, pH, dye concentration, kinetics was determined to determine optimum conditions in decolorization-degradation experiments of azo dye. Then, the data obtained from the adsorption experiments of this dye material were transferred to graphy according to the linear forms of Langmuir and Freundlich isotherms and the regression coefficients were calculated and from this the most suitable adsorption model was determined.

The effects of pH on decolorization-degradation reactions were studied at different pH values. In the degradation reactions, samples from the reaction mixture were analyzed by using UV-vis spectroscopy. In the follow-up of the experiments, the effect of the initial concentration of the stain on decolorization-degradation reaction and rate was determined by finding a kinetic model suitable for the experimental results the Velocity constants were calculated and error calculations were made. Moreover, isothermal studies have been performed to obtain isotherm constants and interpreted.

Keywords: Acid Red-114, adsorption, isotherm, kinetic models

:: Paper No: GCGW - 2018 – P343 ::

THE CROSS-LINKED POLYMER SPHERES FOR REMOVAL ACID ORANGE 8 FROM AQUEOUS SOLUTIONS

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Acid orange 8 acidic dye textiles, paper and so on. It is a paint used in the fields. The waste water of the paint is a major pollution threat in the living area of the creatures. Some methods used to get rid of this pollution are not enough. It was observed that these dyes were removed from the aqueous solution using the cross-linked polymer spheres. The cross-linked polymer spheres used are low cost and offer the possibility of saving on the treatment. The acid is a paint in acidic structure due to the SO3- groups of orange 8. The wavelength at which the dye solution gives maximum absorbance is found at 490 nm. Calibration curves were plotted by measuring specific concentrations using UV-VIS spectrophotometer. 2-12 measured at pH value to find the optimum pH. The cross-linked polymer spheres were attempted and observed pH, time, temperature, concentration parameters for removal acid orange 8 from aqueous solutions

Keywords: Adsorption, Acidic Dye, Cross-linked Polymer Spheres, UV-VIS

:: Paper No: GCGW - 2018 – P344 ::

THE CROSS-LINKED MAGNETIC COPOLYMER MICROPARTICLES FOR ADSORPTION OF ACID VIOLET 7

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It is desirable to investigate the cross-linked magnetic copolymer microparticles for adsorption of acid violet 7 because the industrial residue of this dye causes environmental pollution of paint residues. Prior to the adsorption treatment, the dye aqueous solution was prepared and found in the UV-VIS spectrophotometer at λ_{max} = 520 nm. Calibration graphs were drawn by measuring absorbance at specific concentration intervals after the value of λ_{max} found. Dye solubles were prepared at pH 2-12 and absorbance measurements were made. A change in the color of the paint was observed at pH 11. pH, temperature, time and concentration factors have been investigated as factors affecting adsorption behavior.

Keywords: UV-VIS, Adsorption, Cross-Linked magnetic copolymer microparticles

:: Paper No: GCGW - 2018 – P345 ::

OPTIMIZATION OF COMPOSITION TiB_2-BN COMPOSITES AS CATHODE MATERIALS FOR ALUMINUM ELECTROLYSIS

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During Hall-Heroult process where aluminum is produced from alumina, the alumina is not being dissolved into electrolyte and sink to the bottom the liquid metal pad. Sludge occurs and this is a common phenomenon. This leads to continue to lack of oxygen into the cell. The aim of the project was to develop the ceramic based materials, technology, and necessary engineering packages to retrofit existing aluminum reduction cells in order to reduce energy consumption required for making primary aluminum.

This study extends the life of aluminum electrolysis cells provide energy savings, the carbon cathode stands to the arc blow, cryolite and the abrasion effect of the aluminum film which flows constantly. Also, the electrical conductivity, machinability and wear resistance of TiB_2-BN composite will be better than cathode carbon.

Keywords: Aluminum electrolysis, cathode material, titanium diboride, boron nitride

:: Paper No: GCGW - 2018 – P346 ::

COMPARATIVE ANALYSIS OF PV-PEM FUEL CELL HYBRID SYSTEM BASED ON PEM WATER AND METHANOL ELECTROLYSIS

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This study shows the comparative performance analysis of Photovoltaic (PV)-Proton Exchange Membrane Fuel Cell (PEMFC) hybrid system with hydrogen production using Water Electrolyzer (WE) and Methanol Electrolyzer (ME). The ME and WE are designed and analyzed for net 1 kW PEMFC's fuel demand. A house energy demand which is located in İzmir, Turkey, supplied by this hybid system.

Keywords: Water electrolysis, Methanol electrolysis, PEM fuel cell, PV, Global warming.

:: Paper No: GCGW - 2018 – P348 ::

STRAW-BALE CONSTRUCTION IN SUSTAINABLE ARCHITECTURE

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Straw-bale constructions are sustainable buildings for many reasons. They are one of the key points against climate change since they are one of the biggest energy consuming (therefore carbon emission) areas. The reason why they are sustainable can be described as: use of local material, use of renewable material, use of re-cyclable material, use of healthy material, use of a by-production material (it is the by-product of wheat production), energy efficiency, reducing carbon emissions by reducing transportation energy and manufacturing energy, also by reducing energy requirement by high thermal resistance/good insulation values. And sustainable constructions help us create a sustainable world: a better legacy to our grandchildren. Therefore, the aim of this study is to examine the sustainability features of straw-bale constructions and determine the reasons why they should be used. This is done by describing the features of sustainability and straw-bale constructions first. And then case studies of straw-bale constructions are examined, and in the conclusion, use of straw-bale construction is proposed in order to achieve sustainable architecture and a bright future.

Keywords: Straw-bale construction, Low carbon emission, Energy efficiency, Sustainable architecture, Construction material.

:: Paper No: GCGW - 2018 – P349 ::

USE OF TIMBER IN SOLAR ARCHITECTURE

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Timber is an important construction material in solar architecture. It has been used in architecture for more than 300 millennia. It has been used in many solar buildings that are designed with passive and active solar architecture principles. It helps us produce sustainable buildings in several ways. One of them is that timber is a natural, organic, ecological and recyclable material. It helps us in shading devices and building envelopes in solar architecture. It also helps to place solar panels (collectors and photovoltaic/PV panels) which produce energy directly from the sun, as a load-bearing structural element. Especially the first BIPV example buildings are constructed with the use of timber elements. It helps to decrease the energy loss from the building skin. There are many case studies of solar architecture all around the world in which timber is used. Therefore, the aim of this study is to show that timber is one of the most sustainable solutions in creating solar buildings. This is done by describing the role of timber in solar architecture by making a classification first (as use as structural, cladding and shading elements), and then by describing the use of timber in solar architecture with the use of case studies in which timber is used in different ways, and then discussing the results. Impact 2000 House, Floating House and Carabanchel House are examined as case studies to show the potential of timber use in solar architecture. In the end, it is shown that timber is an efficient and sustainable construction material in producing solar architecture and that it is a friendly material for architects. It is also a good construction material for the design and construction of futuristic solar architecture.

Keywords: Solar Architecture, Sustainable Architecture, Futuristic Solar Architecture, Timber Construction, Sustainable Construction Material.

:: Paper No: GCGW - 2018 – P350 ::

INVESTIGATING THE EFFECTIVENESS OF THERMAL BUFFER ZONE IN BUILDINGS

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Global warming is caused by Greenhouse Gas (GHG) emissions produced from the use of fossil fuel-based energy sources. Buildings consume about 40% of the global energy use, which makes buildings a major contributor to the global warming problem. A long-term plan has been established at Thermal Processing Lab (TPL) to investigate the use of various renewable energy-based technologies to achieve Net-zero energy buildings in Canada. This paper presents results of an investigation of the use of thermal buffer zone (TBZ) in buildings.

A TBZ is a closed passage built around a building that allows air to passively re-distribute heat energy from solar radiation received on the south side throughout the building. A TBZ offers an effective solution of the overheating problem usually experienced on the south side of the building and, at the same time, it helps in reducing the heating load of the north side of the building.

An experimental setup and an analytical model of a TBZ implemented in a model of a typical building floor has been developed. The experimental data has been used to validate the developed analytical model, which then was used to simulate the performance of a TBZ implemented in a life size building. Results show that a TBZ offers an effective means of reducing fossil fuel-based energy sources using solar energy.

Keywords: Greenhouse gas emissions, Thermal buffer zone, Experimental, Analytical model, solar energy, Buildings.

:: Paper No: GCGW - 2018 – P351 ::

A COMPARISON OF ADSORPTION CAPACITY OF ULEXITE AND A WASTE CONTAINING ULEXITE IMPURITY FOR THE REMOVAL OF BASIC DYE FROM AQUEOUS SOLUTION.

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In this study, ulexite and a waste (BW) containing ulexite impurity was used for the removal of basic dye from aqueous solutions. Batch adsorption studies were carried out. Several parameters, namely, initial dye concentration, adsorbent dosage, and the pH of the solutions were examined. The adsorption of basic dye was highly pH-dependent. The dye uptake was mainly governed by the electrostatic attractions. Adsorption kinetic data followed the pseudo-second-order model. Several adsorption isotherm models were applied to interpret equilibrium data. The Langmuir isotherm model showed best fitting to the respective equilibrium data for the adsorption of basic dye. The results showed that the adsorption capacity of BW is better than that of ulexite.

Keywords: Basic dye, Adsorption, Isotherms, Waste

:: Paper No: GCGW - 2018 – P352 ::

ALTERNATIVE BUILDING MATERIALS FOR SUSTAINABLE CONSTRUCTION

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In today's increasingly crowded world, fast depletion of our natural resources due to high demand of building materials is an important environmental concern. In order to address this concern, alternative building materials have started to become a focus in the world of construction. Alternative building materials are low-cost building materials that aim to reduce or eliminate the environmental impact of building construction, simply by providing a host of environmental benefits, such as increased energy efficiency, greater durability, utilization of recycled material etc. Since they are comprised of natural materials that are easy to replenish, or made of recycled elements, their environmental impact is far less than conventional building materials.

This short paper aims to present alternative building materials for sustainable construction, such as HempCrete, Mycelium, Ferrock, Papercrete etc. Current strategies for alternative building materials are discussed with emphasis to sustainability concerns. Benefits of these materials and prominent case studies such as Hy-Fi Tower in New York, Centre for Alternative Technology building in Wales, Nk'Mip Desert Cultural Centre in Osoyoos are also discussed.

Keywords: Alternative building materials, Sustainable architecture, Recycled material

:: Paper No: GCGW - 2018 – P353 ::

SMOG EATING BUILDING FACADES FOR AIR POLLUTION REMEDIATION

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According to an estimation made by World Health Organization, globally 6.5 million deaths were attributable to the joint effects of air pollution in 2012. It's certain that the rise in air pollution levels is becoming a serious environmental problem for many cities around the world. That's why there is a critical need to develop viable techniques for air pollution remediation in large scale. From the architectural point of view, utilization of '*smog eating*' building and infrastructure elements in our built environment is considered to be a promising method that can be used for air pollution remediation in urban scale. The technology called as "smog eating" in architectural trend is based on the Photocatalytic Oxidation (PCO) of TiO_2 (titanium dioxide). Photocatalytic products have been researched and implemented for indoor and outdoor environment air purification for more than two decades. This paper aims to present the current use of this green technology in building facades for air pollution remediation. Important case studies of smog eating façades are also examined.

Keywords: Smog eating building façade, Photocatalytic oxidation, Photocatalysis, Air pollution remediation

:: Paper No: GCGW - 2018 – P354 ::

ENERGETIC AND EXERGETIC PERFORMANCE EVALUATION OF GE90-115B HIGH BYPASS TURBOFAN ENGINE FOR DIFFERENT FUEL USAGE

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The energetic and exergetic performance assessment of a GE90-115 model high bypass turbofan engine used on Boing 777 commercial aircraft are investigated for nine different fuels such as Jet-A, JP-4, JP-5, JP-8, JP-10, AVGAS, No.2 Diesel, Camelina Bio and H_2. The energy efficiency of turbofan engine is calculated to be between 50.796% (JP-10 fuel) and 50.890% (H_2 fuel) while the exergy efficiency of the engine is estimated to be between 45.102% (H_2 fuel) and 48.051% (JP-10 fuel). The engine has the maximum sustainability index value by 1.925 for JP-10 fuel usage when it has the minimum value by 1.822 for H_2 fuel usage. Although H_2 fuel usage in aviation gas turbine is best option in order to reduce environmental pollutant and global warming effects of fuel, the exergetic results indicate that the H_2 fuel usage affects badly exergetic efficiency of the engine hence the H_2 fuel has higher fuel exergy value than other fuels.

Keywords: Turbofan engine, different aviation fuels, hydrogen fuel, exergy efficiency, sustainability index.

:: Paper No: GCGW - 2018 – P355 ::

SUSTAINABLE ENERGY AND GHG MITIGATION PRACTICES IN IZMIR

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As cities in Turkey is becoming bigger and environmental, social and economical problems also have created big stress on healthy city development. City of İzmir is no exception on this regard. Although cities are the main reason of those problems, they have solutions and opportunities as well. As main actor of city of İzmir, İzmir Metropolitan Municipality(IMM) has taken important steps to fight with global warming as a local government.

In 2015, İMM became a party to Covenant of Mayors (COM) which was created within the scope of the European Commission and whom purpose İs to encourage and support the use of renewable and clean energy resources for a world with reduced GHG and fight global warming. İMM promised to reduce greenhouse gas emissions by at least 20% by 2020 together with all partners in the region and has prepared the "Sustainable Energy Action Plan(SEAP) and Baseline Emission Inventory(BEI)" to achieve this goal. The total emissions subject to reductions have been estimated as 8.912.556 CO2e. Four main areas including Urban Development – Built Environment, mobility, renewable energy, solid waste management were targeted to achieve reduction in GHG gases until 2020. Per capita emissions will drop from 2.17 tCO2e/person to 1.59 tCO2e/person, a 26% decrease from 2014 and 2020 Business as Usual Scenario. The SEAP is clearly based on the long-term plans of İMM to create a more livable, citizen and climate-friendly city.

Keywords: Sustainable energy, GHG mitigation, Izmir city.

:: Paper No: GCGW - 2018 – P356 ::

SIMULATION BASED MATHEMATICAL MODEL OF A SOLAR POWERED DC MOTOR FOR UAV APPLICATIONS

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Global warming, often described as the most common example of climate change, is one of the biggest environmental issue in the two decades. To cope with global warming, considering the finite nature of fossil fuels and their destructive effects on the environment, researches are pointed at renewable and sustainable energy sources. Solar energy, wind energy, hydropower are alternative energy sources to create clean and sustainable energy. In particular, solar energy is an important source of renewable energy. Solar systems use the light from the sun to produce electrical energy. Solar panels work by capturing the sun's energy and converting it into electrical energy to answer electricity requirements. By means of solar panels, there is an access to a sustainable source of energy, the sun. All day long, the energy from sunlight is absorbed by the cells on the solar panels. Collected energy within the cells is then converted into direct current (DC) electricity. According to application area, alternative current (AC) electricity can also be produced by using an inverter. Thus, there are many various application areas of solar panels. In recent years, aviation industry has also studies on alternative energy sources on aero vehicles. In this sector, the future is going to electric-powered aero vehicle technology as well. Specifically, electric motors will have permanent roles in propulsion systems. Especially, DC motors are essential components for UAVs (Unmanned aerial vehicles). In this work, a mathematical model of a solar powered dc motor is simulated on MATLAB/Simulink software. A solar panel mathematical model and a DC motor mathematical model are connected together, and simulations are conducted. Simulation results are compared to the dc motor technical specifications and satisfactory results are observed.

Keywords: Aviation, Renewable energy, Sustainability, UAV, Solar energy.

:: Paper No: GCGW - 2018 – P357 ::

DEVELOPMENT AND ANALYSIS OF A SOLAR AND WIND ENERGY-BASED SUSTAINABLE POLYGENERATION SYSTEM FOR REMOTE LOCATIONS

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In this study, a solar energy-based system integrated with wind energy is developed to produce fresh water from sea-water desalination, electricity, cooling, hydrogen and oxygen as well as to provide food drying and domestic water heating. The main components of the proposed system consist of concentrated solar power (CSP), wind turbine, Rankine cycle, multi stage flash (MSF) desalination unit, water electrolyzer, a refrigeration unit, a food drying system, oxy-hydrogen combustor, domestic water heater, and hydrogen & oxygen storage units. Furthermore, for continuous operation of the system during night time and in cloudy weather conditions, a thermal energy storage unit and oxy-hydrogen combustion units are integrated to the system. Based on energy and exergy balances, performance assessment of the proposed system is conducted. Moreover, the effects of various parameters such as solar irradiation and wind speed on some of the outputs of the system are investigated. The results show that the proposed system fulfills most of the remote community requirements in an efficient, environmentally benign and uninterrupted way. The obtained results for the reference case show that with installation of parabolic trough concentrators (PTCs) on an area of 160,000 m^2, the plant produces net electrical power of approximately 10 MW, ~3,200 tons/day of freshwater, about 140 kg/s of hot air for food drying, about 33 kg/s of heated domestic water, approximately 3,500 kg/day of H_2 and about 2,400 kW of cooling.

Keywords: Solar energy, wind energy, hydrogen, desalination, water, refrigeration, food drying, domestic water heating

:: Paper No: GCGW - 2018 – P358 ::

DESIGN, OPTIMIZATION AND FEASIBILITY ANALYSIS OF GEOTHERMAL HEAT PUMP FOR COOLING AND HEATING DEMAND OF AN OFFICE BUILDING IN ISLAMABAD

CASE STUDY FOR PAKISTAN

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The demand of energy for cooling and air-conditioning is continuously increasing due to growing thermal loads, modification in the building architectural styles, and increasing demand of occupant indoor comfort, which results in comparatively higher electricity demand during peak loads. This increasing electricity demand is resulting higher consumption of primary energy use and emission of greenhouse gases (GHG) due to electricity generation from fossil fuels. Pakistan is facing sever energy shortage and new means of energy production needs to be established that can help in reducing these crises. Out of many available and sustainable energy sources geothermal is one of the promising and rarely studied solution in Pakistan. In this paper a case study has been done for heating and cooling requirement of an office building located in Islamabad, the capital of Pakistan. Geothermal energy has been used by using ground source heat pumps. In the first step the heating and cooling loads for this building have been calculated. Using the bin data method, underground heat exchanger has been designed and optimize to achieve the heating and cooling demand throughout the year. Finally, the economic and environmental analysis has been performed. Promising results has been obtained with respect to fulfilling the demand of the building, reduction in greenhouse gas emission and payback period.

Keywords: Geothermal energy, Heat pump, Co-generation system, Renewable energy Pakistan, Building heating and cooling.

:: Paper No: GCGW - 2018 – P359 ::

AN ARID TIME IN THE WESTERN BLACK SEA: THE MIDDLE EOCENE EVAPORITES

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Evaporites are sediments considered to be climate sensitive. Ancient evaporite distribution and associated paleolatitudes are used to reconstruct the distribution of the world's arid belts across time. The middle Eocene sediments of the Safranbolu-Karabük Basin of the Western Black Sea contains evaporates which are represented by gypsum. In detail, the middle Eocene sediments consist of limestone, mudstone and bedded and nodular gypsum. Total thickness of gypsum is 15 meters. Depositional environments of the evaporites are lagoon and saphka. The evaporites extend from east-west direction in the south of the Karabük and Araç cities, nearly 100 km long and 40 km wide. The Karabük-Safranbolu Basin is located in the western Black Sea of Turkey. The basin is filled by the Late Cretaceous (Maastrichtian) to Middle Eocene sedimentary rocks. The basin is underlain by the Paleozoic sediments and the Upper Jurassic-Cretaceous Ulus Basin sediments. The basin is structurally complex and its south and west represented by the fold-thrust zones. The evaporites of the Karabük Safranbolu Basin are deformed due to continent-continent collision of the Anatolite and Pontide Continents after Middle Eocene. However, location of the evaporites is generally not changed. Therefore, the western Black Sea area was affected by an arid time during Middle Eocene.

Keywords: Eocene evaporates, Climate change, Western Black Sea.

:: Paper No: GCGW - 2018 – P360 ::

THERMAL MODELLING OF A PARABOLIC TROUGH SOLAR COLLECTOR INTEGRATED BIOMASS BASED ORGANIC RANKINE CYCLE SYSTEM

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Biomass and solar energy can be used in Organic Rankine Cycle as energy source. In this study thermal model of a biomass based regenerative ORC entegrated parabolic trough solar collector is examined. For this purpose, several control volumes enclosing the components of the system are formed. Applying energy and exergy analyses, various parameters including amount of solar radiation, number of solar collector, working fluid types are investigated and to what extent which parameter affects the thermal and exergy efficiencies is determined. Some suggestions are given for increasing the performance.

Keywords: Organic Rankine Cycle, biomass, energy, exergy

:: Paper No: GCGW - 2018 – P361 ::

SUSTAINABILITY ASSESSMENT OF AN INTEGRATED NET ZERO ENERGY HOUSE

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In this study, a net zero energy house is considered and modeled using solar PV and geothermal heat pump. The system is assessed for sustainability and energetic and exergetic efficiencies. The solar system considered yields an electricity production of 51.4 kW with exergy efficiency of 15% under atmospheric conditions. The geothermal heat pump has a coefficient of performance of 4.9 and an exergetic coefficient of performance of 2.1. The sustainability index of this system is 0.62 using the hierarchist aggregation method and the weighted geometric mean. Furthermore, the effect of various refrigerants on the thermodynamic performance has been investigated.

Keywords: Net zero energy house, Sustainability, Energy systems, Solar energy, Exergy, Efficiency, Assessment model.

:: Paper No: GCGW - 2018 – P362 ::

CO-PRECIPITATED NANOSTRUCTURED SILVER DOPED CERIA REDOX MATERIAL FOR SOLAR THERMOCHEMICAL CONVERSION OF H_2O/CO_2

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In this study, divalent Ag^{+2} cation doped into ceria ($Ce_{0.99}Ag_{0.01}O_{2-\delta}$) was synthesized via co-precipitation of hydroxides method with dropwise addition of NH_3OH (28%) as a precipitating agent. Derived $Ce_{0.99}Ag_{0.01}O_{2-\delta}$ material were morphologically characterized using powder X-ray diffraction (P-XRD) and scanning electron microscopy (SEM). Two step thermochemical redox cycles were performed with O_2 releasing step for 60 min at 1400 ^{0}C and O_2 reincorporation by CO_2 splitting (CO_2 into CO for 30 min) at 1000 ^{0}C using thermo-gravimetric analyzer (TGA). Long term with multiple consecutive redox cycles was performed towards to test the CO generation stability. Experimental results in comparison to CeO_2 showed stable, consistent with enhanced average amount of O_2 released (67.6 µmol/g) and CO generation (105 µmol/g) using $Ce_{0.99}Ag_{0.01}O_{2-\delta}$. Resulted CO generation capacity of $Ce_{0.99}Ag_{0.01}O_{2-\delta}$ material over ten redox cycles with oxidation at 1000 ^{0}C showed 8% and 6% enhancement in comparison to pure CeO_2 and $Ce_{0.75}Zr_{0.25}O_{2-\delta}$ respectively. Therefore, investigated $Ce_{0.99}Ag_{0.01}O_{2-\delta}$ material leads to be a potential option for future study in solar fuel generation applications.

Keywords: Ceria, Solar CO_2 splitting, $Ce_{0.99}Ag_{0.01}O_{2-\delta}$, Co-precipitation synthesis, Solar Fuels.

:: Paper No: GCGW - 2018 – P363 ::

SOLAR THERMOCHEMICAL H_2O/CO_2 SPLITTING USING SOL-GEL DERIVED MAGNESIUM FERRITE

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In this work, various molar composition of active cation Mg^{+2} into iron oxide ($Mg_xFe_{3-x}O_4$, x = 0.2 to 1) as a redox material towards solar thermochemical cycle were prepared via the sol-gel method. Derived $Mg_xFe_{3-x}O_4$ were dried and calcined in presence of air for 2 h at 800°C and further analyzed to determine their phase composition, crystallite size, morphology via powder X-ray diffraction (P-XRD) and scanning electron microscopy (SEM). $Mg_xFe_{3-x}O_4$ materials were investigated for thermochemical splitting of CO_2 into CO as a component of syn-gas mixture. In which, thermal reduction and CO_2 splitting with O_2 incorporation into $Mg_xFe_{3-x}O_4$ were determined by using thermogravimetric analyzer for multiple redox cycles. Experimental results indicate that, the average (10 cycles) amount of O_2 released during the thermal reduction step (at 1400°C) and quantity of CO produced during the CO_2 splitting step (at 1000°C) increases with rise in the molar composition of Mg^{+2}. The maximum average amounts (by excluding first cycle) of O_2 released of 54.09 µmol/g and CO produced of 78.87 µmol/g was observed for material MF10. Finally, $MgFe_2O_4$ gives 13.6% higher O_2 released reduction potential but 17.5% lower CO production in comparison to widely studied and promising redox materials CeO_2.

Keywords: Mg Ferrite, Sol gel synthesis, Thermochemical CO_2 Splitting, Solar fuel.

:: Paper No: GCGW - 2018 – P364 ::

CALCIUM SULFATE – CALCIUM OXIDE BASED THERMOCHEMICAL H2O SPLITTING FOR SOLAR HYDROGEN PRODUCTION

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This paper reports the thermodynamic efficiency analysis of calcium oxide – calcium sulfate (CaO-CaS) water splitting cycle based on principles of second law of thermodynamics. The HSC Chemistry thermodynamic software is used for this analysis. At first, the thermodynamic equilibrium compositions allied with a) the thermal reduction of $CaSO_4$, and b) H_2 production via water splitting reaction (through CaO re-oxidation) are identified. Additionally, the temperatures needed for both thermal reduction and water splitting steps are also determined. Effect of molar flow rate of Ar and thermal reduction on the total solar energy input required, re-radiation losses from the cycle, heat energy released by the coolers and water splitting reactor, and the cycle and solar-to-fuel energy conversion efficiency (with heat recuperation) for the CaO-CaS water splitting cycle is explored in detail. The obtained results indicate that the solar-to-fuel energy conversion efficiency up to 35.4% can be achieved if the thermal reduction and water splitting reactions are carried out at 2220 and 900 K (with 50% heat recuperation).

Keywords: Calcium oxide, H_2, Thermodynamic Analysis, Solar Reactor, Water Splitting.

:: Paper No: GCGW - 2018 – P365 ::

ENVIROECONOMIC ANALYSIS OF AUGMENTATION OF A SOLAR-THERMAL POWER PLANT FOR A COGENERATION SYSTEM IN YAZD, IRAN

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In this study, proposing an augmentation of solar thermal system for a heat and power cogeneration power plant, enviroeconomic analysis was carried out. The model of solar-thermal power generation utilized the preheated steam from Linear Fresnel Solar Collectors (LFC) into the boiler and then to back pressure steam turbines. This compound solar installation gained the sun angles and weather data of city of Yazd in Iran. Then, a common simulation examined the effects of a 2 MW augmented solar plant to a 43 MW cogeneration system while generating the power. Then, to indicate the advantages of solar energy application in potent regions, the environmental and economic effects of solar system in overall power plant were analyzed. Enviroeconomic analysis was included of Greenhouse Gas (GHG) emissions and its costs were determined. Similarly, to compare a green renewable energy source and a fossil-fuel one, the calculation was conducted on cogeneration system as well. In conclusion, the role of solar-thermal system in fuel saving as well as in 93% reduction of GHG emissions was emphasized, while the cogeneration system with negative impact of 310% CO^2 emission was presented as an environmentally-irresponsible energy system.

Keywords: Solar-thermal, LFC, Cogeneration, GHG emission, Augmentation, Enviroeconomic.

:: Paper No: GCGW - 2018 – P366 ::

SYSTEM SIMULATION OF A PARALLEL HYBRID VEHICLE POWERTRAIN FOR THE EFFECTS OF GEAR RATIOS ON EXHAUST EMISSIONS AND FUEL CONSUMPTION

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Consumption of petroleum base fuels and emissions of the greenhouse gases have been tried to reduce using hybrid applications in automotive sector in the last decades. Parallel hybrid construction which is equipped with internal combustion engine (ICE) and electric motor (EM) for the propulsion of vehicle, is one of the most preferred configurations for hybridization. The purpose of this study is to investigate the improvements in fuel consumption and exhaust emissions by considering various gear ratios in powertrain components for a parallel hybrid construction with torque coupling unit (TCU). Investigation of the effects of gear ratios in TCU, gearbox unit (GU) and differential is performed by simulation of parallel hybrid powertrain in MATLAB-Simulink environment. New European Drive Cycle (NEDC) speed and acceleration requirements are defined as input parameters for the simulation. Power requirement of ICE and EM are calculated according to an operation strategy to determine the fuel consumption, exhaust emission and state of charge (SOC) of the battery. Five different gear ratio combination which is stated from option 1 to option 5, are simulated separately. Thus, the best gear ratio distribution among the options is determined by using specific fuel and emission data of the ICE in the simulation for the reductions on fuel consumption and carbon dioxide (CO_2), carbon monoxide (CO), nitrogen oxides (NO_x), and hydrocarbon (HC) emissions.

Keywords: Hybrid vehicle, Powertrain simulation, Exhaust emissions, Fuel consumption.

:: Paper No: GCGW - 2018 – P368 ::

STRAIN-DRIVEN PIEZOELECTRIC ENERGY HARVESTER FOR INTELLIGENT TIRES

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Energy harvesting systems such as piezoelectric can extract a fraction of energy that is being wasted as a result of deflection and vibration of tires during driving vehicles. This extracted energy can be a permanent reservoir of energy to power sensors embedded in intelligent tires. In Intelligent tire, that is used in human-driven or autonomous vehicle, vital parameters on vehicle safety such as pressure, temperature, friction and contact-patch dimensions are measured via sensors that need electric power for operation and wireless communication with the vehicle control system. Harvesting the squandered tire deflection energy and converting it to electrical energy by means of piezoelectric is studied in this paper. A new design of strain-based piezoelectric energy harvester inspired from Cymbal piezoelectric energy harvesters is introduced and its performance is evaluated. The shape of the harvester is adjusted in a way that it can be safely embedded in the inner surface of tires. Ease of manufacturing is one of the advantages of this new design. Multiphysics modeling and finite element analysis using COMSOL Multiphysics software is accomplished to determine the output electric energy and voltage of the piezoelectric. The results indicated that the maximum output voltage, the maximum electric power, and the harvested energy are about 25 V, 8.3 mW and 78 mJ/rev, respectively, which are sufficient to power tire sensors.

Keywords: Piezoelectric, Strain energy harvesting, Tire deflection, Intelligent tire.

:: Paper No: GCGW - 2018 – P370 ::

INVESTIGATION OF HYDROGEN PRODUCTION BY HYDROLYSIS OF AMMONIA BORANE USING PT/MWCNT CATALYST

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The aim of this study is to enable high hydrogen (H_2) production yield from hydrolysis of Ammonia Borane (AB) in the presence of platinum7 multi walled carbon nanotube (Pt/MWCNT) catalyst. H_2 production rates were also investigated in different concentrations of AB (2.6%, 3.8% and 5.0%) solutions. Also, effect of different temperatures (27°C and 47°C) were studied. For comparison, AB hydrolysis was performed with platinum/carbon (Pt/C) and platinum/graphene (Pt/G) catalysts by the same method. Experimental results indicated that Pt/MWCNT catalysts exhibited excellent catalytic activity on the AB hydrolysis to release H_2.

Keywords: Hydrogen generation, Hydrolysis, Ammonia borane, Catalyst.

:: Paper No: GCGW - 2018 – P371 ::

MARINE HYDROGEN POWER PLATFORMS A STEP TO A SUSTAINABLE FUTURE

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Marine hydrogen power platforms (MHPP) are small platforms using hydrogen and fuel cell, located within short distances from shorelines to deliver combined heat and power to customers. The most effective way to utilize ocean energies, such as offshore wind, solar, tidal and wave where it is available, is to produce hydrogen locally and transport hydrogen by ships at moderate pressures the same way natural gas is transported today. At the same time, specialized barges can be designed, acting as solar and wind farms which house hydrogen generators and provide storage required to deliver it to MHPP. This paper addresses the logistics and feasibility of the idea by theoretically modeling and simulating the system from hydrogen production to combined heat and power (CHP) generation and distribution. The paper will present the high voltage direct current HVDC to shore and integration to existing grid. Also, it demonstrates the idea of large scale energy storage in from of hydrogen from intermittent energy sources.

Keywords: Hydrogen, Sustainability, Storage, CHP

:: Paper No: GCGW - 2018 – P372 ::

EXPLORING THE CURRENT STATUS OF CONSTRUCTION INDUSTRY IN AUCKLAND: ARE WE DOING ENOUGH?

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In recent years, there has been a radically growing attention towards optimizing the sustainable design of built environments, particularly from energy performance viewpoint towards tackling the large-scale environmental concerns of cities including climate change. This paper holistically explores the current status of construction industry in Auckland city and critically agues the lack of adequate attention to core sustainability principles. Auckland, with its subtropical climate, has been internationally well-known for its natural beauty, liveable and walkable urban spaces, and accessible recreational zones. Nevertheless, there are existing challenges with regards to the sustainable energy performance of built environments in Auckland from construction perspective. Given the fundamental need for more widespread green buildings, findings propose moving beyond the conventional targets of sustainable development and suggest urban-scale visions for sustainable design implementation. The critical analysis demonstrates the need to incorporate healthy design, smart technologies, emerging digital systems, affordable design concepts and existing sustainable design endeavors for more promising solutions towards creating liveable urban areas with adequate potentials towards tackling climate change. In this line, referring to the Auckland Plan 30-year target by Auckland council, aiming to become the most liveable city in the world, it is of importance to shed light on the multifaceted roles of professionals and academicians in the interrelated fields of architecture, sustainable construction, building science, environmental design and urban planning.

Keywords: Construction industry, Green buildings, Sustainability, Liveable cities, Climate change.

:: Paper No: GCGW - 2018 – P373 ::

PHOTOCATALYTIC DEGRADATION OF METHYL ORANGE AS A MODEL ORGANIC POLLUTANT BY AG/MESOPOROUS TIO$_2$ UNDER VISIBLE LIGHT IRRADIATION

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The photocatalytic activity of Ag doped mesoporous TiO_2 was investigated under simulated solar light irradiation for methyl orange degradation. Ag/TiO_2 catalysts were prepared by impregnation-reduction with citrate with various Ag loadings (0.5wt%, 1.5wt% and 3wt%). Ag/TiO_2 catalysts retain the physical properties of mesoporous TiO_2 and its hexagonal order. The degradation of methyl orange (MO) as a model organic pollutant was carried out under simulated solar light irradiation and compare with P25 TiO_2. The mineralization of methyl orange was investigated by Total Organic Carbon (TOC) measurements. Mesoporous TiO_2 showed a better activity than P25 TiO_2 and photocatalytic performance of silver doped mesoporous TiO_2 was enhanced compare to undoped. The enhanced photocatalytic activity of Ag/TiO_2 can be ascribed to a strong inhibition of (e^-/h^+) recombination. 0.5wt%Ag/TiO_2 exhibited the highest TOC abatement for MO. The greatest activity of 0.5wt%Ag/TiO_2 could be ascribed to the smallest size of the Ag particles. Moreover, this catalyst was very stable after three cycles of reuse and efficient under simulated solar light. Therefore, it is of much interest as a potential catalyst for the treatment of wastewater under solar.

Keywords: Mesoporous TiO_2, Silver, Photocatalysis, Wastewater treatment, Methyl orange.

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THERMAL ANOMALIES IN THE MEDITERRANEAN AND IN ASIA MINOR (1951-2010)

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In Europe, the current climate warming manifests itself with an increasing frequency of anomalously warm months (AWMs) and a declining frequency of anomalously cold months (ACMs). For the purpose of the study the authors define thermally anomalous months as months with the average air temperature at least two standard deviations higher or lower (AWM: $t \geq t_{av.}+2SD$, ACM: $t \leq t_{av.}-2SD$) than the long-term average (1951-2010). The aim of the study is to investigate the frequency of such monthly anomalies in southern Europe (approximately south of 45°N) in the Mediterranean and in Asia Minor, the change in such frequency over the 60-year study period, as well as the location of the anomalies and their coverage area. The authors will be presenting cases of monthly anomalies with the largest geographic extent.

Keywords: Global warming, Climate change, Thermal anomalies, Mediterranean, Asia Minor.

:: Paper No: GCGW - 2018 – P375 ::

THERMOECONOMIC ASSESSMENT OF A SOLAR BASED EJECTOR ABSORPTION COOLING SYSTEM WITH THERMAL ENERGY STORAGE: A CASE STUDY FOR AL-JOFRA CITY IN LIBYA

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Libya lying in one of the warmest regions in the world, a continuous cooling is required for domestic and industrial needs. In this study, a concentrated solar photovoltaic energy (CSPV) based ejector absorption refrigeration cycle (EARC) is evaluated using thermodynamic and thermoeconomic tools for a house requiring ~3.4 kW peak cooling in Libya. The solar data of Al-Jofra city is utilized to operate the CSPV system that produce enough heating and electricity for the refrigeration cycle generator and the thermal energy storage, as well as the system circulation pumps. The thermal energy storage medium uses Therminol59 as the heat storage medium to utilize the system when there is no solar energy input. The overall COP and exergy efficiencies of the system at peak time 0.82 and 32%, respectively. Cooling cost flow rate of the overall system is found to be around $0.22 per hour at generator temperatures above 100^{0}C without thermal energy storage, while it is determined to be as high as $0.29 per hour. Even though the system present high payback periods due to high investment costs for the CSPV equipment, almost 6.58 tons of CO_2 emissions can be prevented with this renewable based cooling system.

Keywords: Clean cooling, Absorption refrigeration, Ejector, Concentrated solar photovoltaics, Thermoeconomics.

:: Paper No: GCGW - 2018 – P379 ::

LARGE-SCALE MICROALGAE CULTIVATION: A POTENT SOLUTION AGAINST GLOBAL WARMING

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The culture of microalgae has unique characteristics, which make it different and, in many ways, attractive in comparison with other biofuel sources. Microalgae are autotrophic organisms that produce biomass using sunlight and extracting from the water dissolved inorganic nutrients, including carbon. Several microalgal species are perhaps the most attractive of all CO_2 removal and biofuel aquatic crops, thanks to high yields and low cost of production. Therefore, efficient production of bio-diesel and bio-ethanol from microalgae has been considered

Microalgae can be viewed as miniature biochemical factories, photo-synthetically efficient and effective CO_2 fixers. Many species of microalgae are rich in oil or sugars that can be converted into biofuels; as a result, the biofuel productivity of microalgae per unit area can be much higher than conventional farm crops, such as wheat and maize. Utilization of anthropogenic CO_2 as an industrial by-product for microalgae production holds great promise not only as a carbon sink, but also as a source of food, fodder, fuel and pharmaceutics. From an ecological point-of-view, generation of biomass should not aim to a single application, treating the remainder as a 'waste', but towards a comprehensive solution to several challenges, including bio fuel, carbon sequestration, waste remediation and natural production of food and biochemicals. The goal therefore should be the integration of the processes. Mass balance and energy balance, complemented by exergy analysis, can guide the optimization of the technologies and economics of using microalgae, regarding carbon sequestration, waste remediation, biofuel production and generation of microalgal products. Additional attractive characteristics of microalgae- based biofuels include (a) some microalgae are rich in oil, others in processable carbohydrates and proteins, (b) different microalgal species can be grown anywhere, in marine, brackish and fresh water and in most climates, (c) microalgae can grow well on liquid domestic and industrial wastewaters and on streams polluted by agriculture, reducing pollution as they grow, (d) microalgal biomass is desirable and valuable for a diverse array of commercial purposes, depending on species, quality and quantity.

This short-paper suggests that CO_2 uptake by microalgae can represent a considerable sink for anthropogenic CO_2 emissions and that harvesting and appropriate use of microalgae primary production is a commercially-viable approach for the amelioration of greenhouse gas emissions and renewable energy production.

Keywords: Microalgae, biodiesel, biogas, global warming.

:: Paper No: GCGW - 2018 – P381 ::

POTENTIAL OF INTENSIVE SEAWEED AQUACULTURE AGAINST GLOBAL WARMING

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Seaweed aquaculture already represents about a quarter of the world's aquaculture production, but its potential is far from being fully exploited. Seaweed cultivation techniques are standardized, routine, and economical. Despite the variety of life forms and the thousands of seaweed species described, seaweed aquaculture presently uses only about 100 taxa. The genera *Laminaria*, *Undaria*, *Porphyra*, *Eucheuma/Kappaphycus*, and *Gracilaria* account for about 98% of global production. However, cultivation of the commercially important species *Asparagopsis/Falkenbergia, Caulerpa, Chondrus, Cystoseira, Ecklonia, Gelidium Gigartina, Hypnea, Macrocystis, Palmaria, Monostroma, Pterocladia, Sargassum and Ulva* takes place in many different places. The world seaweed industry produces over 28 million tons (fresh weight) annually with a total value of over US $ 6.4 billion (FAO, 2006). The farming of seaweed has expanded rapidly as demand has outstripped the supply available from natural resources. Over 90% of the market is supplied by cultivation.

Seaweed growth rate and yield depend on species, the site of cultivation, the season and the cultivation methodology. For example, the daily growth rate (DGR) of *Kappaphycus alvarezii* usually varies between 2-3% and that of *Gracilaria spp*. between 3.3-8.4%, depending on factors, such as CO_2 level of surrounding seawater. Temperature increase may also affect the ability of seaweeds to perform in particular geographic areas, while both increased storm events and run-off from land are likely to impact seaweed growth. Large-scale seaweed culture is attractive due to low cost technologies that have been in operation for decades, and the multiple uses of the product. Yields of seaweeds can be as high as 80 mt dw ha^{-1} y^{-1} in modern intensive pond farms, while extensive low technology coastal farms regularly get yields above 20 mt dw ha^{-1} y^{-1}. Seaweeds can take up 29 mt carbon ha^{-1} y^{-1} in modern intensive farms and 7.3 mt carbon ha^{-1} y^{-1} in low technology farms. Possibilities also exist for promoting intensive growth of seaweeds in integrated aquaculture (IMTA).

IMTA seaweed farming provides exciting new opportunities for valuable crops of seaweeds with higher production. IMTA practice combines the cultivation of fed finfish with extractive shellfish and seaweeds for an ecologically-balanced aquaculture. IMTA can increase the long-term and overall sustainability and profitability per cultivation unit as the wastes of the main cultured species are biomitigated through conversion into fertilizer, food, and energy through additional commercially valuable species. In this way, otherwise costly waste mitigation processes become revenue-generating cultivation components, which, by their harvest, export nutrients outside of the coastal ecosystem. It is important to note that 830 tons of CO_2 y^{-1} can be thus exported by an IMTA farm that produces 1,000 mt fish, 2,000 mt shellfish and 500 mt seaweed. An IMTA farm that produces 1,000 mt fish and 7,000 mt seaweed can export 1,230 tons of CO_2 y^{-1}. The seaweed IMTA component may include species of *Gracilaria*, *Porphyra*, *Eucheuma/Kappaphycus*, *Laminaria*, *Undaria*, *Ecklonia, Macrocystis, Ulva,* and *Caulerpa.* However, other commercially important species, such as *Palmaria*, *Chondrus, Gigartina*, *Hypnea*, *Sargassum*, *Cystoseira*, *Asparagopsis/Falkenbergia* etc. have also high potential in IMTA systems. Today, Several IMTA projects are being conducted in different parts of the world. The goal is to develop for different aquaculture environments profitable modern IMTA seaweed farming components. IMTA technologies with seaweed culture are bound to play a major role worldwide in sustainable expansions of the aquaculture operations within balanced ecosystem. Similarly, seaweeds culture is ready to respond to the worldwide increasing demands for renewable fuel and efficient CO_2 removal.

Keywords: seaweeds, algae, aquaculture, IMTA, global warming

:: Paper No: GCGW - 2018 – P383 ::

A CONSTRUCTAL FLOW FIELD LAYOUT FOR DIRECT METHANOL FUEL CELLS

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In this study, as an alternative to conventional flow distributors, an innovative three-shaped flow-field layout with four-level of bifurcation is designed according to the constructal theory to achieve uniform reactant distribution in direct methanol fuel cells (DMFCs). A three-dimensional (3D) numerical model is developed to provide insights into the designed flow-field layout's internal transport characteristics, such as flow and pressure distributions and crossover current densities. Single cell performance tests are also performed to validate the numerical model with the experimental data. Comparison is made with a conventional serpentine flow-field layout. The experimental and numerical results show that the tree-shaped flow-field layout indeed provides more uniform reactant distribution and far less pressure drop than its serpentine counterpart. Thus, the innovative flow-field design investigated in this study has not only a great promise of opening up an opportunity to improve the cell performance, but also reduce the overall cost, weight and complexity of the fuel cell system, specifically when the relative less pumping power requirement for reactant and oxidant supply is considered.

Keywords: Constructal theory, Direct methanol fuel cell, flow-field design.

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DIRECT CONVERSION OF WASTE BIOMASS TO 5-HYDROXYMETHYLFURFURAL AND LEVULINIC ACID OVER CARBON BASED SULFONATED SOLID ACID CATALYST

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In recent years, due to the consumption of fossil resources that also cause environmental concerns, utilizing of renewable materials has been gaining significant attention for producing high-value organic compounds and biofuels through environment-friendly processes. The use of lignocellulosic/cellulosic waste biomass as raw material is becoming a major alternative to fossil fuels, since it is widely abundant and inexpensive. All among products derived from lignocellulosic/cellulosic biomass, 5-hydroxymethylfurfural and levulinic acid are recognized as a promising platform molecule for production of high value–added products such as plasticisers, resins, herbicides, flavouring agents and solvents, as well as biofuels [1]. In this study, we report a one-pot production of HMF and LA from different waste biomass materials (corn straw, cotton linter and waste textile fluff) over wheat straw-derived sulfonated solid acid carbon catalyst in hydrothermal conditions. The effects of biomass type, reaction time, reaction temperature were investigated to optimize the process. The structure and acidity of the catalyst were characterized by physisorption of N2, fourier transform infrared spectroscopy, scanning electron microscopy and elemental analysis and it showed that wheat straw-derived sulfonated solid acid carbon catalyst is a cheap and promising catalyst for the synthesis of especially LA during the single-step hydrolysis and conversion of real biomass feedstock. Corn straw biomass was the most suitable feedstock for 5-HMF and LA production in aqueous media at 200°C for 1 h.

Keywords: 5-HMF, Levulinic acid, Sulfonated carbon catalyst, Biomass.

:: Paper No: GCGW - 2018 – P385 ::

POWER CONTROL OF FUEL CELL CONNECTED TO POWER SYSTEM

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A hybrid power generation system is a mix of two or more power generation sources differ, but supplementary energy generation systems based on renewable energies or diverse. Fuel Cells to Play Important Role in Power Generation. it is technologies, finding application in large stationary power generation. they will also support the development of distributed power generation. This paper gives the grid connected fuel cell which designed 50 kW and source power generating systems as well as control of fuel cell based distributed generation systems, an inverter and control them. The design system used isolated loads as well as linked to a system connected to the grid. The MATLAB/SIMULINK is used for modelling and developing this system. therefore, this system controls the power of the fuel cell, while this control did not allow to exceed the rated power of the fuel cell 50 kW. Although the power of the load is increased more than the power of the fuel cell. Therefore, this increase in the power of the load or this power difference is provided by the power source.

Keywords: Fuel cell system, Power system, Power electronics converters

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EXPERIMENTAL AND NUMERICAL INVESTIGATION OF 18650 LITHIUM-ION BATTERY CELLS

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Battery technology plays a vital role in numerous applications from daily to industrial applications. While the capacities of the batteries are increasing the size of the batteries are becoming smaller to reduce the required spacing within the device. One of the most advanced types of batteries is the lithium-ion battery cells. In this study, a three-dimensional numerical model is developed to investigate the thermal and electrical characteristics of 18650 lithium-ion battery cells. The NTGK battery model of ANSYS-Fluent is used to simulate the coupled multiphysics problem. In the analyses, the discharging period of the battery is considered. The time-wise variations of the cell temperature and the battery voltage are evaluated both experimentally and the numerically. Experiments are conducted within a temperature-controlled test cabin under two different ambient conditions as 0°C and 25°C. The difference between the predicted battery surface temperature and test data temperature is less than 1°C. The results reveal that the current reduced model could achieve reasonable predictions to understand the transient behavior of the battery cell. Further analyses are conducted to investigate the influence of the convective heat transfer coefficient and the ambient temperature on the thermal and electrical behavior of the battery cell.

Keywords: 18650 Lithium ion battery, NTGK battery model, Experimental and numerical study

:: Paper No: GCGW - 2018 – P388 ::

WIND ENERGY AND UNCERTAINTY

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Estimating wind energy production, in the context of field life cycle analysis, the uncertainties become crucial for the success of investments to be made. In this study, all the uncertainties for wind energy production are reviewed and some case studies are evaluated, as samples.

Keywords: Renewable energy, Wind energy, Uncertainty.

:: Paper No: GCGW - 2018 – P389 ::

AN ELECTRICAL NETWORK CONNECTED FUEL CELL BASED ON (MLFFN) MULTILAYER FEED FORWARD NEURAL NETWORK

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Electrical Power utility should continually provide the flow of energy at their customers, with maintaining sinusoidal and symmetrical voltage at the constant frequency and rms value of supply voltage. But due to power system variations under normal operation and to unwanted events like short-circuit faults, the Power utility never assure these requirements. The aim of this paper is to present a shunt active compensator supplied by the Fuel cells, in shunt active compensator feeds the linear and nonlinear loads by harmonics and reactive currents and the overload energy is released to the power system.

In order to reach multifunctions as harmonic mitigation, reactive and active power control, this paper uses the (MLFFN) Multilayer Feed Forward Neural Network as a control system; the plan is made up of fuel cells, linked to a shunt active compensator. The simulation results prove the efficiency of this plan with the mentioned method for release the fuel cell energy to the power system and power quality improvement.

Keywords: PEMFC, MLFFN, Power-Factor, active compensator, harmonics current

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THE PERCEPTION OF NATURAL AND BUILT ENVIRONMENT OF SECONDARY SCHOOL STUDENTS

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The problems we face today like climate change are the product of the society's current outlook on the environment as a source and product that can be utilized as necessary. Therefore, a solution requires a different outlook to bring solution to such environmental problems. One approach is awareness campaigns on the interaction of humans with their environment. Another is a more systematic change in schooling children on these concepts. This paper presents the preliminary results of a project that focuses on creating awareness on the concepts of natural and built environment and their interaction with each other. The project involved six secondary schools and 130 students. The students were selected from different socio-economic backgrounds and academic and art achievements. Their perception of natural and built environmental problems were taken individual pretest and group study. In the group study, they discussed and listed the most significant natural problems they perceived and generated solutions for these problems. These problems and solutions are given and grouped in this paper. The similarities and differences between the children's perceptions are highlighted. The results indicate that most of the children perceive smoke, deforestation and hunting of natural wildlife as one of the most significant problems. Climate change is in the list, even though it is not perceived as the highest priority, solutions regarding the most significant problems such as utilization of renewable energy, reducing smoke and planting more trees also would contribute to mitigating climate change.

Keywords: Nature, Environmental awareness, Environmental perception, Natural environment, Built environment

:: Paper No: GCGW - 2018 – P391 ::

DEVELOPMENT OF PHASE CHANGE MATERIAL/DIATOMITE NANOCOMPOSITES FOR THERMAL ENERGY STORAGE

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Global warming is one of the most important consequences of excess energy consumption. Phase change materials can be used as energy storage materials to reduce heating and cooling load of buildings. This work aims to develop thermally stable natural Phase Change Material/diatomite composites for thermal energy storage applications like buildings. Phase change material(PCM) is one of the effective solution in curing global warming. Phase change materials store or release large amounts of heat as they change phase like from solid to liquid. Diatomite is one of the important natural raw material with significant reserves in Turkey. Diatomite has tubular structure with nano pores which become important in composite preparation. Phase change material/diatomite nanocomposites provides a new solution in energy storage materials. The nano pores of diatomite protects phase change materials (PCMs) from environmental effects as a shell material and phase changing occurs in nanopores of diatomite. In this study PCM/diatomite composites were prepared. The properties of PCM/diatomite composites have been characterized by scanning electron microscopy (SEM), differential scanning calorimetry (DSC), and Fourier transform infrared (FTIR) spectral analysis.

Keywords: phase change material, thermal energy storage, diatomite, composite

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ANALYSIS AND OPTIMIZATION PROPOSAL OF A TYPICAL BUILDING IN TEHRAN USING TRNSYS SOFTWARE

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In this research, a home-made engineering project in Tehran will be developed which will be close to zero in terms of energy (this will be discussed later). To achieve this goal, the house should be optimized in terms of energy consumption and effective parameters of the building architecture, cooling and heating systems as well as lighting and other power consuming equipment should be properly located and optimized in order to reduce energy losses through this. In the current paper a multizone building is simulated in TRNSYS and in Tehran's wheatear condition, the heating and cooling demand is presented in air-conditioned state of the house. results show that. How this Building Needs Energy in the times of the year in the city of Tehran. The types of walls are illustrated, and the amount of heating and cooling demand needed in the conditioned system is shown in Figure 3.

Keywords: TRNSYS, Building Optimization, Sensible heating, Sensible Cooling

:: Paper No: GCGW - 2018 – P393 ::

THEORETICAL INVESTIGATION OF BUOYANT AIRBORNE WIND TURBINES FOR A MODEL AND PROTOTYPE IN TERMS OF QUANTITY OF HELIUM FOR BALANCE CONDITIONS

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The researches on the wind turbines which are using wind energy which is clean and renewable as energy source have been increasing in recent years because of global warming etc. However, the potential for causing negative effects on the environment in the installation and operation of conventional wind turbines is at a level that cannot be neglected. For this reason, in this study; the introduction and development of the Buoyant Airborne Wind Turbines (BATs), which differ in many aspects from the classical wind turbines and are not yet well recognized in our country, are targeted. These turbines used to obtain electricity from low or high-altitude winds, generally, consist of flexible body (balloon), fuselage wings, airfoil, rotor, generator, helium gas, and ropes connecting the turbine to the ground. This kind of turbine doesn't demand big and expensive towers which are used for traditional wind turbines which have vertical or horizontal axes. These portable turbines can be constructed in places where they will be used about in a day without need for large-capacity lifting machines. Also, it is one of the most important advantages of these turbines, that they can benefit strong winds at the high altitudes which cannot be reached to by other turbines.

In this theoretical study; it is aimed to investigate the introduction and development of BATs and to examine the variation of the maximum electrical power that can be produced by their model and prototype (actual sized turbine) with the height. Also, in the study; change of temperature, pressure, and density of atmospheric air and mean speed of wind with the height and the amount of helium that must be contained by a wind turbine in order for such a turbine to be balanced in vertical direction at a certain height are determined. Moreover, drag force acting in the horizontal direction to this type of wind turbine at a given altitude is calculated. Finally, the average air density in a zone between the ground and a certain height is calculated.

Thus, within this study; change of the properties of atmospheric air, the average wind speed, and the maximum electrical power that can be generated by means of a BAT type wind turbine of a specific size with the height are theoretically determined. In addition, in order to make these turbines known; the maximum electrical power that can be produced by a certain scaled model of this specific BAT to be used in Ankara at various heights near the ground was calculated. Using these obtained results, a comparison is made between the model and the prototype in terms of the theoretical electrical power that can be produced.

Keywords: Buoyant airborne wind turbine, Wind energy, Wind power, Properties of atmospheric air, Helium gas.

:: Paper No: GCGW - 2018 – P394 ::

ENERGY STORAGE MATERIALS: SEPIOLITE/PHASE CHANGE MATERIAL NANOCOMPOSITES

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Phase change materials are energy storage materials and can used to decrease heating and cooling load of buildings and also to obtain thermal management in many thermal energy storage applications. Thermal energy storage (TES) in PCMs, allows to use of energy which is stored in the time available from renewable energy sources when it is needed. The studies of thermal energy storage in natural mineral/PCM composites show an increase in recent days. Sepiolite is important natural mineral with significant reserves in our country. Due to its morphological and chemical properties it can be used as supporting material of composites. This study focuses on preparation of Sepiolite phase change material composites which can be used in thermal energy storage applications. Sepiolite was used as supporting material of phase change material composites. The thermal analysis indicates that Sepiolite/phase change material which was prepared in this study exhibit good thermal properties. This study has a great importance for our country's economy because of utilizing major underground riches of sepiolite as value-added technological products as energy storage materials.

Keywords: Phase change material, Thermal energy storage, Composite, Sepiolite, Energy storage materials

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DEGRADATIONS IN POROUS COMPONENTS OF A PROTON EXCHANGE MEMBRANE FUEL CELL UNDER FREEZE-THAW CYCLES

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Proton exchange membrane (PEM) fuel cells are promising energy-conversion devices, particularly for next-generation transportation applications. However, fuel cells in such applications are likely to experience sub-freezing conditions, which triggers ice-formation (hence volumetric expansions) in porous cell components, including macroporous substrate (MPS), microporous layer (MPL), and anode and cathode catalyst layers (CLs), eventually deteriorating their morphological, microstructural, and physical characteristics. With an improved understanding of these components' degradation patterns under freeze-thaw cycles, their durability could be substantially improved, which would enhance the fuel cells' suitability for end-use applications. In this study, MPSs, double-layer GDLs (MPL deposited MPSs), and catalyzed electrodes are exposed to consecutive 60 freeze and thaw cycles between the temperatures of -40°C and 30°C; and morphological, microstructural, and physical characteristics of these porous components are investigated on completion of each 15 cycles. The results show that continuous cycling of the temperature causes different degradation patterns in different components since each component is comprised of different materials. The MPS faces relatively less degradation in its morphological, microstructural, and physical characteristics than the other porous components, i.e., MPL and CLs, such that only the macro-scale pores become relatively larger, and the polymeric binder at the interfaces of carbon fibers detaches from the surfaces, and in some locations, this detachment causes formation of relatively small-scale pores. These changes noticeably decrease the MPS's surface wettability while increasing its gas permeability. However, the MPL and CL experience relatively more degradation, and both the components' surface becomes gradually inhomogeneous during the cycling. For example, in the MPL, the hydrophobic agent agglomerates detach from some locations, and these agglomerates combine and become even larger throughout the surface, leading to an undesirable surface morphology, and significant deterioration in its surface wettability. However, in the CLs, the polymeric binder detaches from the surface and agglomerates in certain locations, eventually leading to an inhomogeneous surface morphology, as well as physical characteristics. During the continuous cycles, both the MPL and CL, experience severe material loss, noticeably increasing their mean pore size and gas permeability.

Keywords: Proton exchange membrane fuel cells, Gas diffusion layer, Microporous layer, Catalyst layer, Freeze-thaw cycles

:: Paper No: GCGW - 2018 – P396 ::

ON SOME CLIMATE CHANGE SPECIFICS ON THE TERRITORY OF GEORGIA

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The problem of climate change resulting from the growing anthropogenic factors acquires a particular importance for Georgia too. The Georgian climate is characterized by a specific diversity. Namely the statistical processing of the data of mean climatic temperature of the last ninety years exposed the regularity of the climate cooling in the West Georgia and warming in the East Georgia. Also there were elicited those micro-regions where mean climatic temperature had not changed in time. In the present study with the view of finding out the details of the atmospheric currents transformation and the effects of thermal and advective-dynamic factors of atmosphere on the climate changes in Georgia some numerical experiments have been performed by WRF model. The specific properties of regional climate warming process in the eastern Georgia have been studied by statistical methods and mathematical modelling. Some experiments correspond to RegCM4.7 model physics options that have been used to study both regional climate and dust effect over the territory of Georgia are presented. Some results of investigation of Georgian's glaciers pollution and its melting process are given.

Keywords: Georgia, Climate change, WRF, RegCM models, Dust.

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TECHNICAL ASSESSMENT OF A FUEL CELL-BATTERY HYBRID DRIVE POWER SYSTEM: A SYSTEM DYNAMICS APPROACH

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In this study, a fuel cell/battery hybrid propulsion power system for a ferry was modeled in MATLAB/Simulink environment. The main engine power values needed for the ship to be used for simulation are obtained on board by recording them instantaneously. Three different battery types (lead-acid battery, nickel metal hydride battery, and lithium-ion battery) are selected for the model. In simulations, the situation in which the ferry can only provide one day's transport requirement using the fuel cell-battery hybrid power system is assessed. The comparison of the weight of the batteries used was based on the assumption that the batteries were fully discharged starting from a hundred percent charge. In addition, a system dynamics approach has been implemented using the Vensim® package program so that the suitability of the designed model can be evaluated more accurately by considering the entire system. As a result of the evaluations carried out within the scope of the acceptance, the lithium-ion type batteries were found to be the most suitable for working with PEM type fuel cells among the selected batteries. However, it is also stated that the need for daily propulsion power of the ship is evaluated only by batteries and that the most suitable battery type is carried out as nickel metal hydride battery. As a result of the evaluation made, it was seen that the fuel cell/battery hybrid power system was not able to attain sufficient weight gain and these technologies are needed to be developed.

Keywords: Fuel cells, Vensim®, System dynamics, MATLAB/Simulink, Hybrid propulsion system.

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POLY(VINYL ALCOHOL)/NAFION NANOFIBROUS MEMBRANES FOR THE USE IN DIRECT METHANOL FUEL CELLS

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Bead-free PVA/Nafion nanofibres were produced using electrospinning method. Resultant PVA/Nafion nanofibres were stabilised using two different methods such as BTCA crosslinking and thermal stabilisation, followed by sulfonation of PVA part. FT-IR analysis demonstrated that the membranes was stabilised and sulfonated successfully. Thermal, water, methanol and oxidative stability of the membranes were tested as well as ion-exchange capacity. Morphological changes in the structure were analysed using SEM analysis. Thermally stabilised PVA/Nafion nanofibrous membrane was found to be stable against water, methanol and oxidative effects. The nanofibrous structure was well preserved after treatments, while the other membranes became a film-like material. Thermal stability of PVA/Nafion nanofibrous membrane was similar to that of commercial Nafion® 115 membrane up to 200 °C. In conclusion, it was indicated that thermally stabilised PVA/Nafion nanofibres have sufficient stability to fuel cell working conditions and higher swelling degree would be advantageous particularly in terms of reducing methanol permeability directly in methanol fuel cells.

Keywords: Direct methanol fuel cell, Nafion, poly(vinyl alcohol), Nanofibre, Stability.

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DUST INFLUENCE ON GEORGIAN CLIMATE

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In the present study with the view of finding out the details of the dust aerosols influence on the climate changes in Georgia some numerical experiments have been performed by WRF and RegCM models. Toward this purpose we have examined dust aerosols short term transfer by WRF/Chem model and its long term 30 years simulations with and without dust effects based on RegCM4.7 model with 16.7 km resolution over the Caucasus domain and with 50 km resolution encompassing most of the Sahara, the Middle East, the Great Caucasus with adjacent regions. Results of calculations have shown that dust aerosol is an active player in the climate system of Georgia.

Keywords: Dust, climate change, WRF model, RegCM model, Georgia

:: Paper No: GCGW - 2018 – P400 ::

A WELL TO PUMP LIFE CYCLE ENVIRONMENTAL IMPACT ASSESSMENT OF HYDROGEN PRODUCTION ROUTES

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In this study, a well to pump life cycle assessment is performed for hydrogen production routes of water electrolysis via U.S electricity mix, biomass gasification, coal gasification, steam methane reforming, hydrogen production from ethanol and methanol. The CML 2001 impact assessment methodology is utilized to convert the associated emissions to environmental impacts. Hydrogen production route through water electrolysis by utilizing the U.S electricity mix is found to have comparatively higher life cycle global warming potential of 28.6 kgCO_{2eq}/kg H_2, acidification potential of 0.069 kgSO_{2eq}/kg H_2 and human toxicity potential of 0.033 kg DCB_{eq}/kg H_2. Also, hydrogen production route utilizing ethanol is determined to have comparatively higher life cycle eutrophication potential of 0.0043 kg PO_{4eq}/kg H_2 and photochemical ozone creation potential of 0.0045 kg $ethene_{eq}$/kg H_2. Coal gasification hydrogen production route is found to have high global warming potential, however, it has lower environmental impacts when other impact categories are considered. The results of this study signify the importance of life cycle assessment in comparing the environmental sustainability of hydrogen production routes.

Keywords: Hydrogen production, Life cycle assessment, Environmental impacts, Comparative assessment

:: Paper No: GCGW - 2018 – P401 ::

LIFE CYCLE & COST ANALYSIS (LCCA) FOR MICROALGAE PRODUCTION: A CASE STUDY OF PILOT SCALE APPLICATION

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The microalgae represent a potential feedstock for fuels and other valuable chemicals and are considered as potential sources for bioenergy production. However, the large-scale application of microalgal by-product production would be limited cost of lipid extraction and the availability of water, CO_2 and nutrients. As such, the aim of this paper is to analyze the potential environmental benefits and shortcomings for the harvesting of microalgae in the biofuel production process. The method employed is a comparative LCA, where four alternative scenarios based on the application of two cultivation technologies are taken into account.

Keywords: Microalgae, biodiesel, energy, LCA, cost

:: Paper No: GCGW - 2018 – P402 ::

INVESTIGATION OF MICROBIAL COMMUNITIES IN THE FIELD-SCALE CO-COMPOSTING OF SEWAGE SLUDGE AND ORGANIC MUNICIPAL SOLID WASTES

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According to European Landfill Directive (99/31/EC) and Turkey Landfill Regulation the total amount of biodegradable wastes disposed in landfills must be gradually reduced. Therefore, alternative options should be used to treat sewage sludge and municipal solid wastes which are mostly landfilled in Turkey. Co-composting of these waste streams is a suitable method yielding a useful product. The objective of this study was to determine microbial community during the field scale co-composting of sewage sludge and organic municipal solid wastes with addition of bulking agents. Aerated static pile of approximately 26 m^3 was used for 56-day composting process. Investigations of diversity dynamics depending on temperature were determined by denaturing gradient gel electrophoresis and sequencing of bacterial 16SrDNA-PCR products. Changes of physicochemical parameters and biodegradability during the process were also monitored. Results show that most of microbial group's role in composting process was temperature dependent and composting was designated by its characteristic thermal profile.

Keywords: Aerated static pile, Composting, Microbial community, Organic municipal solid wastes, Sewage sludge

:: Paper No: GCGW - 2018 – P403 ::

DEVELOPING HALOGEN-FREE POLYSTYRENE WITH ENHANCED FIRE RESISTANCE

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Greenhouse gas emissions for the energy demand of buildings significantly exceed those from transportation. Thus, energy efficiency in buildings is considered as a potential challenge of global energy and climate change. Nearly 35% of the total CO2 emissions come from heating and cooling buildings. Hence, good insulation is the key parameter to reduce emissions and obtain efficient energy usage in buildings. Expandable polystyrene insulation boards are one of the most preferred materials due to their advantages like constant thermal resistance, sustainability, chemical inertness, dimensional stability and low costs. However, the exclusion of hexabromocyclododecane (HBCD) from these materials regarding environmental and health concerns caused a decrease in their fire resistance. Therefore, to develop a halogen-free alternative flame retardant to be used in polystyrene products is of crucial importance. The objective of this project is to develop halogen-free flame retardant polystyrene by the addition of melamine derived flame retardant materials which are already used in different industries other than polystyrene. Melamine cyanurate is used for polyamides, polyurethanes, epoxides and polyolefins. It is stable up to 320°C and has the following flame-retarding mechanisms as heat sink from deposition and oxygen dilution due to the vaporization of melamine during combustion. On the other hand, melamine phosphate based salts release water above 200°C acting in a heat sink mechanism. Above 350°C melamine-poly-phosphate undergoes decomposition and form a char around the polymer leading to prevent oxygen interaction during combustion. Melamine cyanurate and phosphate additives were mixed during suspension polymerization of polystyrene in order to obtain fire resistant polystyrene. The interaction of the monomer, melamine salts and suspension agents along with changes in viscosity was tracked to sustain the suspension system.

Keywords: Climate change, Energy efficiency in buildings, Insulation, Polystyrene boards

:: Paper No: GCGW - 2018 – P404 ::

DIFFERENT STATISTICAL MODELS OF BIOCHEMICAL METHANE POTENTIAL (BMP) FOR DIFFERENT SUBSTRATE TO INOCULUM RATIO

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In this study, biochemical methane potential was determined using different substrates (macroalgae and market place waste), different substrate inoculum ratios (SIRs – 0.5, 2.0, 4.0, and 6.0 $gVS_{substrate}/gVS_{inoculum}$), different temperatures (35, 45, and 55°C), and different pretreatment methods (microwave, thermal and ultrasound). Also, the first-order kinetic model, the modified Gompertz equation, logistic function and transference function were used to estimate performance parameters and cumulative biogas production. All models agreed well with experimental data with coefficients of determination between 0.90 and 0.99, where the transference function was much better (R^2>0.99) than the other three models. The maximum biogas production was obtained from the transference function were 295.4 m^3/tone waste at 35°C. Although the biogas production rate change was negligible after pretreatment, the lag period was observed to decrease (from 1.49 and 1.10 to 0) significantly. Transference function plot both had higher correlation than the others rise to maximum plot for simulating cumulative biogas production.

Keywords: Biochemical methane potential (BMP), kinetic model, macroalgae, market place waste

:: Paper No: GCGW - 2018 – P405 ::

BIOENERGY PRODUCTION FROM *CHLORELLA VULGARIS* AND *NANNOCHLOROPSIS OCULATA* CULTIVATED IN A PILOT SCALE SYSTEM

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Microalgae is a promising alternative source of biomass for bioenergy production for replacing conventional fossil fuels in the last decade. It is of quite important to determine the most feasible bioenergy products that can be produced from microalgae. The present study investigates the bioenergy production from microalgae cultivated in a pilot scale system. Three different system, lipid production, biomethane production via anaerobic digestion, and directly electricity production via microbial fuel cell were examined within this scope. Considering the data obtained, it has been decided that the lipid production was the best option with the 50% lipid conversion rate.

Keywords: Microalgae, Lipid extraction, Biological methane production (BMP), Microbial fuel cell (MFC)

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HYDROGEN AS A SUSTAINABLE TRANSPORTATION FUEL TO COMBAT GLOBAL WARMING

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Hydrogen is seen as the major component of future sustainable energy systems. Transportation sector is one of the largest consumers of the global energy market. Hydrogen can become a promising fuel for sustainable transportation by providing clean, reliable, safe, convenient, customer friendly, and affordable energy. In this study, the possibility of hydrogen as the major fuel of future transportation systems has been investigated comprehensively based on the recent studies published in the literature. Due to its several characteristic advantages such as energy density, abundance, ease of transportation, a wide variety of production methods from clean and renewable fuels with zero or minimal emissions; hydrogen is a great chemical fuel which can potentially replace fossil fuel use in internal combustion engines. In order to take advantage of hydrogen as an internal combustion engine fuel, existing engines should be redesigned to avoid abnormal combustion. Hydrogen use in internal combustion engines could enhance system efficiencies, offer higher power outputs per vehicle, and emit lower amounts of greenhouse gases. Even though hydrogen powered fuel cells have lower emissions than internal combustion engines, they require additional space and weight and they are generally more expensive. Therefore, the scope of this study is hydrogen fueled internal combustion engines. It is also highlighted that in order to become a truly sustainable and clean fuel, hydrogen should be produced from renewable energy and material resources with zero or minimal emissions at high efficiencies.

Keywords: Hydrogen, Fuel, Sustainability, Internal combustion engine, Transportation, energy

:: Paper No: GCGW - 2018 – P407 ::

INNOVATIVE CATALYST SYNTHESIS AND PERFORMANCE TESTS ON DIRECT ALCOHOL FUEL CELLS

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Reduced graphene oxide (rGO) supported Fe-Ni nanocatalysts doped with N were synthesized for direct methanol fuel cells as an alternative to precious metal catalysts. Graphene oxide (GO) was prepared via improved Hummers (Marcano) method while catalysts were prepared via a combined sacrificial support and wet impregnation methods. By this way, graphene oxide was obtained without exfoliation. N doping was provided by pyrolysis of urea which also provided the reduction of GO support simultaneously. Fe:Ni ratio was selected as 3:1. XRD measurements of the catalysts confirmed the reduction of graphene oxide layer while three characteristic diffraction peaks of FeNi alloy corresponding to (111), (200) and (220) as 43.39°, 55.0° and 78.26°, respectively, were also verified. The average crystallite size of the FeNi catalyst was calculated via Scherrer's equation around 3 nm. Moreover, the interlayer distance of 7.92 Å of GO shows the efficiency of this method to obtain GO without exfoliation process. The electrocatalytic activity for methanol oxidation of the catalysts was obtained with Cyclic Voltammetry (CV) applied between 1.0 V – 2.0 V at a scanning rate of 50 mV s^{-1}. The catalyst amount employed for the working electrode with a surface area of 1cm^2 was around 16.8 mg. The electrochemical measurements were carried out in a 0.5 M H_2SO_4 electrolyte that contains 1.0 M MeOH. A maximum of 0.03142 mA was obtained against 2 V. Hence, CV measurements showed that even though a low catalyst to surface area ratio was applied on test, the oxidation process takes place during the electrocatalytic activity with a reasonable value when compared to the other studies based on non-precious electrocatalysts for direct methanol fuel cell applications.

Keywords: Direct methanol fuel cells, Non-precious electrocatalysts, Sacrificial support method.

:: Paper No: GCGW - 2018 – P408 ::

NUMERICAL INVESTIGATION OF THERMAL HYDRAULIC EFFECT OF PLATE NUMBER OF BRAZED PLATE HEAT EXCHANGERS

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Plate heat exchangers (PHE) are thermo-hydraulic components which have high heat transfer rate for per unit plate surface area. PHE's are utilized as secondary heat exchanger in combi boilers in order to produce hot water for domestic use. BPHE's – brazed plate heat exchangers are heat exchangers where stainless steel corrugated plates are brazed with copper to form PHE channels wherein domestic water and closed circuit hot water flows side by side. The heat of the hot water which flows in central heating channel (CH), is transmitted to the relatively cold-water flows in the domestic hot water (DHW) channel, so, warm tap water is obtained in the end of this heat transfer process. Within Bosch thermotechnology, Manisa-Turkey site is responsible of producing BPHE, nearly 550.000 pieces are produced all the year round 2017.

In the current study, thermal hydraulic performance of plate number of a brazed plate heat exchanger (BPHE) was investigated numerically. Numerical results showed that heat exchange taken place throughout flow channels are not uniform channel to channel. Flow rate maldistribution was observed between channels and this was emphasized as less number of plates used to construct entire BPHE.

Keywords: Plate heat exchanger, PHE, Numerical simulations, Domestic hot water.

:: Paper No: GCGW - 2018 – P409 ::

NUMERICAL INVESTIGATION OF THERMAL HYDRAULIC EFFECT OF PLATE NUMBER OF BRAZED PLATE HEAT EXCHANGERS

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In this study, a numerical model of a cylindrical magnetocaloric regenerator in a Halbach array is developed in ANSYS-FLUENT. The model consists of three components as (i) Halbach array, (ii) Magnetocaloric material and (iii) Heat transfer fluid. The system is reduced into 2D numerical due to the axisymmetric geometry of the physical problem. To simulate the fluid flow, a pressure difference is defined between the inlet and outlet sections of the fluid domain. In the proposed computational scheme, a segregated approach is followed to consider spatial distribution of the magnetic field. To do so, a two-dimensional magnetic field within the magnetocaloric material is determined using an analytical approach, and the results are then integrated into the ANSYS-FLUENT with a dedicated user-defined function (UDF). Hydrodynamic and heat transfer characteristic of the proposed system is evaluated under various flow Reynolds number.

Keywords: Magnetic Refrigeration, Weiss Mean Field Theory, Magnetocaloric Effect, Magnetic Regenerator.

:: Paper No: GCGW - 2018 – P410 ::

REHABILITATING THE CARBON CYCLE WITH BIODESIGN IN ARCHITECTURE

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The carbon emission has reached enormous rates all around the world since the beginning of the industrial revolution. These releases have negative effects on the carbon cycle, which has a direct effect on the life over the Earth. The urbanization causes a wide pie on the chart of carbon dioxide emissions. Therefore, architects and engineers have to look for new solutions in their designs and products to achieve zero emission release. But it is generally overlooked that the process of construction has its own big slice, around 40%, resulting in emissions, during the construction process itself (from materials extraction, processing, transportation, assembly etc.). Thus, it usually harms the carbon cycle in the environment and is considered to have an impact on clmate change.

This paper aims to investigate if another kind of architecture is possible by linking biodesign and bioarchitecture concepts and using them to rehabilitate the carbon cycle. It focuses on two case studies of bio-design in architecture which offers novel low carbon emission construction process by creating the product by or within the nature itself; Neri Oxman's Slik Pavillion and Wolf Hilbertz's Sea-Autopia Ampere (Eco-Island City) proposals. "A new approach to eco-construction methods can be achieved by Bio-Architecture"; is the hypothesis of the study. Bio-design is slowly coming to reality by the fast development in Technology and science. The results indicate the potential effects of Bio-architecture on the environment.

Keywords: Bio-Architecture, Bio-Design, Eco-Construction, Carbon-cycle, Sustainability.

:: Paper No: GCGW - 2018 – P411 ::

PERFORMANCE ANALYSIS OF PHOTOVOLTAIC/THERMAL SYSTEMS WITH EXTENDED SURFACE

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Energy demand of the world is increasing day by day. Sun is the one of the main sources in terms of renewable energy. Solar energy can be converted to electrical energy with photovoltaic panels. Photovoltaic systems have important role in harnessing energy from sun. Photovoltaics have the advantage of being locally available, low operation cost and being less pollutant relative to other energy sources. One of the main downside of photovoltaic thermal systems is efficiency. Efficiency of photovoltaics are directly related to semi-conductor material of panel. Higher efficiencies can be gathered from more quality material which generally costs more than the standard materials. In addition to material dependency, efficiency value of photovoltaic system decreases with increasing operation temperature. Passive and active approaches can be used for thermal control of the system. As active thermal control method application, it is planned to improve the total efficiency of the system by forced air circulation through channels which are located under the photovoltaic cells. In addition to forced air circulation, aluminum fins added to flow channel in order to increase heat transfer area. In this work, three dimensional numerical models of photovoltaic thermal system with air channel developed with ANSYS-FLUENT software. The thermal model consists of five different layers which are glazing glass, photovoltaic cell, air gap, absorber plate and air channel. Natural convection effect of the stagnant air in the air gap is simulated via efficient thermal conductivity approach. One dimensional thermal model developed in order to validate FLUENT model. After the validation work, steady state and transient numerical analyses have conducted under different geometrical parameters and flow control conditions.

Keywords: Renewable energy, Thermal control of photovoltaic system, Mathematical modelling

:: Paper No: GCGW - 2018 – P412 ::

A NUMERICAL ANALYSIS OF CONDENSERS AND EVAPORATORS BY USING TEMPERATURE TRANSFORMING MODEL

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In this paper one-dimensional, steady, numerical analysis of the thermal behavior of the tube and tube evaporators and condensers has been studied. The governing equations (continuity, energy) in the tubes and the annulus are discretized by finite-volume technique and they are solved iteratively by Strongly Implicit Solver (SIS) in MATLAB. This formulation requires the use of empirical correlations for calculating the heat transfer coefficient. Due to the transitions in the flow regime (single-phase, two-phase, dry-out, etc.) equations for heat transfer coefficient differs.

In phase change problems, as in the heat exchanger with a multi-phase flow (condensers and evaporators), the most widely used methods are enthalpy methods and temperature-based equivalent heat capacity methods. Temperature-transforming model, which combines the advantages of both of the methods, assumes that the phase change occurs over a temperature range (mushy zone) instead of a single point. A temperature function for enthalpy is introduced and necessary thermophysical properties depending on the vapor quality can be calculated. This method was modified normally for solidification-melting problems. The aim of this paper is using this method for a condensation-evaporation problem and getting reasonable results. Comparisons with different numerical results in literature are presented in order to verify and validate the model.

Keywords: Heat exchanger, Phase-Change, Numerical methods, Evaporator, Condenser

:: Paper No: GCGW - 2018 – P413 ::

NUMERICAL MODELING OF HEAT TRANSPORT IN FIREFIGHTER CLOTHING AND HUMAN SKIN

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Firefighters are exposed to high levels of heat due to the nature of their work environment. In the literature, several numerical models on the modeling the human skin to find the temperature and tissue damage ratio or modeling the firefighter clothing exist; but there are very limited studies on the numerical modeling of combined human skin and firefighter clothing. In this study, a detailed model for this combined control volume is developed using COMSOL Multiphysics software. In this model, the equations originating from the heat transfer phenomena (conduction, convection, and radiation) within the layers of the human skin and cloth are coupled to find the temperature distribution with time and space. In addition, the damage function, which determines the burn degree of the tissue, is calculated using the Arrhenius approach. The effects of some parameters (air gap width and flame gas temperature) on the temperature distribution are investigated.

Keywords: Firefighter clothing, Damage function, Skin temperature, Heat transfer, COMSOL.

:: Paper No: GCGW - 2018 – P414 ::

GENERATED ELECTRICITY BASED HOURLY AND DAILY INTENSITY OF CO_2 EMISSIONS

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The main aim of this study was to determine electricity generation based on the daily and hourly distribution of CO_2 emissions. Turkey was chosen for a case study because of the CO_2 intensive characteristics of electricity generation. Electricity generation based hourly and daily emissions are calculated by utilizing actual data. The effective end-user intensity of electricity utilization is calculated for each city. It is determined as CO_2 intensity of electricity generation fluctuates with both hour and day. It varies from 418.6 g CO_2/kWh to 824.6 g CO_2/kWh, 597.8 g/kWh in average. According to hourly basis analyzes, the highest CO_2 intensity of electricity generation occurs between 06:00 and 07:00. The highest CO_2 intensity of electricity generation occurs on Sunday despite the lowest electricity demand. The annual total of 162.84 Metric tons of CO_2 is released to the atmosphere as a result of electricity generation. Electricity generation-based CO_2 emission per capita is calculated as 1.912 ton CO_2.

Keywords: Global warming, Electricity generation, CO_2 intensity of electricity generation, CO_2 emission per capita

:: Paper No: GCGW - 2018 – P415 ::

POSITIVE ENVIRONMENTAL EFFECTS OF USING RARE EARTH ELEMENTS AGAINST GLOBAL WARMING

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Nowadays, global warming has become one of the most important issue to be concerned, as a result of considerable environmental pollution and depletion of natural resources. The problem of climate change remains serious, although many authorities have taken action and lots of sanctions have been made in order to protect environment and decrease the pollution. Thus, it is very important to find new ways to prevent environmental hazards causing global warming. One of the preventive ways is to promote Rare Earth Elements (REEs), which are a set of seventeen metallic elements including scandium, yttrium and fifteen lanthanides. These elements are crucial resources for especially high-tech devices used in a variety of sectors. Therefore, it is necessary to highlight their positive environmental effects against global warming. In this study, numerous researches worldwide showing to which extent Rare Earth Elements are used and their positive role towards global warming have been analyzed. In addition, interviews are carried out with different professionals to understand the real impacts. As a result, it is found that using these elements in industry increase energy efficiency and reduce carbon dioxide emission rates considerably. Main sectors benefiting from these elements are metallurgy, automotive, electric-electronic, ceramic, glazing, petro chemistry, energy and many others. These elements can be seen on the basis of many green high-tech products. In addition to their positive environmental roles, it is also observed that these elements promote the products with their additive features. It is estimated that use of Rare Earth Elements will be multiplied with discovery of new features of these elements and their environmental advantages.

Keywords: Rare Earth Elements, global warming, environmental effects, energy efficiency

:: Paper No: GCGW - 2018 – P416 ::

THERMODYNAMIC AND ENVIRONMENTAL IMPACT EVALUATIONS OF A NOVEL BIOMASS GASIFICATION BASED INTEGRATED SYSTEM

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In this study, thermodynamic analysis and environmental impact assessment of a novel biomass gasifier based integrated multigeneration system are carried out, and the results are presented for comparative evaluation. The outputs of proposed multigeneration system are electricity, hydrogen, heating, cooling, drying and hot water. The highest exergy destruction rate in this multigeneration system occurs in biomass gasifier subsystem, therefore possible improvements in biomass gasifier increase the exergy efficiency of the system. Another striking result of the study is that CO_2 emission is 4513 kg/MWh in single generation system while it is only 2328 kg/MWh in the multigeneration mode.

Keywords: Energy, Exergy, Thermodynamic analysis, Hydrogen, CO_2 emissions

:: Paper No: GCGW - 2018 – P417 ::

COMPARATIVE EVALUATION OF COAL GASIFICATION BASED INTEGRATED SYSTEM

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This study proposes an integrated coal gasification system for power, heating, cooling and hydrogen production. The energetic and exergetic analyses are performed for more efficiently integrated system design. Also, this paper focuses on the environmental effects of integrated system and multigeneration. The thermodynamic models in the Engineering Equation Solver (EES) program are utilized for integrated system modelling. Finally, a parametric study on impacts of some design parameters on the integrated system performance and environmental effects is examined. The overall energy and exergy efficiencies are found as 60.74% and 58.15%.

Keywords: Coal gasification, Energy, Exergy, Environmental analysis.

:: Paper No: GCGW - 2018 – P418 ::

NEW TOUCH ON ZERO EMISSION PUBLIC TRANSPORTATION WITH ELECTRIC BUSES

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Today, the negative effects of urban public transportation vehicles with internal combustion on environmental pollution and global warming have reached levels that can not be overlooked. The necessity of using electric busses in public transport is arising in order to reduce urban pollution to the minimum by reducing the emission of exhaust gasses. The emission of harmful exhaust gases such as various particles (entrails), volatile organic compounds, hydrocarbons, carbon monoxide, ozone, lead and various nitrogen oxides will be reduced considerably by reducing the exhaust emission to zero. Electric buses will also provide a significant reduction in CO2 emissions. However, the amount of carbon dioxide emitted depends on the emission intensity of the power sources used to charge the vehicle, the efficiency of the vehicle in question, and the energy consumed in charging. Emission intensity for grid electricity significantly varies on the availability of renewable resources and the efficiency of the fossil fuel-based energy generation at a given time.

Izmir Metropolitan Municipality used 20 electric buses instead of 20 fossil-fueled buses. In that event, according to our statistical results of research shows that from April 17th, 2017 until May 31th 2018 period, We saved 551.500 liters diesel fuel, prevented 1.478 tones carbon release. The same emission could be approximately filtered by the 37110 trees. Furthermore, the energy consumption of electric buses per km is much lower than busses with internal combustion which makes them more energy efficient. Efficiency in energy consumption will have a positive impact on environmental pollution and ultimately on global warming, as it will mean more efficient use of resources.

Keywords: Transportation, Bus, Global Warming

:: Paper No: GCGW - 2018 – P421 ::

NUMERICAL MODELLING AND DESIGNING OF AIR CHANNEL FOR COOLING PROCESS DURING CASTING

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In casting industry aim is to increase quality and reduce the cost. This can be achieved by minimizing the mistakes. One of the most important mistake is local porosity. Mislead cooling causes local porosities. Local porosity mistakes can be minimized by designing applicable cooling system. Significant parameters of cooling system are location of cooling channels and activation time. In practice, these parameters are not calculated. The cooling channels are placed at arbitrary points which are affected the activation time and process efficiency. In this study these are decided by mathematical model. This reduce the time and the cost. In this study, in order to design cooling system correctly, air cooling heat transfer process modelling and simulating on specified mold were done. Instead of modelling complex heat/flow problem in the melt, phase changed heat transfer was considered. Formed mathematical model was solved transient by ANSYS-FLUENT software. Time dependent temperature and solidification percentage changes for different boundary conditions were obtained. The effects of different cooling scripts on porosity formation and local heat disorganization were investigated for different boundary conditions. The mathematical model is verified as a result of the trial casts made. Thus, the areas where the error may occur are specified. Cooling air must be applied to these zones. The parameters of the cooling channels are jet diameter, distance between mold and channel, distance between holes and inlet pressure. Optimal design has been made depending on these parameters.

Keywords: Phase changing, Mathematical model, Solidification, Cooling

:: Paper No: GCGW - 2018 – P422 ::

MODELLING OF ALUMINUM ELECTROLYSIS CELL

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Aluminum demand is increasing day by day with the effects of global warming, population, income and urbanization. World aluminum trade volume reached 316 billion dollars as of 2016 years. In this big market, Turkey has taken a share of 1,6% with 5,1 billion dollars of trade volume. Turkey is increasing its population capacity by an average of 6,6% every years, due to the geographical proximity to the big European market and the growing Middle East market, rising potential in domestic demand.

In the coming period, in order to increase the competitive power of the aluminum industry, it is important to reduce the energy consumption of aluminum cell, to make high value-added products, and to support the recycling activities. The aim of this study is to improve the aluminum electrolysis cells' energy performance with a new modeling approach.

Keywords: Aluminum electrolysis, modelling, energy efficiency

:: Paper No: GCGW - 2018 – P423 ::

DESIGN AND ANALYSIS OF A COMBINED FLOATING PHOTOVOLTAIC SYSTEM FOR ELECTRICITY AND HYDROGEN PRODUCTION

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The current study deals with a potential solution for the replacement of fossil fuel-based energy resources with sustainable solar energy resource. A floating photovoltaic system integrated with a hydrogen production unit is investigated. Data are taken from Mumcular Dam located in Aegean Region of Turkey. PvSyst software has been employed for the simulation purposes. The obtained results have been analyzed in the HOMER Pro Software. The stored energy is used to compensate the electric load through integrating to a hydrogen system. Floating PV system decreases the water evaporation of water resources due to 3010 m^2 shading area. FPV and Hydrogen Systems cover %99.84 of the electricity demand without fossil fuels or grid connection where 211.94 MWh electricity is produced at levelized cost of electricity (LCOE) of 0.6124 $/kW by the Hydrogen Fuel Cell and FPV systems.

Keywords: Energy Storage, Floating Photovoltaic, Fuel cell, Modular raft

:: Paper No: GCGW - 2018 – P424 ::

HYDRO-POWER ENERGY STORAGE: A CASE STUDY FOR IZMIR CITY, TURKEY

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Because of fast consumption of the fossil fuels, it became very important to use energy resources effectively. Energy storage systems are one of the possible methods for the efficient utilization of energy. Among the several energy storage systems, pumped hydro energy storage has been developed rapidly for the last two decades because of its large-scale energy time shifting and easy adaptation with renewable energy systems such as wind and solar. This technique requires to store temporarily a large volume of water in an upper reservoir during off-hours of electricity usage, and to release it through turbines to the lower reservoir during the pick-hours to produce electricity. Especially, integration of these systems wind turbines is very attractive since it can easily compensate the electricity need during the low wind velocities. The scope of this study is to investigate a pumped hydro storage system integrated with wind turbine generator for electric energy storage for the city of İzmir, Turkey. The upper reservoir is a natural lake (Karagöl) that is located at the altitude of 856 m from the sea level. The lower reservoirs are thought to be mounted at the sea level. The pipeline length between two reservoirs is estimated to be 2630 m. The water is pumped to the upper reservoir by the help of energy generated by wind turbines during off-hours. The calculations are made in order to determine the energetic and economic effectiveness of the pumped hydro storage systems.

Keywords: Energy storage, Hydro, Sustainable energy

:: Paper No: GCGW - 2018 – P425 ::

THERMODYNAMIC ANALYSIS OF SOLAR ASSISTED ABSORBTION REFRIGERATION SYSTEMS FOR DIFFERENT REFRIGERANT COUPLES

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In this study, an absorption refrigeration system which was driven by a renewable energy source, solar energy, was analyzed for different refrigerant couples. The necessary heat energy different refrigerant couples were considered for the analyses of absorption refrigeration system. These are lithium bromide – zinc bromide (2LiBr-ZnBr2), acetone-zinc-bromide (Ac-ZiBr2), ammonia-water (NH3-H2O), lithium bromide –water (LiBr-H2O), monomethylamine –water (CH3NH2-H2O), ammonia-lithium-nitrate (NH3-LiNO3), ammonia –sodium thiocyanate (NH3-NaSCN), water-lithium bromide lithium nitrate (H2O-LiBr LiNO3) refrigerant couples. In the analyses, first, the modeling of parabolic trough solar collector was carried out. After, the thermodynamic property relations of the refrigerant couples were derived. In thermodynamic analyses section, a comparative analysis of absorption refrigeration system was conducted for different refrigerant couples. In the analyses, the COP value of the system, mass circulating ratio and mass ratio values were investigated. Additionally, parametrical analyses were carried out for different system parameters.

Keywords: Absorption refrigeration, Refrigerant couple, Thermodynamic analysis, COP, Solar energy

:: Paper No: GCGW - 2018 – P426 ::

PERFORMANCE INVESTIGATION OF A SOLAR TOWER ASSISTED CO_2 GAS CYCLE WITH INTEGRATED ORC

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Supercritical CO_2 gas cycles have become very attractive in the last decades because of their low operating temperatures. Supercritical CO_2 is a fluid state of carbon dioxide where it is held above its critical point. The density at that point is similar to that of a liquid and allows for the pumping power needed in a compressor to be significantly reduced, thus significantly increasing the thermal-to-electric energy conversion efficiency. Since these systems can be driven by waste heat or solar energy, they can be assumed as environmentally friendly power energy generation systems. In addition, CO_2 as a working fluid has favorable properties such as low environmental impact in terms of GWP and ODP, safety, availability, and cost. The primary goal of this study is to carry out thermodynamic assessment of a solar assisted novel supercritical CO_2 gas cycle integrated with an organic Rankine cycle. The heat energy demand for the CO_2 gas cycle is supplied by a solar tower. The rejected heat from the gas cycle is utilized for power generation from the organic Rankine cycle. For the organic Rankine cycle, four different working fluids are taken into consideration for comparison purposes: CO2, hfo-1234yf, R600a, and R134a. The effects of the different working fluids on the performance of the organic Rankine cycle are investigated through parametric studies.

Keywords: Supercritic, CO_2, Gas Cycle, ORC, Solar Tower

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MODELING THE THERMAL PERFORMANCE OF PHASE CHANGE MATERIAL SLURRIES (PCMS) IN LAMINAR FALLING FILMS

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A Numerical model to investigate the heat transfer characteristic of a phase change material slurries (PCMS) flowing over a cooled isothermal surface has been developed. The energy equation governs the heat transfer process includes the source term which accounts for the growth of the phase change material particles that are suspended in the heat transfer fluid to form of phase change materials slurries, PCMS. A fully developed velocity profile has been assumed to model the flow of thin constant falling film of suspensions. In this model the thermo-physical properties of the slurries are calculated based on their effective values which are function of phase change particles concentration. The main features of this work are that the phase change slurries show a binary behavior, i.e. they either in the frozen or melting state and are exposed directly to the water-based solution without encapsulation. Parameters that influence the heat transfer characteristics are found to be the volumetric concentration of phase change suspensions, Nusselt number of the flow, PCM Nusselt number (NU_p). The numerical results have showed that, heat transfer has been augmented due to the growth rate of phase change materials particles concentration.

Keywords: Falling Film, Flow of Suspensions, Heat Transfer, Phase Change

:: Paper No: GCGW - 2018 – P428 ::

THERMODYNAMIC MODELLING OF NATURAL CIRCULATION LOOP ASSISTED COOLING SYSTEM FOR HOME TYPE FREEZER

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The most energy consuming appliances in residential electricity use, which generate a significant portion of total energy consumption, are home-type refrigerators and deep freezers. For this reason, the main objectives of cooling studies are to enhance the cooling performance and reduce electric energy consumption. In order to increase the coefficient of performance (COP) of home type freezers a thermodynamic simulation of natural circulation loop assisted cooling system for a household refrigerator is presented. Although there are several studies in the literature that investigate the natural circulation loops (NCL) are used on cooling systems, these studies have not been effective in the market due to their limitation of design and application.

By adding the NCL with a secondary heat transfer fluid into the cooling system, the amount of heat removed from the condenser will be increased, and the COP of cooling system is increased by decreasing the average condenser temperature. The heat removed from the condenser will be used to increase the amount of heat of the refrigerant in the compressor suction line. Thus, thanks to the effect of natural circulation, it will be prevented that the refrigerant comes in the liquid phase to the compressor.

The thermodynamic model is developed in Engineer Equation Solver (EES) program for both NCL and freezer. The required thermal boundary conditions and input parameters of the models are derived according to the experimental test data obtained in Klimasan A.Ş.

Keywords: Natural circulation loops, Freezer, Coefficient of performance.

:: Paper No: GCGW - 2018 – P429 ::

MONODISPERSE PALLADIUM-COBALT ALLOY NANOPARTICLES ASSEMBLED ON GRAPHENE OXIDE AS HIGHLY EFFECTIVE CATALYST FOR THE DIMETHYLAMINE BORANE (DMAB) DEHYDROCOUPLING

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Addressed herein, a highly efficient, durable and uniformly dispersed graphene oxide supported palladium–cobalt nanomaterials were reported as a catalyst in dimethylamine-borane dehydrogenation reaction at the room temperature. The graphene oxide supported palladium–cobalt nanomaterials (Pd-Co@GO NPs) are obtained by a facile ultrasonic-hydroxide assisted chemical method, and the fabricated nanocatalyst have been defined by Ultra-Violet-Visible (UV-VIS), Raman spectroscopy, X-Ray Diffraction (XRD), X-Ray Photoelectron Spectroscopy (XPS), Transmission Electron Microscopy (TEM) and High-Resolution Transmission Electron Microscopy (HR-TEM). This newly prepared Pd-Co@GO NPs were found to be highly efficient and stable for dehydrocoupling of dimetylamine borane. The catalytic activity of the Pd-Co@GO NPs were excellent by showing the one of the best catalytic activity with a very high turnover frequency and low E_a value for DMAB dehydrocoupling. Another important fact about the prepared catalyst is the reusability of the catalyst was very high and easily reused five times without any significant decrease in their catalytic performance. In the current work, the synthesis, characterization and the catalytic performance of the Pd-Co@GO NPs for the dehydrogenation of the DMAB reaction will be discussed in detail.

Keywords: Dimethylamine Borane, Hydrogen, Palladium, Cobalt.

:: Paper No: GCGW - 2018 – P430 ::

CARBON BASED BIMETALLIC PALLADIUM-NICKEL ALLOY NANOHYBRIDS AS HIGHLY EFFECTIVE CATALYST FOR THE DEHYDROCOUPLING OF DIMETHYLAMINE BORANE (DMAB)

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Herein, a highly active and stable nanohybrid has been synthesized for hydrogen production. The newly prepared nanocatalysts are carbon-based palladium-nickel nanohybrid structures (PdNi @ VC nanohybrid). The prepared nanohybrids were fully identified with the help of different analytical techniques such as UV-Vis (Ultraviolet-Visible spectroscopy), XPS (X-ray photoelectron spectroscopy), TEM (Transmission electron microscopy), XRD (X-ray diffraction) and HR-TEM (High resolution transmission electron microscopy) analyses. This prepared nanohybrid was quite successful in production of hydrogen from DMAB in ambient conditions with very high TOF value. By the way, it was observed that the DMAB was completely converted to product at room temperature with the help of PdNi@VC nanohybrid. Moreover, monodisperse PdNi@VC nanohybrid nanohybrid has showed very good reusability performance even after 5th usage in same reaction. As a result, it can be said that the prepared nanohybrid is highly efficient, stable and durable nanocatalyst for the dehydrocoupling of dimethylamine-borane.

Keywords: Carbon, dehydrocoupling, hydrogen, nanoparticles

:: Paper No: GCGW - 2018 – P431 ::

PHOTOVOLTAIC PANEL EFFICIENCY MODELING FOR SOLAR POWERED VEHICLE

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The increasing trend of the energy consumption of humanity have brought forward the efficient use of current energy resources and seeking for adaptation of renewable energy resources. Integration of renewable energy into transportation, on the other hand, has crucial importance as it reduces the emissions in the urban regions and increases the life quality by reducing the noise in solar-powered electrical vehicles. Solar-powered vehicles, automobiles or planes, with photovoltaic panels (PVPs) are widely in use for decades, however, there are several aspects, such as electrical conversion and storage efficiencies, that should be improved. It is known that increasing the temperature of the PVPs adversely affects both the panel lifetime and electrical conversion efficiency. In this study, a 3D CFD model of a solar-powered racing car is developed in ANSYS-FLUENT to investigate the power outputs of the PVPs on the varies positions of the vehicle under various speeds, 30 km/h to 120 km/h, and irradiations, 300 W/m^2 to 900 W/m^2.

Keywords: Global warming, renewable energy, photovoltaic panel

:: Paper No: GCGW - 2018 – P432 ::

INTEGRATED BUILDING ENTROPY PRODUCTION CONSIDERING MAIN DISTRUBITION LINE WITH SYSTEM PREFERENCE

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Integrated structures are intensive energy consuming buildings and having complex consumption behaviors. Energy efficiency and energy management have become an important criterion for sustainability of environmental problems along with energy costs in such integrated structures. Especially in these type specific buildings, it is seen that the energy costs of heating are quite high. It is known that these systems, which are still operating with centralized steam or boiling water heating systems, are intense losses starting from the energy production point. In the places where the steam energy system is used for heat energy demand, the high levels of condensation on the lines increase the energy consumption and costs as well as the operating risks.

In this study, the loss potential and associated environmental effects caused by the condensation effect on the main distribution lines for an integrated structure were examined. Besides, also the effects on environmental parameters such as main distribution line losses and CO2 emission from fuel was investigated. In energy and environmental analyzes based on fuel consumption caused by entropy production in the main distribution lines, only line-sourched irreversible potential, it was found that the total effect is about 20%. At the end of the study, some evaluations about regarding the selection of systems for such structures and the improvement of energy efficiency were made.

Keywords: Cement, Efficiency, Irreversibility, Emission, Sustainability.

:: Paper No: GCGW - 2018 – P433 ::

COMPARATIVE EVALUATION OF EMISSIONS ARISING FROM THE USE OF VARIOUS FUELS IN A COMBINED CYCLE

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In the present study, various fossil fuels, in addition to solar, are utilized to supply required heat of a combined cycle and find out the emissions differences. For this purpose, five cases are considered for analysis, impact assessment and evaluation, such as full solar, 80% solar and 20% natural gas, full natural gas, full fuel oil, and full lignite-based systems, according to their annual CO_2, SO_2 and NO_x emissions. The results obtained from the analyses show that the maximum CO_2 and NO_x emissions are calculated as 16.717 and 0.041 Million kg/year, respectively for the case which lignite is utilized as fuel. On the other hand, the maximum SO_2 emissions are found for fuel oil-based system as 0.297 Million kg/year. Also, the effect of the energy efficiency on annual emissions for the lignite-based system is examined. Increasing of the combined cycle efficiency has reduced the emission values.

Keywords: Combined cycle, environmental impact, emissions, CO_2, SO_2, NO_x, fossil fuels.

:: Paper No: GCGW - 2018 – P434 ::

USAGE OF HYBRID ELECTRIC AND FUEL CELL ELECTRIC PROPULSION SYSTEMS IN AIR VEHICLES

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Throughout the history of aviation, internal combustion engines have been used as propulsion systems. Unfortunately, internal combustion engines use fossil fuels that are rapidly consumed as an energy source, whose costs increase day by day and which negatively affect the environment. The use of electric vehicles instead of internal combustion engine vehicles is being offered as a solution in order to remove these negative effects. Despite the fact that many studies have been carried out, it is not possible to pass directly to electric vehicles, especially in air vehicles with today's technology and facilities. When vehicles are designed, design is made according to the maximum power demanded. Under normal conditions, a small amount of motor power is used, maximum power is not always needed. Since hybrid electric propulsion systems use an electric motor with an internal combustion engine, an internal combustion engine with lower power can be used. The internal combustion engine also charges the battery. Vehicles with a hybrid electric drive system that reduces exhaust emissions, seen as an intermediate solution for passing to zero emissions vehicles, consume less fuel than vehicles powered by internal combustion engines. Hybrid electric vehicles, which also reduce noise emissions, emit zero emissions when in electric mode. Fuel cell vehicles use fuel cells to generate electricity from hydrogen and air. Fuel cells are more efficient and quiet compared to internal combustion engines and have nearly zero emissions. Remediation activities are being carried out in many fields such as obtaining, transporting, storing, making the hydrogen more secure, and reducing the weight of the hydrogen used in the fuel cells.

In spite of their extra cost and weight, research and studies are being carried out in order to be able to use hybrid electric and fuel cell propulsion systems for air vehicles as well as for land and sea vehicles. In this study, the studies and applications on the use of hybrid electric and fuel cell electric propulsion systems in air vehicles were examined.

Keywords: Air vehicles, hybrid electric propulsion system, fuel cell electric propulsion system

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ENVIRONMENTAL IMPACT ASSESSMENT OF LIGNITE DRYING IN A POWER PLANT

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In this study, a Rankine cycle with a drying chamber is investigated thermodynamic analyses through energy and exergy approaches. The effects of lignite drying process on the emissions from the plant are studied comparatively. It is aimed to decrease the humidity of Turkish (Tuncbilek) lignite from 27% to 19% in the drying chamber. By decreasing the moisture content, the lower heat value of the lignite is increased, and the emissions of CO_2 NO_X and SO_2 resulting from lignite combustion are then decreased. The overall energy and exergy efficiencies are comparatively evaluated as found to be 29.6% and 47%, respectively.

Keywords: Power plant, environmental impact, exergy, efficiency, emissions, lignite drying

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EXERGOENVIRONMENTAL ANALYSIS OF A SOLAR TOWER BASED INTEGRATED SYSTEM: COMPARISON WITH VARIOUS FUELS

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Renewable energy based integrated, efficient and sustainable systems are considered a rational way to supply energy demand and hence used to combat environmental issues, such as global warming and increased CO_2 emissions. In this study, environmental benefits of solar tower systems and thermal energy storage are evaluated. In addition, the desalination processes which consist of multi distillation and reverse osmosis unit are considered. The solar system is compared with various conventional fuels such as natural gas, gasoline, diesel and coal. A comparison is performed when the required electricity power and heat source for desalination units are supplied by fossil fuels. CO_2 and NO_x emissions of gasoline, diesel, natural gas and coal as well as SO_2 emissions of coal option is investigated.

Keywords: Solar energy, fossil fuels, emissions, desalination, exergy, exergoenvironmental analysis.

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THE DETERMINING VEHICLE EMISSIONS AND ITS IMPACT ON PASSENGER HEALTH DURING THE CAR AND PASSENGER OPERATIONS ON RO-RO AND FERRY SHIPS

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The high population and traffic density consist of the main problems in the many cities and if the cities connected with inland waterways, short-sea transportation might be alternative transportation mode for passengers and cars. In the short-sea routes, the passengers and cars were carried with the ro-ro/ferry ships by the reducing the spent time in traffic and transportation costs. It is well known that the cars are one of the most important emission sources. When the cars were carried with passengers in the same enclosed spaces of ro-ro/ferry ships, the passengers might be exposed to high emission values. In this study, authors aim to calculate car emissions and take attention the stakeholders to operational parameters for increase time and passenger health base operational efficiency. For this aim, authors selected the ro-ro/ferry ships which engage the voyages within Yalova-Pendik line in Istanbul. After that authors obtained 1-year car-passenger-voyage statistics by the management company and then collected 1-week data with visual observation of car and passenger operations. Overall data were analyzed with SPSS statistical programme and then car emission calculated with developed a mathematical model. The results show that the passengers exposed to emission value approximately 204.31 times more than Euro 6 emission standards (1.233 g/km). However, exposed emission value might be decreased to under Euro 6 limitations with several operational improvements.

Keywords: Ro-ro/ferry operation, car emission, passenger health, Euro 6 standards, operational efficiency.

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CHANGES OF POWER DEPENDING ON DIFFERENT FACTORS DURING THE NAVIGATION OF THE SHIP, FUEL CONSUMPTION AND EMISSION ANALYSIS

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Efficient use of energy in ships is crucial as the marine operating costs, if any, are considered to be harmful to the surrounding fuels. In this study, the changes of the fuel consumption and emission of the ship have been analyzed according to the effects such as speed, engine load, flow velocity, wind, and the optimum values have been obtained for ship. When the results are analyzed, it is concluded that the average machine load must be kept at 56%. Optimal machine speed is between 13 and 13.8 knots at this loading amount. It is estimated that the emissions are reduced by about 6% at an economic speed, the most favorable emissions are in the loading range between 56% and 64%.

Keywords: Ship emission, economic speed, shipboard efficiency, ship power, fuel consumption.

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