Pharos University in Alexandria

Royal Institute of Technology

Book of Abstracts

International Conference On New Trends For Sustainable Energy – ICNTSE 2016

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Welcome Note

The faculty of Engineering at Pharos University in Alexandria and The Royal institute of Technology have the pleasure to welcome you to the first international conference for new trends of sustainable energy ICNTSE 2016 – Held in Alexandria on October 1st – 3rd at Pharos campus.

The conference will be discussing the general new trends in Sustainable energy development through distinguished keynote speakers from Sweden and Egypt in the morning sessions.

Up to date technology applied to specific cases on sustainable energy in Egypt will be reviewed.

Up to date research results will be discussed in three parallel sessions to include Power Engineering, Renewable Energy Technologies, Bioenergy, Energy and Sustainable Development and Energy Management.

The Executive committee of the conference would like to thank Prof. Abdel Moneim Moussa for his valuable advice and directions.

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VP of the Ministry of Electrical and Renewable Energy
National policy of egypt for renewable energy

Prof. Mahmoud El Gammal, PUA
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Use of Solar Energy in the Project of Irrigation of 1.5
Million Acres in Egypt

Prof. Taher Ahmed Al-Sahhaf, Kuwait University
Vice president of research, Kuwait University
Sustainable Energy Research in Kuwait GCC Countries

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Prof. Said ElNashaie, UBC
Adjunct Professor, Chemical and Biological Engineering Department, University of British Columbia, Vancouver, BC, Canada
Sustainable Development

Prof. Radwan H. Abdel Hamid
Multipurpose Applications by Thermodynamic Solar (MATS)

Prof. BjörnLaumert, KTH
The role and future potential of CSP in the MENA region.

Dr. Fahd Hashiesh, ABB
FIET Head of Power Consulting, ABB Ltd, UK
The Grid Challenges & Mitigations

Prof. Mark Howells, KTH
African Energy Renaissance – An immense investment, technology and sustainable development prospect

Prof. YohannesKiros, KTH
Alternative catalysts for anodic and cathodic reactions in water electrolysis

Prof. Alexis Pontvik, KTH
Sustainable Urban Form

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Prof. Hisham El Shimy, PUA
Professor of Architectural Engineering
Green Housing

Prof. GöranEngdahl, KTH
Energy Efficiency of Electric Drives

Prof. KlasEngvall, KTH
Trends in thermochemical conversion of waste and biomass

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Day 1, 1ST October 2016				
08:30	Registration			
10:00	Opening Ceremony			
11:00	Coffee Break			
11:30	National policy of the Egyptian ministry of electricity and renewable energy *Dr. Mohamed ElyamaniMoEE*			
12:00	Distributed Generation *Prof. Mahmoud El Gammal*			
12:30	Future Energy Systems *Pro. Björn Palm*			
13:00	Renewable Energy for Egypt *Prof. Osama El Masry*			
13:30	Lunch break			
Research Papers				
	E127	**E124**	**E215**	**E212**
15:00	01C2	03B5	02A5	03C1
15:20	01C3	02D4	02A7	03C2
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16:00	Break			
16:15	01C5	03A6	02A1	03C4
16:35	01C7	03A5	02A3	03C5
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09:00	Use of Solar Energy in Irrigation in Egypt *Prof. HossamMoghazy*			
09:30	Kuwait and GCC policies for renewable energy *Prof. Taher Ahmed Al-Sahhaf*			
10:00	Sustainable Development *Prof. Said ElNashaie*			
10:30	Coffee Break			
11:00	Multipurpose Applications by Thermodynamic Solar (MATS) *Prof. Radwan H. Abdel Hamid*			
11:30	Trends in Thermochemical Conversion of Waste and Biomass (Video Conference) *Prof. KlasEngvall*			
12:00	The Grid Challenges & Mitigations *Dr. Fahd Hashiesh*			
12:30	Giza – Unistar – Nile Sugar			
13:30	Lunch break			
Research Papers				
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Day 3, 3rd October 2016				
09:00	African Energy Renaissance – An immense investment, technology and sustainable development prospect *Prof. Mark Howells*			
09:30	Fuel cell Technology *Prof. YohannesKiros*			
10:00	Sustainable Urban Form *Prof. Alexis Pontvik*			
10:30	Coffee Break			
11:00	The role and future potential of CSP in the MENA region *Prof. BjörnLaumert*			
11:30	Energy Efficiency of Electric Drives *Prof. GöranEngdahl*			
12:00	Green Housing *Prof. Hisham El Shimy*			
12:30	Break			
Research Papers				
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13:40	SSM1	02D2	03D11	01B3
14:00	Closing Session E127			

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01 - Power Engineering

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01(A1 – A3) Protection System

01A1 - Preventive Maintenance Role in Minimizing the System Failure in Alexandria Electricity Distribution Company (AEDC)

Dr. Amani Ibrahim Attia

Abstract

A preventive maintenance program is a schedule of regularly planned maintenance testing and actions with the intent of preventing breakdowns and failures. Finding and replacing worn components before they can actually fail is the goal of preventive service, as well as predicting useful life of existing equipment. Electrical preventive maintenance is cost effective because of the benefits it provides such as minimizing the system downtime, improving the system reliability and maximizing the equipment life. Infrared Thermography has evolved into one of the most valuable diagnostic tools used for preventive maintenance which is considered as a very important task that can prevent electricity blackout in large areas, reduces equipment damages of both transmission and distribution systems. Therefore, AEDC has decided to use thermal image camera to inspect the power lines. This technique offers a pinpoint location of system deficiencies and "hot – spots" in transformers, switchgears and overhead lines. This leads to minimize the major causes of interruptions to the system. This paper illustrates the classification of interruptions by cause during the period 2010-2015 and the preventive maintenance role in decreasing the system failure in AEDC.

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01A2 - A Proposed Single Pole Automatic Reclosure Scheme for Transmission Lines

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Abstract

This paper presents a simple technique for single pole automatic reclosure (SPAR) on shunt compensated transmission lines using wavelet packet transform (WPT). The proposed scheme is tested under stressed power swing situation. The proposed SPAR performs two functions, the first one aims to discriminate between natures of faults, and the second function detects the instant of arc extinguished. The proposed technique uses an adaptive threshold level and therefore no adjustment is needed for various transmission systems. The proposed technique is examined at different fault scenario cases - involving various fault locations, inception angles, and also the representation of secondary arc characteristics. The evidence of the potential of the proposed scheme is well proven compared to the reported techniques in the literature.

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01A3 - Simulation of Distance Relay for Load Encroachment Alleviation with Agent Based Supervision of Zone-3

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Abstract

Cascaded tripping of power lines due to mal-operation of zone-3 distance relays has been one of the main causes of many previous blackouts worldwide. Encroachment of load into zone-3 characteristics during stressed system operation conditions is a basic factor for such mal-operation of the relays. By improving the operation of zone-3, it is possible to prevent mal-operations so that cascaded line tripping can be avoided. For proper study of the behavior of distance relay during faults and load encroachment phenomenon, we must build a model of distance relay, so in this paper, a modeling study of distance relay is implemented using MATLAB/Simulink program. However, this model is distinguished from the previous models that, examines in detail the third zone of distance relay. Many cases are simulated with changing line loading and fault location to ensure the capability of the relay to detect the fault and thus the maximum load ability limit of distance relay is obtained. In order to prevent cascading events caused by hidden failures in zone-3 relays, agent based relay architectures have been suggested in the recent past. In such architectures, each zone-3 relay contains agents that require communication with other agents at various relevant relays in order to distinguish a real zone-3 event from a temporary overload. In this paper, a local master agent is consulted by all zone-3 agents before a tripping decision is made. The master agent maintains a rule base which is updated based on the local topology of the network and real-time monitoring of the status of other relays and circuit breakers. Cisco Packet Tracer program is used for running communication network simulations. The result of the simulation indicates that the time estimated to send and receive a packet data unit (PDU) message between one relay to anther can satisfy the communication requirement for the proposed scheme with fiber media.

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01(A4 – A8) Optimization

01A4 - Multi-Objective Fruit Fly Optimization Algorithm for Economic Power Dispatch Problem

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Abstract

In this paper, the economic power dispatch involves the simultaneous optimization of fuel cost and emission objectives which are conflicting ones in nature. However, there is no single optimal solution which simultaneously optimizes all the objective functions. This paper presents a novel robust multi-objective fruit fly optimization algorithm (MOFOA) incorporated with Pareto optimal solutions. The algorithm is initialized by a population of random fruit flies. During this initialization, the objective functions are simulated into the single objective function. Then, the evolutions of these fruit flies are performed by flying randomly around the Pareto optimal solution or around the best solution so far. The application to the standard 30-bus IEEE system demonstrates the efficiency and robustness of the proposed approach to generate well-distributed Pareto optimal solutions for the multi-objective economic power dispatch problem.

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01A5 -Optimal PMUs Placement Due to Several Stages for Achieving Full System Observability.

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Abstract

The new measurement devices such as phasor measurement units (PMUs), is considered to be an essential component in implementing future power network systems. The problem of optimal placement of PMUs (OPP) requires finding minimum numbers of PMUs that must be installed to provide full system observability. Due to the large number of the PMUs required and their relatively high cost, it is important to partition the installation of PMUs placement into several stages to overcome this problem. A new proposal depends on limiting the number of installed PMUs at each stage and maximizing system observability will be illustrated in this paper. The proposed method will be implemented on the IEEE-14 bus system.

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01A7 - Multi-phase Fuzzy-based Modeling and Control of Combined Cycle Gas Turbine Plants

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[4]Department of electrical engineering, Mansoura University, Egypt

Abstract

Combined cycle gas turbine (CCGT) has become an important technology for power generation due to its significant effect on power system stability studies. A simplified mathematical model of CCGT has been proposed to study the dynamic response of the CCGT under normal operation condition with a small load perturbation condition. This paper is interested in the implementation of fuzzy logic control (FLC) in the control system of CCGT considering the limitations on the system inputs. The aim of the fuzzy logic controller is to maintain the system speed, exhaust temperature (Te) and air flow (Wa) within the desired interval further, it is required to make the coordination between fuzzy speed control signal and exhaust temperature control signal using fuzzy fuel control system to compute the accurate value of fuel signal which provides fast reaction time. The simulation results show the improvement of combined cycle gas turbine dynamic response with fuzzy logic control systems compared to the conventional model of CCGT under normal and abnormal conditions.

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01A8 - Security Constrained Unit Commitment in Deregulated Power Systems by Seeker Optimization Algorithm

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Abstract

Security constrained unit commitment (SCUC) is becoming a strategic scheming in modern deregulated electric energy markets. This calculation extends the conventional unit commitment (UC) problem to incorporating the power transmission network constraints for pre- and post-contingency operating conditions. Such constraints complicate the problem considerably, and much work remains to be done to implement them satisfactorily. This paper concerns with solving the SCUC problem using the seeker optimization algorithm at normal and abnormal operating conditions. Abnormal (Emergency) operating conditions may occur due to increased power transactions and continuing postponement of transmission reinforcements. The SCUC is solved considering the transmission losses. Different case studies are employed to show the capability of the proposed procedure.

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01(B1 – B4) Reliability

01B1 - Development of Reliability Indices for Electric Distribution Network in Egypt

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Abstract

Reliability indices (RIs) are the elemental benchmark used by Egyptian Electricity Holding Company (EEHC), and the Electric Utility and Consumer Protection Regulatory Agency (Egypt ERA) to evaluate the continuity and compliance of supply.

The power system continuity of supply level is controlled through system indices. The most widely used reliability indices are SAIFI, SAIDI and CAIDI (IEEE std. 1366-2000). Historical electrical indices, reliability indices threshold and satisfaction index are used as the guide for electric network performance, which measures the adequate and secure power supply.

The paper presents the reliability indices, the relation between indices and satisfaction area to highlight the appropriate guideline values for electric systems, also presents the development of indices since 2011 to now for the distribution network in Egypt.

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01B2 - Reliability Improvement of Power Distribution Systems using Advanced Distribution Automation

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Abstract

Towards the complete vision of smarter distribution grid, advanced distribution automation system (ADAS) is one of the major players in this area. In this scope, this paper introduces a generic strategy for cost-effective implementation and evaluation of ADAS. Along with the same line, fault location, isolation and service restoration (FLISR) is one of the most beneficial and desirable applications of ADAS for self-healing and reliability improvement. Therefore, a local-centralized-based FLISR (LC-FLISR) architecture is implemented on a real, urban, underground medium voltage distribution network. For the investigated network, the complete procedure and structure of the LC-FLISR are presented. Finally, the level of reliability improvement and customers' satisfaction enhancement are evaluated. The results are presented in the form of a comparative study between the proposed automated and non-automated distribution networks. The results show that the automated network with proposed ADAS has a considerable benefit through a significant reduction in reliability indices. In addition, it has remarkable benefits observed from increasing customers' satisfaction and reducing penalties from industry regulators.

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01B3 – DG- Allocation Based on Reliability, Losses and Voltage Sag Considerations - An Expert System Approach.

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Abstract

Expert System (ES) as a branch of Artificial Intelligence (AI) methodology can potentially help in solving complicated power system problems. This may be more appropriate methodology than conventional optimization techniques when contradiction between objectives appears in reaching the optimum solution. When this contradiction is the hindrance in reaching the required system operation through the application of traditional methods ES can give a hand in such case.

In this paper, the knowledge- based ES technique is proposed to reach near-optimum solution which is further directed to the optimum solution through particle swarm optimization (PSO) technique. This idea is known as Hybrid-Expert-System (HES). The proposed idea is used in getting the optimum allocation of a number of distributed generation (DG) units on Distribution System (DS) busbars taking into consideration three issues; reliability, voltage sag, and line losses. Optimality is assessed on the economic basis by calculating money benefits (or losses) resulting from DG addition considering the three aforementioned issues. The effectiveness of the proposed technique is ascertained through example.

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01B4 - Optimal Placement and Sizing of Distributed Generation Units Using Different Cat Swarm Optimization Algorithms

Adel Ali Abou El-Ela[1], Ragab A. El-Sehiemy[2], Abdel-Mohsen Kinawy[1], Eman Salah Ali[1]
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Abstract

This paper presents a proposed method to allocate the distributed generation (DG) units on distribution network using cat swarm optimization algorithm. The proposed method finds the optimal location and sizing of distributed generation units. The objectives of the optimization problem are: minimizing the total electrical generation costs, power losses, and total emissions produced by the generation units, and improving the voltage stability. The proposed method depended on cat swarm optimization (CSO) algorithm and parallel cat swarm optimization (PCSO) algorithm. The proposed optimization method are applied to the IEEE 33-bus and IEEE 69-bus distribution systems. The results of these algorithms are compared to other previous methods that reported in this field. The proposed optimization methods are considered as effective and perfective method to find the allocation and the sizing of the distributed generation units on distribution systems.

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01(C2 – C8) Power Quality

01C2 - Extended Abstract: Harmonics Monitoring Survey on LED Lamps

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Abstract

Light Emitting Diode (LED) lamps are being increasingly used in many applications. These LED lamps operate using a driver, which is a switching device. Hence, LED lamps will be a source of harmonics in the power system. These harmonics if not well treated, may cause severe performance and operational problems. In this paper, harmonics (amplitude and phase angles) generated by both LED lamps and conventional fluorescent lamps will be studied practically. Then they will be analyzed and evaluated. Compared to each other harmonics generated by both LED and conventional florescent lamps, self-mitigation may occur based on the phase angle of these harmonics. All data will be measured using power analyzer and will be done on a sample of actual lamps.

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01C3 - Harmonic Analysis of Radial Distribution Systems Embedded Shunt Capacitors

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Abstract

A new fast harmonic load flow method has been introduced. The introduced method is designed to save the computational time required for the admittance matrix formation. Also, the introduced method can overcome the singularity problems that appear in the conventional methods. Applying the introduced harmonic load flow method to harmonic polluted distribution systems embedded shunt capacitors which commonly used for losses minimization and voltage enhancement, it is found that the shunt capacitor can maximize or minimize system total harmonic distortion (THD) according to its size and connection point. Therefore, in this paper, a new proposed multi-objective particle swarm optimization "MOPSO", based on a modified Non-Dominated Sorting algorithm, for optimal capacitors placement on harmonic polluted distribution systems has been introduced. The obtained results verify the effectiveness of the introduced MOPSO algorithm for voltage THD minimization, power losses minimization and voltage enhancement of radial distribution systems.

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01C4 - Application of DSTATCOM coupled with FESS for Power Quality Enhancement and Fault Mitigation

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Abstract

In power systems, the use of renewable energy, especially Wind power generation is steadily increasing around the world. However, this incorporation and the lack of controllability over the wind, and the type of generation used cause problems in the power quality and in the dynamics of the system. In this work, the use of a Distribution Static Synchronous Compensator (DSTATCOM) coupled with a Flywheel Energy Storage System (FESS) is proposed to mitigate problems introduced by the intermittency of wind power generation. A dynamic model of the DSTATCOM/FESS device is briefly presented and a multi-level control technique is proposed. The proposed control technique has one control mode for active power, and two control modes to choose between, for reactive power and voltage control. The above technique has been used here to enhance not only the steady state operation but also to mitigate sudden load changes. The considered control system under consideration, with the DSTATCOM/FESS, and its controls are analyzed also, under the conditions of different faults which may happen in the system. Simulation tests of the device are analyzed when it is combined with wind generation in the electric system. The results demonstrate satisfactory performance of the proposed control techniques, as well as a high effectiveness of the control system to mitigate problems introduced by wind power generation.

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01C5 - The Effect of Harmonics on Distance Relay in Short and Medium Transmission Line Model

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Abstract

One of the today's challenges that faces the stability of power networks is the continuous increasing in the number and the power ratings of the non-linear loads such as semiconductors, arc furnaces, and converters which are the main sources of harmonics that affect the performance of all electrical elements. This harmonics either current or voltage harmonics have a serious effect on the quality of electricity power supply or all network elements like protection elements especially distance relays. Therefore, the effect of harmonics on distance relay will be illustrated through a comparative study between the distance performance in the short and the medium transmission line model under different levels of harmonics. As well as, this study is presented using Matlab to describe the distance relay, harmonics (current source), transmission line, fault simulation [single line to ground fault (SLG)] and impedance type distance characteristic were chosen to be as the protection scheme..

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01C7 -Applying FACTS to Mitigate Power Quality Problems in Steel Making Industry- A Techno-Economic Study.

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Abstract

Electric Arc furnace (EAF) represents one of the most intensive and disturbing loads in the electric power systems. Utilities are concerned about the power quality issues such load can cause and try to take precautions to minimize their effects on power network at Point of Common Coupling (PCC). In this paper, mitigation of these resulting power quality issues can be shown to be also beneficial to industrial plant from a techno-economic point of view. One of the most important FACTS solutions for mitigation is the Static Var Compensator (SVC). This study presents the results of applying this solution in Main Receiving Substation (MRSS) of EZDK and the techno-economic benefits from such application reference to international standard performance figure.

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01C8 -Genetic Algorithm Implementation for Minimizing Harmonic Distortion in Cascaded Half-Bridge Based Multilevel DC Link Inverter.

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Abstract

Multilevel inverters become widely used in many industrial applications and when harmonic contents and high power are required. This paper presents an inverter topology with reduced number of switches and provides the higher number of output voltage levels. This topology is known as cascaded half-bridge based multilevel dc link inverter. This inverter consists of cascaded half-bridge units which produce a stepped dc waveform, and the four switches H-bridge to convert from dc to ac. Each unit consists of only two series switches and fed from a separate dc source. The dc sources magnitudes are suggested to have asymmetric values in order to provide the higher number of output levels. Along with the different modulation techniques of multilevel inverters, the fundamental switching frequency modulation is preferred to minimize the switching losses. Selective harmonic elimination technique is used to eliminate the low order harmonics based on genetic algorithm. Genetic algorithm computes the optimum switching angles of the inverter and minimizes the total harmonic distortion according to the objective function. A laboratory system was built based upon the (NI PCI-6013) data acquisition controller and experimental results for single phase 15-level inverter show a well-matching and good similarity with the simulation results.

02 – Renewable Energy

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02(A1 – A9) Solar Energy

02A1 - Highlight of Grid-Connected PV Systems in Administrative Buildings in Egypt

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Abstract

PV systems installed on roof tiles are to reduce electric bills, and provide emergency back–up energy. It started with a prime minister decree to install PV projects on one-thousand of the governmental buildings. This was followed by as an initiative called "ShamskyaMasr", and finally the Feed-in Tariff (FiT) projects.About 90 PV systems have been already mounted with about a capacity of 9 MW. In 2014, the Egyptian government issued the Feed-in Tariff program. Egyptian Electric Utility and Consumer Protection Regulatory Authority (EgyptERA) has set the regulations, promotion and awareness for PVs. The paper highlights the impact of the mechanisms in deploying PV technologies through small scale projects. It also represents a cost- benefit analysis for the installed systems taking into account the measured value for PV parameters (kWh/kWp, PSH) and daily load profiles of the selected administrative buildings.

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02A2 - Efficiency Enhancement in Dye-sensitized Nanocrystalline Solar Cell by Mechanical Compression

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Abstract

The potential for improvement in the power conversion efficiency is one of the reasons it is regarded as a highly promising method for efficient and economical conversion of light into electrical energy. This paper is trying to increase the efficiency of Dye-sensitized solar cells (DSSC) and make it comparable with silicon-based solar panels. Various values of compression on TiO2 NP film were tested to optimize the performance of (DSSCs). Field emission scanning electron microscope (FE-SEM) gave the morphological structure of the thin films. The results show that when the DSSC fabricated by the TiO2 NP thin film compressed at pressure of 12.75MPa, has the maximum short circuit photocurrent density (JSC) of 1.45 mA/cm2 , open and the photoelectric conversion efficiency (η) of 9.83%were observed. Compared to the DSSC fabricated by the non-compression of TiO2 NP thin film, the overall conversion efficiency is improved by more than 36.21%.

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02A3 - Study on the Performance of Solar Still

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Abstract

The present work deals with studying the efficiency of a solar still. The basic idea of the work is to check the production of a simple still for solar distillation (desalination) that has no moving parts and does not use any other source of energy. The still is basically a rectangular basin filled with black or blackened solid material that acts as the solar energy collector. Experiments were carried out during the months from May to August. The different materials used as collecting media are black plastic balls made of polyamide with different diameters, steel balls painted black with a diameter of 5mm and black or dark gravel with an average diameter of 6.4mm. The experiments investigated the effect of changing initial water volume, water to ball volumetric ratio and black solid material diameters on the productivity and the efficiency of the still. The highest volume of distillate water was obtained with 4mm diameter black plastic balls, and water to ball ratio 1.8, this rate was 4 m3/m2.day with an average efficiency of 49%. It was also found that solids with high heat capacity gives better rates of distillation and higher efficiency in the afternoon hours. Finally, the still was used for desalination of sea water and gave almost the same rate of production at the best conditions. A mathematical model was developed and used to predict the performance of the still. It was found that the predicted results are in good agreement with the experimental results. The percentage deviation is less than 10% of glass, water and solid temperature for all types of solids. And less than 20% for volume of water collected for experiment with spherical solid. But with gravel which has nonuniform shape, a correction factor must be included in the model. Finally, the still was used for desalination of sea water and give almost the same rate of production at the best conditions.

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02A4 -Assessment the Performance of Artificial Neural Networks in Estimating Global Solar Radiation.

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Abstract

Accurate knowledge of solar radiation considers the first step in solar energy availability assessment, and it is the primary input for various solar energy applications. The unavailability of the solar radiation measurements for several sites around the world leads to proposing different models for predicting the global solar radiation. Artificial neural networks consider effective tools for modeling nonlinear systems and require fewer inputs parameter. Accordingly, this work purpose to investigate the performance of artificial neural networks based models in estimating global solar radiation. For achieving this goal, measured dataset of global solar radiation for the case study location (Lat. 30˚ 51` N and long. 29˚ 34` E) are utilized for establishing and validating the models. Mostly common statistical indicators are employed for evaluating the performance of these models and recognizing the best model. The obtained results show that the artificial neural network models demonstrate promising in the prediction of global solar radiation. In addition, the proposed models provide superior relationship between the measured and estimated values.

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02A5 - Performance Improvement of Roof Transparent Solar Still Coupled With Agriculture Greenhouse

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Abstract

In Egyptian desert, growing plants is difficult due to harsh climate (hot at the daytime and cold at the night), infertile soil, low average rainfall and lack of fresh water for irrigation purposes. A set of simple transparent solar stills are integrated with a new solar driven agriculture greenhouse (GH). The stills are placed at the GH roof to use the extra solar radiation (above that required for plant photosynthesis process) for water desalination. In addition to water desalination concept the solar still units even reduce the cooling load during the daytime. A net of aluminum metal coated with black colour is placed on the base of the solar still units to raise the water temperature (enhance desalination process) and provide partially shading for the GH. Using aluminum net decreases also the number of solar still units required to produce the required amount of GH fresh water leading to a significant cost reduction.The main objectives of this work are sizing of the aluminum net, spacing between solar still units to obtain the threshold of plant requirements. Also fresh water production and greenhouse climatic conditions that plant needs (temperature, relative humidity, air velocity and amount of oxygen) are simulated.

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02A6 - Role of Dyestuff in Improving Dye-Sensitized Solar Cell (DSSC) Performance

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Abstract

Dye-sensitized solar cells DSSCs have attracted great attention for their simple fabrication process, low production costs, relatively high conversion efficiency, and being environmental friendly. DSSC are a combination of materials, consisting of a transparent electrode coated with a dye-sensitized mesoporous film of nanocrystalline particles of TiO2, an electrolyte containing a suitable redox-couple and an electrode. DSSCs use organic dye assist to produce electricity in a wide range of light conditions, indoors and outdoors. The dye in the solar cell is the key element since it is responsible for light harvesting ability, photoelectron generation (the creation of free charges after injection of electrons into the nanostructured semi-conducting oxide) and electron transfer. For this reason, this paper gives a background of dyestuff, types and limitations. The motivation of this work is to design a simple, easy and prepare an efficient organic dye sensitizer. Also, this paper investigates the important criteria which are considered for selecting dye to enhance DSSC efficiency.

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02A7 - Development of a Traffic Control System for PUA Complex Using a Solar Cells System

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Abstract

This work proposes a system to manage traffic control through the gates, the network of roads, parking structures and parking lots for PUA complex, Alexandria, Egypt. The system is to utilize RFID and Image Processing technologies. It will identify the vehicles that pass through the gates of the university complex by using an RFID tag adhered to the windshield of vehicles of faculty members, staff of the university, students, and the others for services. The system will enable as well, inspect the vehicles parked randomly on the network's roads and parking facilities through the use of a mobile reader and check also their status. In case the vehicle is parked randomly or in a parking space other than the allocated to them, a violation ticket is issued against the owner of the vehicle. The system will ensure the smooth and orderly flow of traffic and improve the safety level of the road users in PUA. It will also help to get rid of the bad practices and unpleasant scenery such as the use of concrete blocks to force drivers to follow certain routes to their destinations. The system will make use of a solar cells system to avoid complex power systems.

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02A8 - Factors Affect Dye Sensitized Solar Cells Performance

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Abstract

Recently, dye-sensitized solar cells (DSSCs) have received great attention for their simple fabrication process, low production costs and, relatively high conversion efficiency.DSSC are a combination of materials, consisting of a transparent electrode coated with a dye-sensitized mesoporous film of nanocrystalline particles of TiO2, an electrolyte containing a suitable redox couple and an electrode. In order to optimize DSSC performance, it is important to fully understand the factors which affect the key features of DSSC characteristics.This paper presents an overview of the construction of a dye-sensitized solar cell, operating principle of DSSC, DSSC performance and, investigates the most important parameters which affect Dye-Sensitized Solar Cells performance.

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02A9 - A Hybrid Stand-Alone PV-Diesel Power System for a Base Transceiver Station in Egypt

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Abstract

Energy sourcing is one of the main important issues for telecom Base Transceiver Station (BTS) especially to ensure mobile network coverage in remote areas. Most of BTS systems in Egypt are powered by diesel generators. The generator also charges batteries as a power back-up system. As a contribution in diesel fuel saving, this paper addresses the use of hybrid solar-diesel power system to supply the required power to remote BTS along with charging the batteries with two dispatch strategies for two cases; AC and DC diesel generator. The two operation dispatch strategies, load following, and cycle charging are tested using a HOMER model

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02(B1 – B3) Thermo Fluid

02B1 - Numerical Analysis for U-Shaped Borehole Heat Exchanger

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Abstract

Vertical U-shaped borehole heat-exchangers (UBHE) use the earth as a heat sink or heat source, respectively, to dissipate and absorb thermal energy into/from the ground. The ground temperature depends on the seasons at a certain depth (about 30 meters in the ground) the cold and warm temperatures of the ground are represented for cooling and heating of buildings that happens in summer and winter respectively. Various model's Configurations have been investigated by changing the time step size, depths, the shank spacing between U-tube, different of flow velocities and ground temperatures. The simulation of the dynamic and thermal behavior of the geothermal vertical U-tube borehole heat exchanger (UBHE) was carried out under Fluent –ANSYS 14.0 software. The simulation of UBHE assumes heat transfer within the circulating fluid and grout to be in a Transient. The governing equations, based on the k–ε model used to describe the turbulence phenomena, are solved by using finite volume method. CFD calculations were performed for different of U-tube shank spacing, depths and pipe lengths, flow velocities, ground temperatures, and results.

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02B2 - Shooting Method as a Proposed Technique to Solve Heat transfer Problems

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Abstract

The present proposed technique is suitable to analyze the thermal network of some unconventional heat transfer problems. The temperatures at the two boundaries of the network are known (T_∞1 and T_∞2), and one or more of the thermal resistances are unknown (e.g. the thermal resistance of radiation through evacuated space). According to the present technique, the temperature difference across each thermal resistance is calculated, starting with the value of temperature at the left boundary (T_∞1). As a result of the forgoing step, the value of the temperature at the right boundary is obtained.

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02B3 - Electricity Generation in Gas Pressure Reduction Process by Using Turbo Expander in West Delta Power Stations

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Abstract

Natural gas is supplied to power station at high pressure (approximately 40 bar), pressure is reduced before ignition with pressure reduction ratio ranging from 5 to 1.4 (PR = 5: 1.4). Usually, pressure control valves are used to reduce the pressure, where energy of the gas is spent without doing any work. This lost energy can be recovered as electricity if turbo-expanders coupled with generators are used instead of throttle valves. Turbo-expander is a centrifugal or axial flow turbine through which a high pressure gas is expanded to produce work that coupled with a generator or used to drive a compressor. It is relatively small and compact. The entire assembly is mounted on a skid, which can be relocated if required. This technology is being applied in different countries around the world, and the power obtainable from it range from hundreds of kW to several MW. Application of this technology for power generation is gaining more attention due to the recent global trend of extracting energy from any possible source.

This paper attempts to the ability of using this technology in West Delta power stations, it is clear that the most important factors affecting the power output from Turbo-expander are pressure ratio (p1/p2), inlet temperature, and the flow rate. For a given pressure ratio, the work is linearly related to the inlet gas temperature and gas flow rate. Turbo-expander outlet temperatures, in most cases, are very low due to isentropic expansion through turbine. Such low temperatures will almost ensure hydrate formation, liquid production, icing, and similar undesirable effects. Therefore, pre-heating before expansion is necessary to avoid hydrate formation. It can be seen that, to operate safely above the hydrate zone, a low percentage of gas should be used as fuel for pre-heating process. It found that the net power obtainable from West Delta power stations by using this technology is ranging from 18 to 10 MW depending upon the load percentage.

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02(C1– C4) Refrigeration and air conditioning

02C1 - Solar Cooling, Status and Perspectives

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Abstract

Cooling is naturally primarily desired when the temperature is high, and high temperatures are caused by high radiation rates from the sun. The solar influx is thus well in phase with the need of cooling. It is therefore natural to search for cooling solutions which are driven by the radiant energy from the sun. In this presentation, different techniques for harvesting the energy of the sun and using it for cooling of buildings are reviewed, and remarks are made concerning the applicability of each.

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02C2 - Simulation of District Cooling Plant and Efficient Energy

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Abstract

In hot aired countries with severe weather, the summer air conditioning systems consumed much electrical power at peak period. Shifting the loads peak to off-peak period with thermal storage is recommended. Models of residence buildings and schools are used to estimate the daily cooling load profile in Makkah, Saudi Arabia at latitude of 21.42o and longitude of 39.83o. The average data of Makkah weather through 2010, 2011 and 2012 are used to calculate the cooling load profile and performance of air conditioning equipment. The maximum cooling load is calculated at 15 O'clock from main floor to 40 floor for residence buildings and to 5 floor for schools. District Cooling Plant of 180000 Refrigeration Ton is suggested to serve the Gabal Al Sharashf area in central zone of Makkah. Thermal storage system to store the excess cooling capacity is used. Air cooled condensers are used in the analysis of chiller refrigeration cycle. The operation cost is a function of electrical energy consumption. Fixed electricity tariff is 0.04 $/kWh for electromechanical counter, and 0.027, 0.04, 0.069 $/kWh for shifting loads peak for smart digital counter. The results showed that the daily saving in consumed power are 8.27% in spring, 6.86% in summer, 8.81% in autumn, and 14.55% in winter. Also, the daily saving in electricity bills are 12.26% in spring, 16.66% in summer, 12.84% in autumn, and 14.55% in winter. The obtained maximum saving in consumed power is 14.5% and the daily saving in electricity bills are 43% in summer when the loads peak are transferred to off-peak period.

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02C3 - Challenges Encountered in Using the Vapor Compression Refrigeration System for Cooling Steam Plant Condenser

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Abstract

This paper presents the main challenges that may be met in using vapor compression refrigeration system for cooling steam power plant condenser. These challenges were met during design, construction and examining a test rig for simulating this process. The challenges found are refrigerant charging, running vibration, large thermal stress on the condenser tube wall at startup, vacuum generation in the steam condenser, and operational control of the system. These challenges are clearly addressed and discussed in this paper. The vapor compression refrigeration system (VCRS) uses R-410Arefrigerant to cool water in a heat exchanger of an intermediate loop. The chilled water in the intermediate loop serves as a coolant for the steam condenser. It has been shown by the results of the experiments carried out in this work that the vapor compression refrigeration system can generate more vacuum in the steam condenser, which will practically increase the steam turbine output power. Moreover, the use of vapor compression refrigeration system for cooling steam plant condenser causes a decrease in the required cooling water mass flow rate and hence the condenser size. Also, the COP of the vapor compression system is improved a little bit at lower operating condenser pressure and inlet cooling water temperature, but COP dwindles at lower values of cooling water mass flow rates.

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02C4 - EER Improvement for Unitary Air Conditioner (UAC) in Egypt

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Abstract

This paper illustrates the possibility of achieving higher Energy Efficiency Ratio (EER) for unitary Air Conditioner (UAC) such as Room Air Conditioner (RAC) unit, Split Air Conditioner (SAC) unit and Package unit, in support of the energy conservation requirements in International Building Code (IBC) and Egyptian Building Code (EBC)

This study considered several design options to improve the performance and efficiency of UAC. These design options include the number of condenser and evaporator rows, fins density, frontal area, compressor types, and refrigerant type.

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02(D2 – D4) Energy Conservation

02D2 - The Impact of Variable Flux Permanent Synchronous Machines on Energy Consumption of Electric Vehicles

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Abstract

This paper presents a study about the impact of replacing the conventional rare-earth permanent magnet synchronous machines utilized in most electric vehicles nowadays with Alnico variable flux machines. The performance of an electric vehicle is simulated under different driving cycles, and the machine losses for each driving cycle are calculated using finite element simulation. The vehicle simulation results show that utilizing variable flux machines can provide considerable energy savings, especially during the highway drive, where the calculated losses of the variable flux machine were 4.7 times lower than the rare-earth permanent magnet synchronous machine.

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02D4 - Assessment of Energy Conservation in Egypt's Electric System

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Abstract

This paper provides an evaluation of energy saving policy as a key factor in Egypt's electric system in terms of benefits, invested cost, power quality and environmental impact, solutions have been made by system planners and decision makers aiming to face the challenges that being encountered by the electric system such as scarce and precious of prime energies are compared in terms of invested cost, implementation time and advantages for both of power providers and end users w.r.to energy savings. A case study that implemented in a pilot program for energy savings was given. It is a group of facilities include industrial, commercial, administrative companies and worship houses, they are connected to Alexandria electrical distribution network, they are classified as big customers, i.e. contracted power for each is higher than 0.5 megawatt, the goals of the program were evaluating potentials of energy saving opportunities in the system and estimating the outcomes. Options were evaluated with regard to savings in electricity, fuels, and water. Cost of investments and pay back periods were calculated. Environmental impact as a result of saving in emitted greenhouse gas co2 is determined. Potentials of energy savings are analyzed and benefits to both electric utilities and end users were assessed.

03 – Other Energy Topics

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03(A2 – A6) Bio Energy

03A2 - Mapping of Agricultural Biomass Resources for Sustainable Bioenergy Production in Indonesia

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Abstract

Indonesia is facing an increasing energy demand originating from population and economic growth. At the same time, the country aims at reducing GHG emissions and diversification of energy sources. Indonesia has a large agrarian economy with an underutilized resource base in form of agricultural residual biomass. Instead using this biomass for energy conversion, can reduce GHG emissions, diversify the energy mix and bring benefits to the agricultural sector. This study is an assessment of the available agricultural residues; with a temporal and spatial mapping of the resources. We use the method of residue per product ratio to quantify biomass residues of rice, palm oil, sugarcane cassava, coconut and maize. The majority of the agricultural residue resources in Indonesia are generated by the palm oil industry followed by paddy cultivation. Paddy residues have good spatial and seasonal synergy with sugar and maize residues which in combination can provide a more even biomass supply along the year. Palm oil residues are concentrated in many districts of Sumatra and Kalimantan and are available at substantial amounts all year around. The information provided here on seasonal and spatial distribution of biomass residues can help optimize biomass for energy conversion and develop bioenergy strategies at both national and district level.

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03A3 - Modeling and Experimental Investigation for PEMFC to Achieve High Fuel Cell Performance

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Abstract

Proton exchange membrane fuel cell (PEMFC) is one of the most promising types of clean and renewable energy. PEMFC is a device that converts chemical energy to electrical energy. In this study, the numerical model has been developed by using MATLAB program to optimize the fuel cell operating conditions to achieve high power density and efficiency for PEMFC. The two main parameters that were considered in this work were cell temperature and air to fuel ratio. The numerical results were validated by experimental data which obtained in our laboratory by using Fuel cell test system (Scribner Associates Model 850e).

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03A4 - Optimization of Biodiesel Production Using Nano Heterogeneous Catalyst from Waste Cooking Oil

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Abstract

The demand for energy around the world is increasing; specifically the demand for petroleum fuels that is rapidly becoming scarcer and more expensive. The scientific community has been forced to investigate new type of renewable energy sources, mainly due to the greenhouse effect brought about by the growing usage of fossil energies and thus to increase the time over which fossil fuels will still be available. Biodiesel has become more attractive because of its environmental benefits and it is obtained from renewable resources. There is a growing interest in using waste cooking oil as the feedstock for biodiesel production due to its availability in Egypt. This study discusses the preparation of nano catalyst from saw dust by physical and chemical activation and their characterizations, also its application as a heterogeneous catalyst for biodiesel production from waste cooking oil by transesterification with methanol to give the corresponding mono alkyl esters. The effect of the following variables on the yield of the biodiesel produced was studied. The variables investigated were reaction time (0.5–2 .5h), catalyst concentration (3–10wt %), temperature (27 “room temp.”-60 °C) and methanol: oil molar ratio (6:1– 14:1). From the results obtained, it was found that, the chemical activation catalyst is more effective than physical activation catalyst that the best yield percentage was obtained using a methanol: oil molar ratio of 8:1, catalyst (5%) and 50± 1 ºC temperature for 1.5 h .The yield of biodiesel was determined according to GC-MS. From the results it was clear that the produced biodiesel fuel by the nano catalyst prepared in this work was in the recommended standards range of biodiesel fuel.

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03A5 - Extended Abstract: The Leading Role of Hydrogen for a Sustainable Energy System

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Abstract

In this presentation, we will try to shed some light on how to overcome the two challenging problems the world is facing regarding energy:

1st Fossil fuels - which meet about 80 % of our energy needs today - are being depleted fast.

2nd The use of fossil fuels is causing major environmental problems.

Solution of these interrelated problems is pursued through the use of what is called Sustainable Energy resources (SER). Hydrogen is introduced as an energy carrier to utilize SER in an effective and non-polluting way. The analogy between hydrogen as energy carrier in an energy system and blood in human body is established; both are energy carries.

Methods of hydrogen production are presented. The pros and cons of using hydrogen in our system are illustrated. The question posed: is hydrogen sustainable? is answered as well.

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03A6 - Hydrogen through Water Electrolysis and Biomass Gasification for Application in Fuel Cells

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Abstract

Hydrogen is considered to be one of the most promising green energy carrier in the energy storage and conversion scenario. Although it is abundant on Earth in the form of compounds, its occurrence in free form is extremely low. Thus, it has to be produced by reforming processes, steam reforming (SR), partial oxidation (POX) and auto-thermal reforming (ATR) mainly from fossil fuels for high throughput with high energy requirements, pyrolysis of biomass and electrolysis. Electrolysis is brought about by passing electric current though two electrodes to evolve water into its constituent parts, viz. hydrogen and oxygen, respectively. Hydrogen produced by non-noble metal catalysts for both anode and cathode is therefore cost-effective and can be integrated into fuel cells for direct chemical energy conversion into electrical energy electricity, thus meeting the sustainable and renewable use with low carbon footprint. We report here the use of Raney-Ni cathodes and anodes with different additives in alkali as well as thermochemical process (gasification) of wood charcoal, agro-residues and energy crops for generation of hydrogen with a series of purification steps and further enrichments for application in a 250 W AFC system.

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03(B2 – B5) Energy Management

03B2 - Application of the Fuzzy Computational Intelligence in Power Quality Data Management

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Abstract

In Electrical Power Distribution System the sustained availability and quality of electric power are the main challenge they need to satisfy so overcoming the power quality (PQ) degradation became an asset. This Paper addresses the perfect load management using the computational techniques by analyzing the data of the system taking into account the density of the feeding nodes and its distribution also the classification of major Power quality degradations such as power factor and harmonics in the System and The methodology will be illustrated, simulated and evaluated using the fuzzy technique clustering the data and on an Artificial Neural Network (ANN) to achieve the optimum utilization of the energy loads and perfect load management and optimization. Simulation results demonstrate the effectiveness of the proposed algorithm in reducing the power and energy losses, improving the quality of the electric power system.

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03B3 - Energy Saving Feasibility Study Using a Concentrating Solar Power Plant for Borg El-Arab International Airport. Egypt.

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Abstract

Energy saving introduces significant impact on reducing energy cost as well as the CO2 emission. Energy saving at airports provides an attractive case study as the airport has various electrical critical and non-critical loads. Renewable energy resources can contribute to feeding the airport with the required electrical power. In this paper, the case study of Borg El-Arab International Airport in Egypt is addressed where a concentrated solar power (CSP) system without thermal energy storage subsystem is used. The CSP system produces electrical power which may be connected to the grid or supplying critical loads during emergency situations. Additionally, the CSP system produces heat to supply the absorption chillers of the HVAC system. The sizing of thesystem components is presented and a software simulation model is used to investigate the proposed energy management technique.

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03B4 - Market potential of solar thermal enhanced oil recovery –a techno- economic model for Tia Juana oil field in Venezuela.

Sunay Gupta

Abstract

Solar thermal enhanced oil recovery (S-EOR) is an advanced technique of using concentrated solar power (CSP) technology to generate steam and recover oil from maturing oil reservoirs. Conventionally, this steam is generated through natural gas (NG) fired boilers with associated greenhouse gases emissions. However, pilot projects in the USA (Coalinga, California) and Oman (Miraah, Amal) demonstrated the use of S-EOR to meet their steam requirements despite the intermittent nature of solar irradiation. Hence, conventional steam based EOR projects under the Sunbelt region can benefit from S-EOR with reduced operational expenditure (OPEX) and increased profitability in the long term, even with the initial investment required for solar equipment. S-EOR can be realized as an opportunity for countries not owning any natural gas resources to make them less energy dependent and less sensible to gas price fluctuations, and for countries owning natural gas resources to reduce their gas consumption and export it for a higher margin. In this study, firstly, the market potential of S-EOR was investigated worldwide by covering countries including USA, Canada, Brazil, Mexico, Venezuela, Indonesia, Oman, Kuwait, Netherlands and Germany. Presently, there is no study which consolidates the information of different oil fields and compares them at the level of a defined set of parameters to identify opportunities for S-EOR to flourish in those oil fields. The parameters considered for market study at each oil field included oil production, direct normal irradiation (DNI), steam requirements, NG price, NG availability (geopolitical stability, size of imports and exports), oil field expected remaining lifetime, oil field location (fixed, floating, inside/outside a city), land topography, CSP penetration in the country and any political will or opportunity to introduce renewable technologies. Secondly, a modeling approach for S-EOR was designed to identify cost reduction opportunities and optimum solar integration techniques. The Tia Juana oil field in Venezuela was selected to substantiate the approach and a steam drive model was designed using CSP based direct steam generation. The costs were calculated using DYESOPT, KTH's in-house tool for techno-economic modeling. The discounted payback for this plant was 13 years with IRR of 10% and project life of 25 years. The LCOE of this 100% solar integrated steam model was $ 29.2/ton of injected steam, with reduction in CO2 emissions of 4 tonnes/year. The feasibility results from this case study proved that the modeling approach can be used to develop S-EOR even in regions less favorable compared to Coalinga and Amal

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03B5 - Extended Abstract: ICT for Community Energy

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Abstract

Community energy initiatives are becoming more and more widespread. For them to be successful and flourish, engagement from people in the community is a prerequisite. ICT can provide the means to support engagement, by helping people to assess the impact and benefits of a CE project and by capturing and disseminating the benefits. Also, ICT can support with the design and management of a CE project; and lastly ICT can support research on the topic.

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03(C1 – C5) Wind Energy

03C1 - Experimental and Simulation Verification of Pitch Angle ControllerofDFIGBasedWindEnergy ConversionSystem

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Abstract

Due tothe growing of electrical energy demand, wind energy is receiving much interest all over the world. This paper realizes the performance analysis of double fed induction generator (DFIG) with pitch angle controller. Comprehensive models of wind speed, wind turbine, DFIG along with its control strategy are implemented in MATLAB/SIMULINK package. Verification analysis is achieved experimentally to clarify the harmony between the results. The pitch angle controller is a mandatory method of controlling the blade angle of the wind turbine when the wind power exceeds its rated value (i.e. wind speed exceeds its rated value). In this way, pitch angle control is activated to limit the maximum output power to be equal to the rated power and thus protect the generator when the wind speed reaches to guest level. The pitch angle controller is only activated at high wind speeds. Further, the response of the pitch controller system to wind velocity variations is declared. Both experimental and simulation results show that the reduction behavior the power coefficient Cp with the increase in pitch angle consequently the active power and rotor speed decreases.

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03C2 - A Modified Open Loop Control of a Matrix Converter Connected to Wind Energy System

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Abstract

The Wind energy conversion system (WECS) is bitten by bit gaining interest as a suitable source of renewable energy. In this paper, a direct AC-AC matrix converter is utilized to interface an isolated static load fed from WECS. A self-excited induction generator is utilized as it has many advantages in terms of ease of maintenance, self-protection against short circuits. This paper proposes a modified open loop control of matrix converter with indirect space vector modulation. The modified open loop provides the constant output voltage and constant frequency even if the wind speed changed. Matrix converter (MC) is used rather than AC-DC-AC converter as it eliminates the bulky capacitors. Finally, simulation results for different operating points are displayed which are consistent with the expected results.

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03C3 - Impact of Wind energy Integration on Economic and Reliable Operation of Electrical Networks

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Abstract

In this paper, an integration of a wind farm designed at the installation site of a new city with conventional power generation (CPG) is presented. Two scenarios are suggested to integrate this wind farm with CPG. The impact of this integration on the economic operation of the electrical network is studied using two proposed scenarios. Also, the impact of this integration on the reliable operation of the electrical network is introduced. A long-term load forecasting of the Egyptian electrical network is presented to be helpful in introducing the impact of wind farm integration on the reliable operation of the electrical network. The impact of wind energy integration on the economic and reliable operation of electrical networks is applied to the new Borg El-Arab city in Egypt. The results show the capability of the two proposed scenarios.

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03C4 - Optimal Planning with Wind Energy for a New City in Egypt

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Abstract

This paper presents the load forecasting of a new city using the conventional techniques such as extrapolation of trend curves and modern techniques of load forecasting such as Genetic Algorithm (GA) and Particle Swarm Optimization (PSO) technique. A comparison between different wind generator modes (WGMs) as related to the technical and economical sides is presented. The optimal WGM is chosen for designing the wind farm at the Borg El-Arab site which has a new city in Egypt.

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03C5 - Review on Types of Generators for Wind Energy Conversion System

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Abstract

Greenhouse gas emissions have a bad effect on the environment. The demand for clean &continuously energy source was increased. Energy generation by wind turbines seems to be one of the most competitive renewable energy sources. The size of wind turbines has increased recently. This paper presents a review of wind turbine control strategies, classification of the wind energy conversion system according to type of electric power output, comparing between types of generators, illustrating the rotational speed of aero turbines for fixed and variable speed, also according to partial and the full-scale power converter.

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03(D1 – D14) Building materials and Construction

03D1 - Development a Type of Sustainable Self-Healing Concrete Using Bacteria and Different Organic additives

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Abstract

Bacterial concrete is used to extend the service life of the structure and reduce costs of maintenance and repair. The main objective of this research is to develop Sustainable mortar by using bacteria. Bacillus megaterium (Bm) with five types of organic additives were incorporated in the matrix to obtain an autogenous self-healing mortar. The bacteria were added to the mortar with the ratio (0.5%) of cement weight. Setting time test, the rate of water absorption test, compressive strength test, and flexural strength test was performed. The increase of compressive strength and flexural strength was observed. Scanning Electron Microscopy (SEM) photos showed that bacteria embedded in the mortar matrix can precipitate calcium carbonate. There is a significant development in mechanical properties of mortar. The increase of compressive strength for calcium acetate (CA) and calcium formate (CF) at 120days age was 160.3% and 155.9% compared to the control specimen's compressive strength, respectively. Flexural strength of yeast extract(Y) at 120days age increased and became 161.4% compared to the flexural strength of control mortar. The decrease in the rate of water absorption for calcium lactate was 24% at 120days age compared to the rate of water absorption of control mortar.

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03D2 - Bibliotheca Alexandria Shifts To Energy Efficiency Lighting Systems

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Abstract

In the LAST YEARS, the energy sector in Egypt faced many challenges. Light-emitting diodes (LED) is one of highly energy-efficient lighting systems compared to incandescent, fluorescent and halogens lighting systems as it consumes less energy leading to decreasing the CO_2 emissions. New led technology uses only 10% the energy and last as much as 25 times longer than incandescent, fluorescent and incandescent lamps.

Bibliotheca Alexandrina (BA) strives to be a green institute by adopting new practices and technologies to ensure sustainability of natural resources. a collaboration between BA and ministry of electricity and renewable energy has been established through the energy efficiency project supported by the global environmental facility (GEF) and the united nations development programme (UNDP). The project was targeting the transformation from incandescent traditional lighting to led system. The 1,750 incandescent lamps were substituted by high efficiency led lamps. Electric measurements before and after the implementation of the new lighting system were performed by Alexandria electricity distribution company. Energy savings and the carbon dioxide emission were also calculated. This paper will present the project implementation steps and its impacts on electric saving. The calculated decrease in carbon dioxide emissions was found to be equivalent to 124 tons.

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03D3 - Sustainability and Energy Value of Heritage Buildings

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Abstract

Conservation and sustainability have long shared fundamental goals. Heritage buildings are basically sustainable and will continue to be if their sound construction and superior materials are conserved properly. Despite this fact, heritage buildings have gained a reputation for being inefficient and therefore unsustainable in the face of modern, energy efficient structures. As a result, models which measured embodied energy arose to advocate for the retention of heritage structures over new constructions. The initial need to measure energy capital in buildings started due to rising needs to save energy and address global sustainability goals. Both responses measure the overall energy efficiency of heritage buildings by attempting to account for the "energy capital." The life cycle assessment/avoided impacts model is another model that acts as a response to the evolving metrics and currency of sustainability. The Conservation Green Lab further developed the capabilities of the life cycle assessment/ avoided impacts model in 2012 in its' innovative report, "The Greenest Building: Quantifying the Environmental Value of Building Reuse". With this aim, the study applied energy software models supported by guidelines laid out by LEED and are consistent with judicious conservation practice on a case study heritage building in Alexandria. The outcome revealed proves that heritage buildings can be both sustainable and energy efficient while maintaining their historic integrity when dealt with properly.

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03D4 - Dynamic Facades - Environmental Control Systems for Sustainable Design

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Abstract

Façades are the most strategic and visible part of the building which leads to an improvement in appearance and environmental performances in buildings. Facades play a significant role in the quality of a building. It forms the barrier between the internal space and the outside climate. This means that the façade is the medium through which the interaction takes place between the activities, inside and outside. The image of a building, and therefore for the users, is reflected through the design of the façade.

In recent practices, architects and engineers are strategically designing and installing dynamic facades not only for their aesthetic valuesbut also for improving the buildings' energy performance. The high integration of these strategies for dynamic facades increases their durability and suitability, with current building demands, which targets for energy efficiency and thermal comfort level.

In the meantime, recent studies show that the majority of people spend up to 90% of their time indoors especially in hot climates. This trend has had a high impact on the requirements of the indoor environment, consequently turning the buildings into complex devices that ensure the wellbeing of the people who use them. Therefore, users are starting to look for new products for the façade design that comply with the requirements of energy. This poses an important question, is there anything to be done to this specific part of the building in order to positively influence the overall energy need of the building?

The paper will discuss the concept and the importance of dynamic facades according to their design and types, implementations, current challenges and climate impacts. It will highlight the history of these facades and the essential parameters which make the building sustainable through its facades. Moreover, the paper will analyze two examples of buildings with dynamic facades with automated control systems and its effect on the building environment. At the end, the paper tries to demonstrate if these facade systems and strategies could be applicable to the buildings in Egypt.

Finally, the paper aims at integrating the dynamic facades in buildings as an environmental control system to achieve a sustainable design to reach good energy performance in buildings.

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03D5 - Low-Carbon Communities between Vision and Implementation - The Case of Borg Al Arab

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Abstract

Several cities are facing the problem of running-out of fossil fuels and are contributed to an estimated 70% of the world's energy-related greenhouse gasses (GHGs). Consequently, there is a tremendous need for low-carbon communities which will lead to more livable, efficient and ultimately sustainable cities. Furthermore, well-planned and designed communities can effectively provide the basic human needs and reduce reliance on fossil fuels. Some communities have developed strategies to reach net zero-carbon future by reducing demands for energy and supplying the remaining demands with renewable resources.

In the meantime, Egyptian cities face the problem of greenhouse gasses and the lack of energy and water. Therefore, passive, energy efficient and energy offset design are needed. This can be achieved through sustainable transportation systems and the shift to efficient management of water and waste.

The paper discusses the problem of climate change and its relation to communities. It investigates examples of communities that have focused on reducing their carbon emissions in different parts of the world. Also, it examines some of the most important aspects of design strategies that help to implement low-carbon communities and how could they be achieved in the Egyptian context (Borg Al Arab-Alexandria).

The aim of the paper is to highlight certain cities that demonstrate a deeper understanding of what a low-carbon community is and how to achieve it through reducing energy demand and providing the best options for passive design and renewable energy supply in the Egyptian communities to become self-contained in terms of energy.

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03D6 - Opportunities of Energy Saving In Lighting Systems for Public Buildings

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Abstract

The lighting system provides many options for cost-effective energy saving with low or no inconvenience. Lighting improvements are excellent investments in most public buildings, it is usually cost-effective to address because lighting improvements are often easier to make than many process upgrades.

For public buildings, the easy no and low cost options to help save money and improve the energy performance are:

- Understand energy use.
- Identify options
- Prioritize actions

Make the changes and measure the savings.
Continue managing energy efficiency.

The challenge is to retrofit traditional lamps with LED lamps of good quality. The benefits of LED light bulbs are long-lasting, durable, cool, mercury free, more efficient, and cost effective. The light Emitting Diode (LED) bulb uses a semiconductor as its light source, and is currently one of the most energy efficient and quickly developing types of bulbs for lighting. LEDs increasingly are being purchased to replace traditional bulbs. LEDs are relatively more expensive than other types of bulbs but are very cost-effective because they use only a fraction of electricity of traditional lighting methods and can last for longer. Benchmarking guides decision makers to policies aimed at the energy sector through better understanding of energy consumption trends nationwide, e.g.: energy price, moderating, peak demand, and encouraging sectors, low energy expansions. The “Improving Energy Efficiency Project of Lighting and Appliances” carried out energy audits and implemented opportunities of energy saving in lighting for different type of public buildings. To rationalize the use of energy by giving guidelines to consumers, the IEEL&A project prepared some brochures. This paper leads with the results of case studies as energy audits, opportunities in lighting systems, energy saving, and CO2 reduction.

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03D7 - Energy Efficiency Opportunities in Hotels

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Abstract

According to the statistics in Egypt (2013), the number of hotels is 1193, about 407 of them have contracted power greater than 500 kW. The energy consumption per night spend changes a lot, depending on various factors.

For Energy benchmarking, the most useful performance indicator (or Energy Efficiency Benchmarking) of hotels are: Lighting Power Density (LPD) in W (for lighting)/m^2, and energy intensity (kWh/m^2/ y). Energy efficiency opportunities are low-cost measures and cost- effective investments.

There are many energy saving opportunities for lighting in hotel's guest rooms. Behavior campaigns can yield substantial energy savings, both through the guests and housekeeper behavior. The paper presents the energy efficiency guidelines and energy benchmark for hotels. Also, a case study showing how the energy efficiency program implemented is presented.

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03D8 - Exploring the Importance of Employing Bio and Nano- Materials for EfficientBuildings Construction

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Abstract

The continued and increasing use of ordinary building materials to house the ever-growing world population ensures growing contributions of carbon (C) to the active carbon cycle through carbon dioxide (C02) emissions from combustion and chemical reactions in the raw material to the atmosphere. To minimize this, materials should be conserved, reduce their unnecessary use, produce them more benignly and make them last longer, recycle and reuse materials. Thus, paper will focus on exploring alternative building materials and systems that can be developed in order to balance atmospheric carbon dioxide. It also presents the Bio-inspired architecture approach that embraces the eco-friendly practices of using Biomaterials and Nano-materials for sustainable dwelling construction through a number of examples that shows how a building can be strongly related to its site.

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03D9 - Sustainable Biomimic Approach in Green Architecture, Architectural Applications Inspired by Nature

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Abstract

Humans with theirhabits are destroying the nature day after day, leaving us with worries about the decay of nature. This led the public and architects to feel the massive impact of our buildings on nature and built environment. There is a necessity to rescue the environment and strengthen the relation between built environment and surroundings. A new vision is introduced by combining sustainability and biology with architecture in order to form living buildings in harmony with surroundings and comfortable to human. Biomimicry is fast becoming an integral part of sustainable design. Nature-inspired decisions can add tremendous value to architecture. From the definition of biomimicry and its principle comes the importance of the studies of sustainability and the use of the principles of sustainable development. “Biomimicry” became a famous term used to apply sustainability on designs. But as a concept, it is often misunderstood. The purpose of this paper is to introduce and create interest by the reader in the ideology of biomimicry with sustainability by analyzing an example for a building that extracted biological solutions to apply sustainability principles, showing the pros and cons and architectural challenges of using biomimicry and how this affects the project, save resources and reach sustainability.

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03D10 - Concrete Pavement Reduce Energy Consumption

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Abstract

Rigid pavements, like concrete, are built in just one layer and as a result require less fuel to construct than conventional pavements made from more flexible materials, like asphalt , that are built in several thin layers. Every layer requires more delivery trucks, passes of the paving machine, rollers, etc. In addition, concrete does not need to be heated to mix properly, and does not need to be maintained at a high temperature during placement like flexible pavement materials.

Moreover, rolling resistance generated by tires affects vehicle fuel economy. Therefore, most of the research carried out previously has focused on the energy dissipation caused by rubber tires. The energy loss in the pavement due to stiffness is ignored since it is much smaller than that caused by tires. For these reasons, a concrete roadway requires less fuel to construct.

The main objective of the study will be divided into some parts:

1. Selecting pavement sections (flexible & rigid) for specified traffic loads and tire pressure according to Egyptian specifications;
2. Calculating pavement deflection for both types of pavements using BISAR computer program;
3. Calculating pavement rolling resistance as a function of traffic speed at various top layer stiffness for flexible and rigid pavements;
4. Analysis of the obtained results.

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03D11 - Power Generation Using Waste Heat Recovery by Organic Rankine Cycle and Steam Rankine Cycle in Cement Industry

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Abstract

As the cement industry is one of the most energy intensive industries and the losses of both electrical and thermal energy can account for 35 - 40% of the energy input, the recovery of waste heat for power generation becomes very important. The ORC (organic Rankine cycle) is a promising technology for power generation utilizing waste heat, however, the steam Rankine cycle is the most used technology in this field. In this paper, the reasonability of using ORC for power generation will be compared with the steam Rankine cycle in a cement plant in Egypt. Aspen HYSYS is used to build up the simulation model in which water and methanol have been investigated. The comparison is based on different parameters such as net power output, efficiency, and profitability analysis.

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03D12 - Towards Sustainable School Buildings: Methods and Techniques used for Controlling Natural Lighting and Ventilation

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Abstract

Sustainable schools; also referred to as green or high-performance schools, benefit the outdoor environment, the indoor environment, and the students, teachers, and administrators who study and work in these buildings. These schools are energy and water efficient and make use of renewable energy and green materials to the fullest extent possible.

This paper investigates compatible methods and new techniques used in school buildings to optimize their environmental performance. It makes special emphasize on those used for controlling natural lighting and ventilation. It reviews related examples to disclose the way these aspects are treated in the shadow of sustainability understandings. In the further step, it examines the applicability potential of these methods and techniques to be practically exploited in new school buildings in Alexandria, Egypt.

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03D14 - Towards a Zero Carbon Alexandria

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Abstract

Today, the world faces an unprecedented environmental crisis. Since the Industrial Revolution, the accelerated climate change is believed to be a result of human activities; that increase the concentration of greenhouse gases (GHG) in the atmosphere – to which carbon dioxide is the largest contributor. It made a must beginning to reverse the damage inflicted on the planet. Egypt is exerting great efforts to reduce the emissions of Green House Gases and mitigate the negative impacts of climate change and deal with the main challenges that affect sustainable development.

Based on an empirical analytical study, the paper examines all of the environmental factors and its effect on carbon dioxide concentration taking into consideration the characteristic of the urban fabric and conditions of Alexandria one of the biggest cities in Egypt as an applied case study of a big willing costal city. The paper simultaneously aims the management of the carbon dioxide emissions through several recommendations based on the stated study, while creating a vibrant urban environment.

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03D15- Green Building between Tradition and Modernity Study Comparative Analysis between Conventional Methods and Updated Styles of Design and Architecture Processors

Elshimy .H (1), Samir, N (2)

Abstract

Green house concept appeared from the ancient to the modern age ages and there is a tendency to use a traditional architecture with a pristine ecological environment areas and through sophisticated systems arrived to modern systems of the upgraded systems by Treatment architectural achieve environmental sustainability in recent years, sustainability concept has become the common interest of numerous disciplines. The reason for this popularity is to perform the sustainable development. The Concept of Green Architecture, also known as "sustainable architecture" or "green house," is the theory, science and style of buildings designed and constructed in accordance with environmentally friendly principles. Green house strives to minimize the number of resources consumed in the building's construction, use and operation, as well as curtailing the harm done to the environment through the emission, pollution and waste of its components.

To design, construct, operate and maintain buildings energy, water and new materials are utilized as well as amounts of waste causing negative effects to health and environment is generated. In order to limit these effects and design environmentally sound and resource efficient buildings; "green building systems" must be introduced, clarified, understood and practiced.

This paper aims at highlighting these difficult and complex issues of sustainability which encompass the scope of almost every aspect of human life.

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POSTERS SESSIONS

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03A1 – Poster: Transesterification of Rapeseed Oil by Solid Oxide Catalysts

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Abstract

Vegetable oils are a vast triglyceride source for biodiesel production, i.e. fatty acid methyl esters (FAME), with methanol and a catalyst via transesterification reaction. The aim of this work was to study heterogeneously catalyzed biodiesel production with solid oxides such as mayenite (Ca12Al14O33) and alumina (Al2O3) as catalyst carriers. These oxides were impregnated to have MgO and Li2O concentrations of 5-10 wt. % and 5-30 wt.% over the carrier, respectively. The catalysts were characterized using Brunauer-Emmet-Teller (BET), Scanning electron microscopy (SEM), and X-ray diffraction (XRD) analyses. The synthetized catalysts are mesoporous from 119 to 401 Å and their chemical phase composition was confirmed by the XRD 2θ results. The catalyst usage for the reaction was optimized, catalyst coating of MgO/Li2O, amount of catalyst in the reactor, along with the reaction kinetics using gas chromatography (GC). The reaction occurred at 60 °C, atmospheric pressure, and agitation rate of 180 rpm for 2 hours in a 6:1 molar methanol to oil ratio mixture. For each catalyst, loadings of 2, 5-5-10 wt. % relative to the oil weight were evaluated. The highest biodiesel yield was obtained using 5 wt. % impregnated mayenite catalyst coated with 10 wt.% Li2O.

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03B1 – Climate Change Adaptation during the Economic Development. A Water-Energy Nexus Assessment for Bolivia

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Abstract

Water, Energy and agriculture activities are inextricably linked. Water and energy are inputs for the agro-food chain. In the same way, using water to irrigate crops might promote food production but reduce the hydropower potential. Climate change is likely to aggravate pressure on resources and changing temperature and precipitation patterns. For instance, an integrated planning platform is required to ensure sustainability to minimize externalities.

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SSE1 - PV Solar Cells and Its applications

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Abstract

The depletion of fossil fuel resources on a worldwide basis has necessitated an urgent search for alternative energy sources to meet up the present day demands. PV Solar energy is one of the alternative sources to the fossil fuels. In this project, a prototype PV solar cell is selected, sized, mounted and tested to use PV solar cell in remote areas and coastal tourist Villages to: meet electricity demand and overcome water shortage.

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SSE2 - How to Build Your Own Dye-Sensitized Solar Cell (DSSC)

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Abstract

Dye-sensitized solar cells (DSSC) technology has been widely recognised as a technology of the future. DSSC using nanocrystalline titanium dioxide (TiO2) has been studied intensively owing to their simple structure, transparency, flexibility, low production cost, harvest light from any angle and direction and multicolor options. With object of building your own dye-sensitized solar cell, this project demonstrates a simple approach of self-assembled process to form a very smooth and compacted dye-sensitized solar cell (DSSC).

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SSE3 - Energy Audit in an Industrial Plant

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Abstract

The main objective of our project is to carry out a thorough investigation for an intermediate industrial plant. The selected plant is “Coveris advanced coatings” factory located at Borj Al Arab in Alexandria governorate.

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SSM1 - Utilizing landfill Gas Produced at Al- Hammam Town for Electrical Energy Desalination Salt Water

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Abstract

Alexandria's Municipal solid waste is buried in Alhammam town, which is 60 km far from the populated city. It consists of 12 cells where the solid waste is collected. Unfortunately all the gas comes from the cells is burned into special furnace without any gain. Alhammam area is also located near the sea, which makes it ideal for desalination. Landfill gas can be used in generating electricity with an internal combustion engine the cooling water will go through a heat exchanger with the seawater to raise it's temperature, then the seawater will pass through a MD unit to be desalinated.

After the desalination process the brine comes from the MD unit will be used in salt manufacturing as a byproduct, and the purified water will be used in a local community.

The general objective of the project is to

1. Assess the feasibility of the co- production of electricity and drinking water from landfill gas,
2. Selecting the most suitable components for the system, conducting experimental work on the MD unit, conducting system simulation for the proposed system and
3. Conducting the economical analysis of the project.

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SSM2 - Design and Manufacturing of Regenerative Turbine Compressors

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Abstract

These days, looming water deficiency has been intensified in many regions, which may lead to water conflict in near future. Some people think that the most viable measure to address water issues is to introduce water desalination technology. Several methods including MVC, TVC and AM were presented for water declination, where it was regarded as a gold mine in certain rural areas when dealing with water sacristy. The main reason is that salt-water is largest source of water that can be leveraged to enlarge the amount of water available, where this technology has been the mainstream to increase water reserve in the Middle East.