2ND INTERNATIONAL CONFERENCE ON

ENERGY SYSTEMS FOR SUSTAINABLE DEVELOPMENT (ESSD 2018)

DEPARTMENT OF CHEMICAL ENGINEERING
COMSATS INSTITUTE OF INFORMATION TECHNOLOGY, LAHORE

● FEBRUARY 21-23, 2018

ESSD-2018

Abstract book

ORGANIZED BY

Department of Chemical Engineering, CIIT, Lahore.

CONFERENCE VENUE

COMSATS Institute of Information Technology (CIIT)

Address: Defence Road, Off Raiwind Road, Lahore.

Tel: +92(042)-111-001-007, Ext. 123

Email: ESSD@ciitlahore.edu.pk

LANGUAGE

The official conference language is English.

REGISTRATION HOURS

Wednesday, February 21 8:30 AM – 9:30 AM

IMPORTANT CONTACTS

Registration:	Engr. Tariq Mehmood Raza (+92-300-6952062)
Accommodation:	Engr. Muhammad Akmal Rana (+92-345-7353392)
Transportation:	Dr. Abdul Razzaq (+92-300-4123743)

PROGRAM

The technical program includes invited plenary and keynote lectures, oral sessions and poster presentations.

ORAL PRESENTATIONS

Oral presentations are scheduled for 12 minutes of presentation and 3 minutes of Q&A.

All presentations should be in PowerPoint or PDF formats. A laptop and LCD projector will be available in all sessions. Each presenter is requested to bring the presentation in a USB storage device and upload it to the laptop before the session begins. All presentations will be destroyed at the end of the session.

We urge all presenters to use the provided laptop for presentation so as to minimize changeover times.

Since we have a very tight and fully packed program, we request all the delegates to be punctual and respect the allocated timeslots.

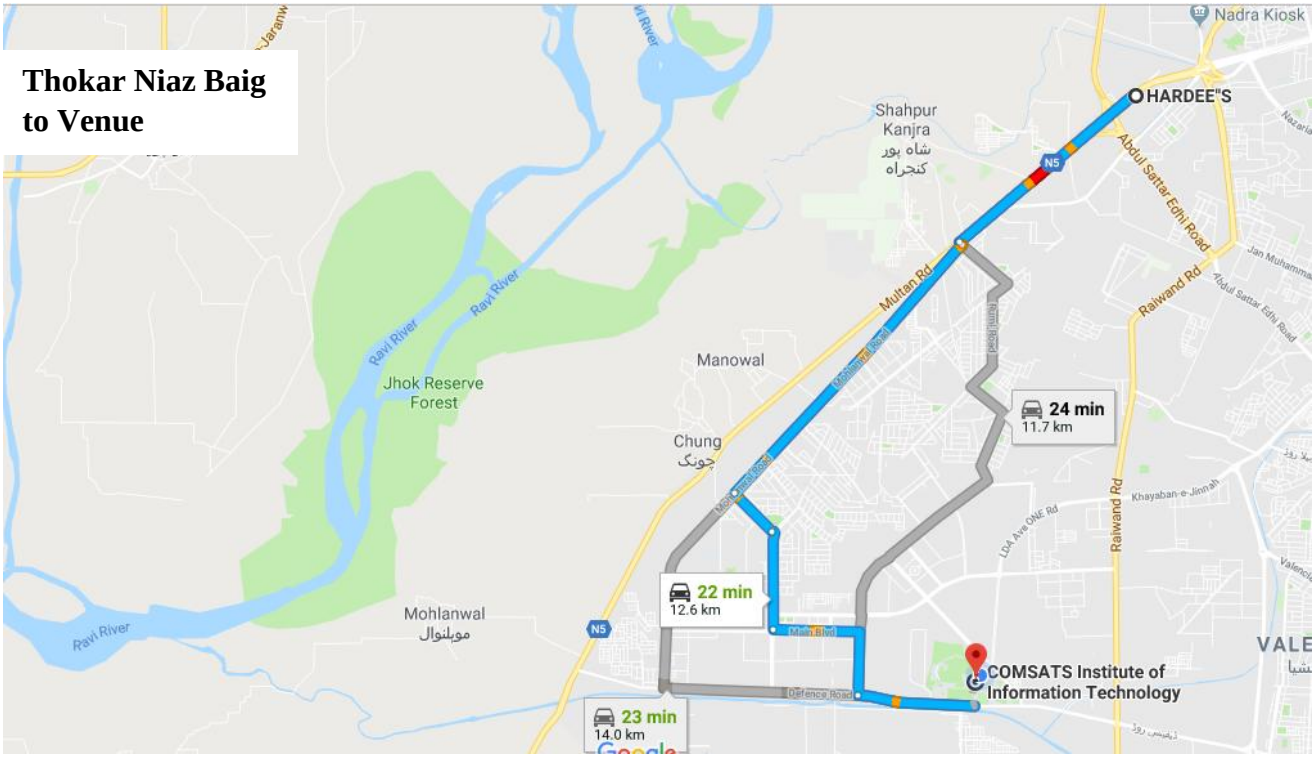
In case of absence of some presenter, next presenter shall be called for presentation.

POSTER SESSION

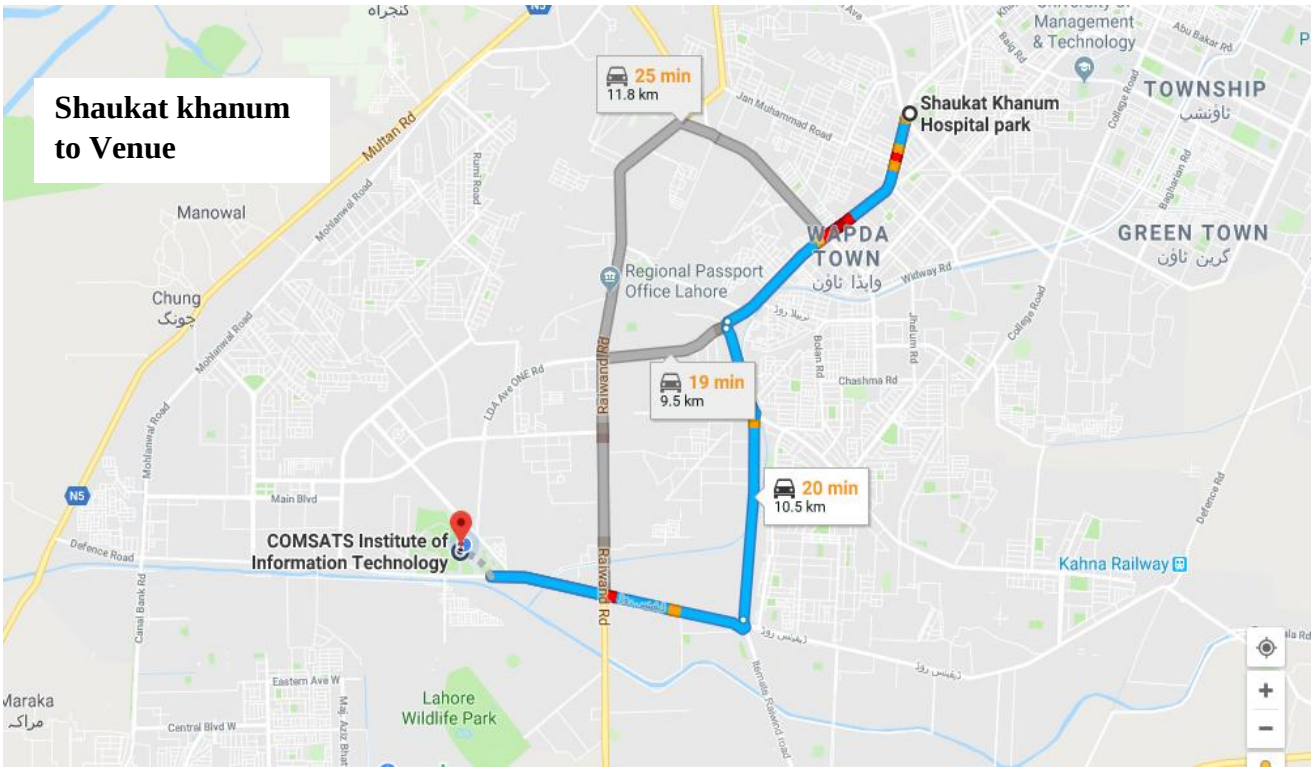
The dimensions of the poster board will be 594 mm (Width) x 841 mm (Height) (or equivalently 23.3 in (W) x 35 in (H)). This corresponds to A1 size in portrait layout. Posters are to be put up according to the assigned Paper IDs.

Road Map of Conference Venue

Thokar Niaz Baig to Venue



Shaukat khanum to Venue



Plenary Speakers

Prof. Dr. Zainuddin Abdul Manan
Universiti Teknologi Malaysia, Malaysia

Prof. Dr.-Ing. Martin Kaltschmitt
Technische Universität Hamburg-Harburg, Germany

Prof. Dr. M. Asif
Glasgow Caledonian University, UK

Prof. Dr. Ahmad Naim Ahmad Yahaya
Universiti Kuala Lumpur, Malaysian

Invited Speakers

Prof. Dr. Muhammad Abid
Director
Interdisciplinary Research Center
Prof. & Chairman, Department of Mechanical Engineering
COMSATS Institute of Information Technology, Wah Campus, Pakistan

Prof. Dr. Abdul Waheed Bhutto
Dean
Faculty of Engineering
Dawood University of Engineering and Technology, Karachi, Pakistan

Prof. Dr. Muhammad Najam Khan Malghani
Dean
Faculty of Engineering & Architecture
Balochistan University of Information Technology,
Engineering and Management Sciences
Quetta, Pakistan

Dr. Munir Ahmad
Chief Scientist-II
Member (Natural Resources Division)
Pakistan Agricultural Research Council
Islamabad, Pakistan

Prof. Dr. Muhammad Younas
Professor & Chairman
Department of Chemical Engineering
University of Engineering & Technology Peshawar, Pakistan

Prof. Dr. Shahid Munir
Director
Centre for Coal Technology, University of the Punjab Lahore, Pakistan

Prof. Dr. Saeed Gul
Associate Professor
Department of Chemical Engineering
University of Engineering & Technology Peshawar, Pakistan

Detailed Program

Wednesday, February 21

08:30 – 09:30	Registration
09:30 – 10:00	Inauguration/ Opening Ceremony 09:30 Recitation of Holy Quran 09:35 Welcome Address by Conference Chair 09:40 Address of Guest of honour 09:50 Address of Chief Guest 10:00 Vote of Thanks by Director, CIIT Lahore
10:10 – 10:40	**Coffee/Tea Break**
	Plenary Session-I **Venue: Seminar Room – A Block**
10:40 – 11:30	*Driving reforms and innovation in energy sustainability via a university living lab* Prof. Dr. Zainuddin Abdul Manan Universiti Teknologi Malaysia
11:30 – 12:15	*Benzene exposure among tanker worker during unloading of petrol at gas station* Prof. Dr. Ahmad Naim Bin Ahmad Yahaya Universiti Kuala Lumpur, Malaysia

12:15 – 13:00	*Biomass-coal co-combustion to overcome energy crisis in Pakistan* Prof. Dr. Shahid Munir University of the Punjab Lahore, Pakistan	
13:00 – 14:30	**Lunch Break**	
	Technical Session I **Venue: Seminar Room-Block-A** **Session Chair:** Prof. Dr. Zainuddin Abdul Manan **Co-Chair:** Prof. Dr. Asad Ullah Khan	**Technical Session II** **Venue: Room A-6** **Session Chair:** Prof. Dr. Ahmad Naim Ahmad Yahaya **Co-Chair:** Prof. Dr. Zulfiqar Ali
14:30 – 15:00	***Invited Talk:*** *Energy systems for sustainable agriculture production in Pakistan* Dr. Munir Ahmad Pakistan Agricultural Research Council, Islamabad	***Invited Talk:*** *Electricity generation through wastewater treatment* Prof. Dr. Saeed Gul University of Engineering and Technology, Peshawar
15:00 – 15:15	*Analysis of physicochemical characteristics of rice straw pretreated with sodium hydroxide (ID: 41)* Muhammad Junaid Khalid NUST, Islamabad	*Design and development of advance metering infrastructure for residential purpose (ID: 76)* Sajjad Haider Zaidi PNEC, NUST Karachi
15:15 – 15:30	*Comparison between conventional and novel techniques for extraction of concentrated oils (ID: 67)* Uzair Tariq UET, Peshawar	*A novel method of health monitoring of electrical equipment for smart grid technology (ID: 77)* Mudasir Hussain Buledi PNEC, NUST Karachi
15:30 – 15:45	*Retrofitting for automation of HVAC system in mechanical engineering department (ID: 62)* Muhammad Rizwan MUET Jamshoro	*Second order generalized integrator based phase lock loop for single phase grid connected roof top PV systems (ID: 81)* Hassan Zahid Butt NUST, Islamabad

15:45 – 16:00	*Synthesis and application of Cu based MOF as a CO_2 adsorbent (ID: 95)* Junaid Khan USPCAS-E-NUST, Karachi	*Excess lithium stored LiFePO4 (LFP) synthesized by a novel reflux method (ID: 73)* Aqsa Yasmin University of Science and Technology, China
16:00 – 16:30	**Tea/Coffee Break (Networking + Poster Presentation)**	
	Technical Session III **Venue: Seminar Room-Block-A** **Session Chair:** Prof. Dr. Saeed Gul **Co-Chair:** Prof. Dr. Noaman-ul-Haq	**Technical Session IV** **Venue: Room A-6** **Session Chair:** Prof. Dr. Abdul Waheed Bhutto **Co-Chair:** Prof. Dr. Murid Hussain
16:30 – 16:45	*Improvement of waste water treatment efficiency using electrical discharge plasma ozonation (ID:116)* Ainy Hafeez COMSATS Lahore	*Technical evaluation of scope of linear fresnel technology in Pakistan (ID: 102)* Saad Tahir NUST, Islamabad
16:45 – 17:00	*Home energy management system (ID: 86)* Hamna Rawish Air University, Islamabad	*Synthesis of alumina/polysulfone nano composite membrane for copper ions removal from wastewater (ID: 110)* Muhammad Ayaz UET, Peshawar

Thursday-22 February

Plenary Session-II Venue: Seminar Room – A Block		
09:30 – 10:10	*Renewables within the German electricity supply system status, experiences, lessons learned, and actions to be taken* Prof. Dr.-Ing. Martin Kaltschmitt Technische Universität Hamburg-Harburg, Germany	
	Technical Session V **Venue: Seminar Room-Block-A** **Session Chair:** Prof. Dr.-Ing. Martin Kaltschmitt **Co-Chair:** Dr. Muhammad Yasin	**Technical Session VI** **Venue: Room A-6** **Session Chair:** Dr. Munir Ahmad **Co-Chair:** Prof. Dr. Moeen-ud-Din Ghauri
10:10 – 10:40	***Invited Talk:*** *Experimental and numerical studies of bolted flanged pipe joints for safe strength and sealing (An overview of the progress)* Prof. Dr. Muhammad Abid COMSATS Institute of Information Technology, Pakistan	***Invited Talk:*** *Emerging membrane technologies for the development of innovative hybrid processes* Prof. Dr. Mohammad Younas University of Engineering and Technology, Peshawar
10:40-11:10	***Invited Talk:*** *Production of biodiesel through catalytic transesterification of jatropha oil* Prof. Dr. Muhammad Najam Khan Malghani BUITMS, Quetta	***Invited Talk:*** *Supporting biomass energy to advances modern energy services in Pakistan* Prof. Dr. Abdul Waheed Bhutto Dawood University of Engineering & Technology, Karachi
11:10-11:30	**Tea/Coffee Break (Networking + Poster Presentation)**	

	Technical Session VII **Venue: Seminar Room-Block-A** **Session Chair:** Prof. Dr. Muhammad Younas **Co-Chair:** Prof. Dr. Aqeel Ahmed Bazmi	**Technical Session VIII** **Venue: Room A-6** **Session Chair:** Prof. Dr. Muhammad Abid **Co-Chair:** Dr. Muhammad Shahzad Khurram
11:30 -11:45	*Microbial enhanced oil recovery and field trials (ID: 21)* Muhammad Asim Saeed DUET, Karachi	*Experimental and analytical study of a concentric heat exchanger using CuO nanofluid (ID: 23)* Rasikh Tariq HITEC, Taxila
11:45 – 12:00	*Design of wind tracking wind turbine with multi-cylinder generation (ID: 24)* Muhammad Iftikhar Hussain UET, Lahore	*Amine modification of Cu based MOF for CO_2 adsorption applications (ID: 99)* Junaid Khan USPCAS-E-NUST, Islamabad
12:00 – 12:15	*Grid integration of micro hydro power plants: major requirements, key issues and challenges (ID: 37)* Waqas Ali UET, Lahore	*An attempt to forecasts the enhancement of oil recovery by using microbes (ID:36)* Tahmina Fatima Siddiqui DUET, Karachi
12:15 – 12:30	*Analysis of novel maisotsenko cycle applications in power and energy systems (ID: 38)* Daniela Abigail Hernandez Lopez Arco Technology, Mexico	*Successful solutions against barriers to renewable energy development in Pakistan (ID: 34)* Muhammad Rizwan UAF, Faisalabad
12:30 – 12:45	*Photovoltaic solar energy system, a dominant and ultimate source of energy for developing countries (ID:39)* Safa Khalid UAF, Faisalabad	*Effect of reduced graphene oxide as counter electrode material and low-cost natural dye as photo sensitizer on dye-sensitized solar cells (ID: 43)* Maleeha Anwer NED, Karachi
12:45 – 13:00	*Thermodynamic optimization of air bottoming cycle for waste heat recovery (ID: 44)* Abubakr Ayub CUST, Islamabad	*Performance enhancement of N_2 single expander liquefaction process for offshore LNG production (ID: 56)* Muhammad Abdul Qayyum Yeungnam Univeristy, Korea

13:00 – 14:00	***Lunch Break***	
	Technical Session IX **Venue: Seminar Room-Block-A** **Session Chair**: *Professor. Dr. Mohammad Younas* **Co-Chair**: *Dr. Abrar Faisal*	**Technical Session X** **Venue: Room A-6** **Session Chair**: *Prof. Dr. Muhammad Asif* **Co-Chair** : *Dr. Asim Laeeq Khan*
14:00 – 14:15	*Design and fabrication of a low cost solar water desalination plant for coastal and remote areas (ID: 45)* Hashim Hasnain Hadi BUEITMS, Quetta	*Scope of flywheel energy storage system in a fitness centers of Pakistan as a back-up energy supply (ID: 16)* Sadaf Zeeshan UCP, Lahore
14:15 – 14:30	*Exceptionally alkaline stable and highest fuel cell performance imidazolium-type anion exchange membranes (ID: 68)* Muhammad Aamir Shehzad UET, Lahore	*Lithium ion cell modeling for electric vehicle: a step towards zero carbon emission (ID: 70)* Rida Fatima NUST, Islamabad
14:30 – 14:45	*La4NiLiO8 as solid state electrolyte for next generation Li-ion batteries (LIBs) (ID: 71)* Aqsa Yasmin University of Science and Technology, China	*Design of multivariable PID controller; a comparative study* (ID: 97) Anum Khowaja MUET, Jamshoro
14:45 – 15:00	*Simulation of thermal performance of cool roof through building engineering system software (ID: 93)* Aftab Ahmed Sahito MUET, Jamshoro	*Development of talc as an alternative of zirconium silicate in ceramic tile glaze (ID: 75)* Murtaza Khan UET, Peshawar

15:00 – 15:15	*Efficient power generation using vertical axis wind turbine (ID: 88)* Abdul Wasy Air University, Islamabad	*A study of thermal stratification for pressurizer surge line with different turbulence models and flow velocities (ID: 108)* Abdullah USPCAS-E-NUST, Karachi
15:15-15:30	*Solar energy and its thermal application in Pakistan (ID: 46)* Sadia Tariq Hamdard University	*Pakistan's energy crisis: economic or administrative issue? (ID: 14)* Humaira Tabassum VU, Lahore
	Economic comparison of various pervaporation based ethanol recovery schemes for syngas bio-refinery (ID: 4) Azqa Khalid COMSATS Institute of Information Technology, Lahore	
15:30 – 16:00	***Tea/Coffee Break (Networking + Poster Presentation)***	
Plenary Session-III **Venue: Seminar Room – A Block**		
16:00 – 16:30	*Optimized application of solar PV to address energy challenges in Pakistan* *Prof. Dr. Muhammad Asif* *School of Engineering and Built Environment* *The Glasgow Caledonian University, UK*	
16:30 – 17:00	*Working sessions closing remarks & prize distribution*	

Friday-23 February

Session I	
09:30 – 04:30	**Round table discussion**

Poster Presentations

Sr. #	Paper ID	Presenter	Affiliation	Abstract Title
1	Paper_03	Sohail Zafar Qureshi	AJKU, Muzaffarabad	Public ownership
2	Paper_22	Saeed Nawaz	DUET, Karachi	Pakistan's shale gas play
3	Paper_26	Ammara Kaynat	MUET,Jamshoro	Electricity theft- a well known problem of Hyderabad
4	Paper_28	Abid Ali Dogar	UMT, Lahore	Photovoltaic based PWM inverter using experimental approach
5	Paper_29	Suliman Khan	BUET, Khuzdar	To investigate the effects of recycled coarse concrete aggregate obtained from locally available demolished concrete on the properties of concrete
6	Paper_35	Hatif Bin Abdul Majeed	USPCAS-E, NUST,	On proportional resonant Controller for voltage dip mitigation using a dynamic Voltage Restorer
7	Paper_40	Tahmina Fatima Siddiqui	DUET, Karachi	An analysis of the effect of carbon dioxide injection in the low rank coals
8	Paper_51	Rameez Saqib Khan	MUET, Jamshoro	Managing occupational health & safety in small and medium size construction companies in Hyderabad
9	Paper_52	Noman Bashir	CUST, Islamabad	To convert a conventional (large size) domestic building into a smart building by using information communication technologies
10	Paper_55	Kinza Qadeer	Yeungnam University, Korea	Design optimization of single mixed refrigerant LNG process using metaheuristic runner-root algorithm
11	Paper_58	Arif Hussain	Yeungnam University, Korea	Optimal design of ethylbenzene process using column with side-reactor configuration
12	Paper_59	Shahzeb Memon	MUET, Jamshoro	Sustainability of green buildings: opportunities and challenges
13	Paper_60	Mohammad Adnan Gulshan	NUST-Karachi	Home area network
14	Paper_63	Micaiah Das	UET Peshawar	Simulating a simplified model of a biodiesel production plant using COCO ChemSep; software analysis
15	Paper_64	Danish Ahmad Peerzada	PNEC NUST	Sensor-less machine control
16	Paper_69	Rida Fatima	NUST, Islamabad	A review on renewable energy integration's effects on frequency and power system stability

17	Paper_74	Muhammad Aamir Shehzad	UET, Lahore	Outstandingly acid recovery through graphene oxide sheets-type anion exchange membranes
18	Paper_79	Muhammad Awon	NUST, Islamabad	Optimized solution for a PMUs placement in a power system for complete network observability
19	Paper_82	Mian Yahya Gul	UET, Peshawar	Comparative study of conventional and microwave assisted pyrolysis of corncob
20	Paper_83	Hassan Zahid Butt	NUST, Islamabad	PV integration with grid and anti-islanding protection - a review
21	Paper_87	Hina Nadeem	Air university, Isd.	Variable frequency drive for operating the induction motor
22	Paper_89	Ali Zaman	Air university, Isd.	Wireless power sensor profiling
23	Paper_90	Moiz Uddin	Univeristy of Balochistan, Quetta	Fabrication of magnetic nanorodes of cobalt by controlling the barrier layer of anodic aluminum oxide
24	Paper_96	Rawash Asif	PNEC NUST, Karachi	Brain computer interface
25	Paper_100	Muhammad Altaf	UET, Peshawar	Recycling of wastes in to composites
26	Paper_104	Yasir Abbas	COMSATS, lahore	Potential of renewable energy resources in Pakistan
27	Paper_109	Abdullah	USPCAS-E NUST	To study over all downward slope of pressurizer line for thermal stratification
28	Paper_111	Fahad Javed	COMSATS, Lahore	Microbubble mediated mass transfer for production of ethyl acetate
29	Paper_112	Zufishan Shamair Attari	COMSATS, Lahore	High CO_2 selective 1-Butyl-3 methylimidazolium tetrafluoroborate based ionic liquid membrane
30	Paper_113	Muhammad Umer Khan	PNEC-NUST	Molecular communication : Data transfer using alcohol molecules
31	Paper_114	Naveed Ahmad	COMSATS, Lahore	Energy economized oleic acid esterification accelerated by microbubbles technology
32	Paper_115	Sidra Yasin	COMSATS, Lahore	Development of advance oxidation Process by using micro-reactor for wastewater treatment
33	Paper_117	Zaman Tahir	COMSATS, Lahore	Bio-MOF-11 based mixed matrix membranes for gas separation
34	Paper_119	Mawahid Ali Khokhar	SMME, NUST	Desiccant based evaporative air conditioning system (Aab-O-Hawa)
35	Paper_120	Bazla Sarwar	COMSATS, Lahore	Coal characterization: a gap analysis

PLENARY SESSION

PL-1.

Renewables Within the German Electricity Supply System Status, Experiences, Lessons Learned, And Actions to Be Taken

Martin Kaltschmitt

Hamburg University of Technology (TUHH), Institute of Environmental Technology and Energy Economics (IUE), Eissendorfer Straße 40,

D-21073 Hamburg, Germany,

Email: kaltschmitt@tuhh.de

As a consequence of the nuclear accident in Fukushima/Japan the German government decided to phase out nuclear energy and to accelerate the already started increased use of renewables within the German energy system. This goes along with a major goal of the German environmental politics to reduce GHG emission to fight global climate change. Thus, the political driven and societal widely accepted goal to transform the overall German energy system fast and target oriented towards more sustainability has been deeply implemented within the German legal framework in recent years. Beside the increased use of renewables this includes the more efficient use of energy throughout the overall provision chain (e.g. more energy efficient industrial processes).

This policy has been partly successful. Within the electricity market roughly 190 TWh (2016) of electrical energy have been produced. This reflects a share of roughly 30 % related to the German gross electricity generation in 2016. Related to the overall electricity generation from renewables wind power (onshore and offshore) contributes with roughly 41 % and biomass (i.e. solid biofuels like demolition wood and biogas e.g. from sewage sludge and animal manure) with close to 28 %. The contribution of hydro power and photovoltaics is 11 and 20 %, respectively. Especially the use of wind power and photovoltaics have been characterized by a significant growth in the last years. Compared to this biomass and especially hydro power is characterized by a more or less stable absolute contribution in recent years.

This development towards a higher share of renewables is connected with various challenges covering e.g. technical, environmental, economic, social as well as legal aspects. Lots of experiences have been gained and numerous lessons have been learned. Additionally, this development has been accompanied by an intensive discussion process within the overall German society. This social debate aiming at the identification of the most promising development pathway taking more and more challenging sustainability

criteria into consideration is still on-going. For example, this discussion process includes aspects related to

(a) the preservation of the high degree of supply security for electrical energy even with higher shares of strongly fluctuating electricity generation from wind and solar,

(b) the development of market mature technologies for the most efficient use of the renewable energy supply potentially to be sold on the globally strongly growing energy markets and

(c) the adaptation of the administrative framework to the special aspects of the renewable energy supply.

Against this background, the goal of this presentation is it to give a brief overview about the current use of renewable sources of energy for electricity generation in Germany. Based on this, selected experiences gathered so far are discussed in detail. Beside these given challenges and resulting opportunities for the years to come are addressed and presented. Based on this, conclusions are drawn what need to be taken into consideration and what actions are needed to allow for an ongoing smooth development. Additionally, some thoughts are presented what important measures are necessary if within another country a similar development is planned. By doing this it becomes obvious that a pathway for more sustainability within the electricity supply system is possible and can most likely be realized even under framework conditions different to the German circumstances. Nevertheless, such a development needs time and stable conditions because the smooth and successful transition of an energy system is a process for decades.

PL-2.

Driving Reforms and Innovation in Energy Sustainability via a University Living Lab

Zainuddin A. Manan
Universiti Teknologi Malaysia, Johor Bahru 81310, Malaysia
Email: dr. zain@ utm.my

Growing concern on energy security and climate change has attracted widespread interests toward teaching and learning as well as research on energy sustainability among universities across the world. A university is, therefore, an ideal *living lab* to incubate and showcase technologies and best practices on energy sustainability. This lecture describes the experience of Universiti Teknologi Malaysia in developing a Sustainable Energy Management (SEM) living lab that eventually became a catalyst for reforms and driver for innovation in energy sustainability for organisations across Malaysia and ASEAN (The Association of South East Asia Nations).

PL-3.

Optimized Application of Solar PV to Address Energy Challenges in Pakistan

Muhammad Asif
School of Engineering and Built Environment
The Glasgow Caledonian University, UK.
Email: Muhammad.Asif@gcu.ac.uk

Renewable energy is one of the most prominent and the fastest growing form of energy across the world for its credentials like abundant and inexhaustible resources, environmental friendliness and ease of scalability. Solar photovoltaic (PV) is one of the leading renewable technologies already demonstrating economic competitiveness in several countries. Pakistan has abundant renewable resources including for solar power. These resources however have not been adequately capitalized despite the fact that the country is facing severe energy crisis for almost a decade now. The potential for solar energy is huge and widely distributed across the country. Pakistan has planned an ambitious 1,000MW solar PV project named Qaid-e-Azam Solar Park (QASP) of which 100MW has already been installed. This talk has been designed to discuss the optimized utilization of solar energy to deliver cost effective and value engineering solutions to mitigate the impacts of the ongoing energy crisis. Given the fact that over 30% of the population lack access to grid, drawing lessons from successful solar energy programs from around the world especially in the regional countries like Bangladesh, India and Nepal, micro-generation solar solutions shall be discussed. Referring to the QASP, a comparison of very large scale (VLS) PV systems and solar home systems will also be presented.

PL-4.

Benzene Exposure Among Tanker Worker During Unloading of petrol at gas station

Ahmad Naim Ahmad Yahaya
Institute of Chemical and Bio-Engineering Technology
Universiti Kuala Lumpur Malaysian
Email: ahmadnaim@unikl.edu.my

The studies on the exposure of benzene on a high exposure area have been made throughout the years. Benzene exposures data are compared with the current legislation form Occupational Safety and Health Act (OSHA) and National Institute for Occupational Safety and Health (NIOSH). Tanker worker are being expose to benzene at 0.167 ppm to 0.833 ppm at a period of 45 minutes to 95 minutes at one unload session. The data shows that all mean Short-Term Exposure Limit (STEL) benzene exposure still within the range appointed by OSHA and NIOSH of 5 ppm and 1 ppm. Both likelihood and posterior decision in Bayesian Decision analysis gave a rating of 3 (very high) on benzene exposure to the tanker worker.

INVITED TALKS

IV-1.

Supporting Biomass Energy to Advances Modern Energy Services in Pakistan

Abdul Waheed Bhutto
Dean Engineering
Dawood University of Engineering & Technology,
Karachi, Pakistan
Email: abdulwaheed27@hotmail.com

Thirty per cent population of Pakistan is still without electricity. In addition, energy uses and devices available are typically less efficient, more hazardous to users, and more damaging to the environment. Low carbon energy system prerequisites access to modern energy services. Biomass resources have been around for domestic as well as commercial energy use for a long time, but have not yet been utilised in Pakistan. The Pakistan Vision 2025 aims at addition of 25,000 MW by 2025 and optimizes energy generation mix between oil, gas, hydro, coal, nuclear, solar, wind, and biomass with reference to its indigenousness, economic feasibility, scalability, risk assessment, and environmental impact. An assessment of biomass resources potential in Pakistan as renewable and alternate energy resources is presented in this paper. This study reviews the opportunities and challenges in the efficient and effective utilization of biomass as an energy source in Pakistan. The focus is the potential contribution of all kinds biomass to the total energy consumption in Pakistan in short and medium term.

IV-2.

Energy Systems for Sustainable Agriculture Production in Pakistan

Dr. Munir Ahmad
Chief Scientist-II/
Member (Natural Resources Division)
Pakistan Agricultural Research Council
Islamabad
Email: drmunir.abei@hotmail.com

Agriculture sector is a vital component of Pakistan's economy as it contributes 19.8 % in national GDP, and it is the largest employer by absorbing 42.3% of the country's total labour force. Pakistan is also one of the world's largest producers of crops, as the production of chickpea ranked 3rd, cotton, mango and rice ranked 4th, dates and sugarcane ranked 5th, oranges ranked 6th, and wheat ranked 7th in world. Horticultural commodities are perishable in nature, because they have an inherent tendency to spoilage due to physiological reasons, disease and pest infestation. Due to non-availability of basic postharvest technologies, a huge amount of these produce is being wasted from orchard-gate till it reaches the consumer. To overcome this problem, scientists / engineers at PARC have developed two types of solar dryers, and at present these dryers are being disseminated for dates drying in Districts Khairpur / Sukkur. Secondly, Pakistan is water scare country, and efficient utilization of water resources is imperative for long term economy of the country. Therefore, a solar pumping system has been developed and installed on a mini-dam to irrigate 5 ha farm land in Potohar region through high efficiency irrigation systems. This technology has been taken up by Agency for Barani Area Development (ABAD), Punjab for dissemination at larger scale. The presentation will focus on energy systems for sustainable agriculture production in Pakistan developed and disseminated by Pakistan Agricultural Research Council, Islamabad for improving the livelihood of the rural masses.

IV-3.

Production of Biodiesel Through Catalytic Transesterification of Jatropha Oil

Muhammad Najam Khan Malghani

Department of Chemical Engineering

BUITMS, Quetta

Email: Najam.khan@buitms.edu.pk

Depletion of fossil fuel and their effect on environment give the importance of alternative fuel or renewable fuels. It is renewable, nontoxic and sustainable energy resource. Jatropha oil is non-edible vegetable oil which is obtained from jatropha curcas plant. It is used for the production of biodiesel. Biodiesel was produced through transesterification process. In this process 4:1 methyl alcohol to jatropha oil molar ratio was used. Mg/Al hydrotalcite was used for the production of biodiesel in reactor under different conditions. Optimum yield 87.92% of biodiesel was obtained at reaction temperature 450C at 500 rpm for 1.5 hr and catalyst wt.% was 1.3%. Flash point, density, viscosity and calorific values of produced biodiesel were determined. Jatropha oil can replace the edible oil for the production of biodiesel and it can fulfill the requirement of energy in Pakistan.

ORAL and POSTER PRESENTATIONS

Paper ID# 3.

Public Banking Do Contract

Sohail Zafar Qureshi
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It is understood that for ownership status, it does affect performance and growth in an economy in terms of efficiency. Squeeze excitement and changes in management in ownership effect performance and productivity. For state owned banks there is inconclusive arguments need researchers to bring more evidences in contract theory. Putting simply, it turns out an individual banking, operational learning, forwarding and asset management albeit allocation of resources, of course state bank of Pakistan need to bring more data from banks and its availability to researchers and policy makers. Public banking is globally accepted for strong governance such that any unit not performing well could be undertaken to rule out on part of government. However, it is not globally recognized. In some countries government ownership is crucial part of working for having a balance in social and economic objective.

Paper ID# 4.

Economic comparison of various pervaporation based ethanol recovery schemes for syngas bio-refinery

Azqa Khalid, Muhammad Yasin
Department of Chemical Engineering
COMSATS Institute of Information Technology, Lahore
Email: myasin@ciitlahore.edu.pk

Microbial syngas conversion to liquid fuels, and commodity chemicals has emerged as a potential technique to extract energy from biomass, coal, and exhaust gases. However, lower enzyme productivity and subsequent higher separation cost is causing hindrance in successful commercialization of this technology. Due to the lesser ethanol concentration in fermentation broth, conventional distillation scheme is consuming a major portion of total energy requirement of the process. The present study is designed to investigate three pervaporation integrated separation schemes with corresponding distillation based conventional configurations. Comparison based on energy consumption and economics is presented. The processes were evaluated using commercial simulation software Aspen Plus V. 9.0 with an integrated Aspen Custom Modeler's pervaporation model. Pervaporation integration in the two column distillation configuration was found to be the best alternative overall with least annual operating cost.

Paper ID# 14

Pakistan's Energy Crisis: Economic or Administrative Issue?

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The critical state of Pakistan's energy sector is a primary constraint on the country's economic development. Despite a significant body of literature on issues and options in the sector, the deterioration continues, contributing to an ever-widening energy deficit. The story of Pakistan's energy sector is symptomatic of virtually all sectors of the economy. Overwhelming evidence from energy analysts points to the absence of coordinated policy formulation as a fundamental issue. The problem is not what the objectives are but how they can be achieved. The special issue in Pakistan is a largely ad-hoc process which responds to crisis situations instead of preventing crises through a long-term vision. Analysts unanimously agree that the absence of coordinated planning and policy formulation is a fundamental drawback to Pakistan's energy sector. A review of the energy objectives through several of Pakistan's five-year plan cycles reveals that the objectives are well thought out and clearly stated. This vision is in stark contrast to what is actually occurring in the sector. The "circular debt" in Pakistan has paralyzed many energy-related enterprises and severely curtailed power supplies despite ample installed generation capacity. In the 1980s, the concept of Integrated Energy Planning and Policy Formulation (IEP) was introduced in Pakistan, but could not be sustained due to the increasing disintegration of policy-level institutions. The problem of circular debt is a prime example of prolonged neglect for which short-term bailout solutions seem to have become the norm. There is a common misconception that Pakistan has insufficient installed capacity. The following figures speak for themselves. Installed capacity in Pakistan is 20,922 MW, while the peak demand is around 14,500 MW. However, due to the issues mentioned above, the system is only able to satisfy less than 70 percent of peak demand, explaining the outages and dispelling the myth of inadequate capacity. Comparative analysis shows that energy crisis in Pakistan is more an administrative rather than an economic issue.

This paper outlines the policy mechanisms available for managing the sector, emphasizing that it is not just the availability of resources but, more importantly, how they are managed that marks the difference between success and failure of energy policy. By highlighting the economic cum administrative problems lying within the energy

sector, this paper concludes that "Policymakers should move beyond defining where Pakistan needs to be to how to get there. Given the high level of attention to Pakistan's energy problems, now is the time for action, to build on the momentum of recent initiatives to consolidate the sector. Starting with the skills available in Pakistan and with the political will to launch the structural changes, IEP could be put in place relatively quickly, paving the way for the recovery of the energy sector and thereby for the economy as a whole".

Paper ID # 16

Scope of Flywheel Energy Storage System in a Fitness Centres of Pakistan as a Back-up Energy Supply

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The paper presents review on how mechanical energy that is wasted during exercise in fitness centres and gymnasiums can be stored and utilized in creating a backup energy through Flywheel Energy Storage (FES) system for uninterrupted power supply. For a country like Pakistan where load shedding is a reality, this kind of a set up will help not only to create a backup energy supply but eventually also help in energy conservation and reduction of electricity bills of the fitness centres. The case study reviews the scope of a Flywheel Energy Storage (FES) system incorporated in cycling machines in fitness centres. Results suggest that FES system has a lot of potential in gymnasiums of Pakistan as back up energy supply.

Paper ID# 21

Microbial Enhanced Oil Recovery and Field Trials

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For production of oil from reservoir to the surface it requires a natural pressure mechanism of the reservoir, when it reaches its limit we precede towards artificial lift methods or injecting immiscible fluid that physically contact with oil. When even this method reaches its economic limit the EOR methods are applied to recover the remaining oil by various processes most commonly by chemical flooding. But due to the technical complexity, operating cost of producing oil and environmental issues raised, the EOR process is no less than another limitation. To overcome this limitation and further continue to recover the oil trapped within the reservoir Microbial enhanced oil recovery (MEOR) is utilized. The MEOR process simply uses various microbes each to fulfil the job of synthetic materials. The microbes provide useful products such as bio solvents, biopolymer, biogas, bio acid, bio surfactants for EOR process. MEOR process proves to be an inexpensive method for recovering oil at an incremental cost as low as 3USD/barrel, it has lower technical difficulties and few surface facility modifications. The MEOR can be very useful in era of petroleum crisis where cause of high operating cost deserts the projects. It is estimated that after the limitation of conventional recovery methods 2 trillion barrels of oil will be left that are uneconomical to be produced with current EOR methods. This paper focuses on providing a brief introduction to the MEOR techniques, the candidates used for MEOR process and the process of applying this technique. This paper also provides information about the field trials for MEOR process and their success rates. The field trials are given for Big well field Texas and Southern Saskatchewan Canada.

Paper ID# 22

Pakistan's Shale Gas Play

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Pakistan is about 4BCFD followed with a demand of 6.2BCFD with a gap of 2.2 BCFD. It is estimated that the gap will reach 6.79 BCFD by 2030 under current available resources. Since Pakistan should consider its unconventional sources mainly Shale reservoirs. Pakistan compounds two shale formations i.e. Sembar and Ranikot formation in the Lower Indus basin. This paper discusses the major shale reservoir characteristics to define a baseline for a shale reservoir to prove if it could be a potential shale producer. The characteristics of Sembar formation are defined and compared to the baseline inform of polar charts for a better understanding to determine if it could be an economical source when subjected for exploration. Sembar is compared to Barnet shale of Texas USA with an average production of 10-12 BCFD. When Sembar formation compared to the Barnett shale, they exhibit similarity and may provide similar productions as found in Barnett shale.

Paper ID# 23

Experimental and Analytical Study of a Concentric Heat Exchanger Using Cuo Nanofluid

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Nano-fluids have stable suspended nano-sized solid particles in a liquid base fluid which exhibit high thermo-physical properties as compared to base fluid alone. Since solids have higher thermal conductivity; therefore, suspended solid particles enhance the heat and mass characteristics of the base fluid. In this work, an experimental and analytical analysis is carried out by using nanofluid (CuO-water based) in tube side of concentric heat exchanger. The experimental study is carried out on SOLTEQ concentric heat exchanger and the details of the necessary instrumentation are provided. A total of eight liters of nanofluid is prepared using two-step preparation technique and stability is obtained using sonification process. Afterwards, the analysis (both experimental and analytical) results are benchmarked by a comparison with the results available in the literature for validation purposes. The analysis is accomplished to monitor the performance parameters of the heat exchanger including heat flux, overall heat transfer coefficient, and effectiveness. A parametric study is conducted by varying particle size, particle volume concentration, flow rates of hot, and cold fluid to observe their influence on performance parameters. A maximum enhancement of ~14% in heat flux, ~16% in overall heat transfer coefficient and ~9% in the effectiveness of the heat exchanger is reported. Concentric heat exchangers have numerous industrial (material processing, food preparation etc.) and domestic (air-conditioning, water geyser, solar collectors etc.) applications; therefore, this research eventually helps in performance enhancement of existing devices, and size/area reduction of new heat exchangers.

Paper ID# 24.

Design of Wind Tracking Wind Turbine with Multi-Cylinder Generation

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This paper investigates a prototype model of Wind-Tracking Wind Turbine with Multi-Cylinder Generator. The goal of the project is to get the maximum general power input from the wind by using Wind-Tracking Mechanism (also called yawing system) in the wind turbine. As the wind direction changes, wind-tracking mechanism stops and starts frequently to keep the wind turbine aligned with the wind direction. In addition to wind-tracking mechanism, multi-cylinder generator is a quite new thing that we are introducing in HAWT. Multi-cylinder DC generator is more efficient than a single DC generator of same ratings at low wind speeds, i.e., it can utilize low wind speeds more effectively to deliver more output power when the wind turbine is off-the-grid. Multi-cylinder DC generator has two dc cylinders (generators), and number of connected generators depends upon rotor speed (RPM). It is concluded that the implemented model is equally beneficial for the production of electricity at small as well as at large scales.

Paper ID# 26.

Electricity Theft- a well-known problem of Hyderabad

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Pakistan with several other issues faces Electricity theft at a miserable state. It is a great threat for the economy of Pakistan, it produces several other mafia and unfair means in a society. The public through various sources are engage in electricity theft regularly. In the era of globalization, one of the rising issues of under developing country is handling such huge unfair means. Pakistan is facing a great burden on country's economy in the shape of electricity theft. The core aim of paper is to overview current electricity theft practices in Hyderabad and recommendation of punishment. The research include economical loses which government have to bear due to theft for Hyderabad city which results in detection in several areas & inflation in rates of electricity units. Research proposes a practical approach that achieves sustainable reduction in Power thieving. Hyderabad is 2nd largest city of Sindh and 6th in Pakistan. Unfortunately, it does not pose proper metering& billing system. The research aims to uncover the reasons of electricity theft in Hyderabad city especially residential areas. For data collection, various areas in the city have been visited. Interviews were conducted from HESCO department officers. A questionnaire survey has been conducted to list out top most significant causes of electricity theft in city. which results in identifying critical causes and discussed with the field expert for their possible solutions for Hyderabad. This will help in achieving control over thieving methods and will help in reducing the factors affecting the illegal customers.

Paper ID# 28.

Photovoltaic Based PWM Inverter Using Experimental Approach

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Electricity plays vital role for urbanization of any country. Today's world is still mostly dependent on conventional energy source for power generation. Due to limited available resources, the world is inclined towards finding new renewable energy generation. The utilization of solar energy has rapidly increased due to its benefits such as, sustainable energy source a help to reduce CO2 emission. In Pakistan, the installed electric power system uses alternating current (AC) supply for transmission and distribution system, while the photovoltaic (PV) system provides direct current (DC). Thus, an inverter is used to convert DC to AC. To this end, we present a method to calculate optimum operating parameters for photovoltaic-based pulse w modulation (PWM) inverter by applying different switching techniques using micro-controller. Variations on the input voltage level and switching frequency are utilized to see their impact o the operation of inverter and harmonics produced. Three different switching techniques (Squ wave, 3-level modified sine wave and PWM) are applied on ordinary inverter using Micro-Controller. Spectrum Analyzer is used to see the output impact, wave forms and total number of harmonics. Finally, the harmonics produced by the inverter are analysed and minimized with the variation in the voltage and switching frequency parameters. Using PWM technique, 3rd, 5th and all odd harmonics are eliminated; as a result, the maximum amount power loss will be overcome. Experimental results show that careful selection of inverter parameters yields inverter's operation with highest efficiency and lowest harmonics distortion.

Paper ID# 29.

To Investigate the Effects of Recycled Coarse Concrete Aggregate Obtained from Locally Available Demolished Concrete on The Properties of Concrete

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The rate of demolition of concrete structures has been intensely increased in the recent decade Due to scarcity of land for dumping of these demolished concrete structures as well due to increasing cost of natural aggregate, this research work focused on the effect of use of recycle coarse concrete aggregate (RCA) on the properties of concrete. The recycle aggregate has been obtained by crushing demolished concrete collected from different areas in the vicinity of Dis Khuzdar in Pakistan. This experimental study comprises of the comparison between the prop of controlled concrete and concrete made with partial replacement of RCA i.e. 0%, 15%. 30% an 45% RCA. For the testing purpose total 24 cylinder of 6in diameter and 12in height and 12 bases of 6in x 6in x 20in were casted with concrete mix 1:1.5:3 concrete mix ratio with water cement ratio of .47. The specimens were tested after 28 days of curing. The workability of concrete w found to be same up to 30% replacement of natural coarse aggregate by recycled coarse concern aggregate but a slightly workability reduction trend was observed when the replacement ratio exceeded than 30%. Results show that there was no effect on the Compression strength, Tensile strength and Flexural strength of concrete up to 30% replacement ratio while a slightly strength reduction trend was observed when the replacement ratio was exceeded beyond 30%. The root cause of strength reduction was due to high water absorption characteristics of recycled concern aggregate due to adhered mortar particle to recycled aggregate.

Paper ID# 34

Successful Solutions Against Barriers to Renewable Energy Development in Pakistan

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Pakistan being an under-developed country is deficient in energy. The energy sources are not constant and currently the Global scenario indicates 79.7% fossil fuels, 15.3% hydro powers and only 5% of Renewable energy being used as domestic and commercial energy source. The high use of fossil fuels is leading to environment pollution and depletion of source. Keeping in view all these factors, Renewable energy development is the best choice for Pakistan. Every new technique is always accompanied with barriers, so the following article will highlight them and elaborate successful solutions. A decision model is advised based on Goal, criteria and sub-criteria. The solutions are summarized and include, public awareness, R&D projects, resource assessment, market development, Government policies and participation Applying. these solutions will help in 50% of energy supply from renewable energy by 2050.

ESSD 2018

Paper ID#35

On Proportional Resonant Controller for Voltage Dip Mitigation Using a Dynamic Voltage Restorer

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A dynamic Voltage Restorer is a series connected voltage source converter, mainly (DVR) used for voltage dip mitigation. This paper presents a comparison between the stationary and rotating reference frame based cascade control structures for DVR. Stationary frame controller consists of an inner Proportional Resonant (PR) current and outer proportional voltage control. Similar cascade structure is used in the rotating frame controller but with a conventional Proportional Integral (PI) current control. For both the controllers the performance analysis is presented while considering the computational time delays. The simulation study presents the results under balanced voltage dip with linear and nonlinear loads.

Paper ID#36

An attempt to Forecasts the Enhancement of Oil Recovery by using Microbes

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As the demand of fossil fuel not only continues but increasing and the time of conventional oil is thought to have ended. The communal total production of oil by means of primary and secondary methods is almost less than 40% that is, the 60% amount of the oil remains into the reservoirs. To meet the increasing demand new techniques are required to recover and/or produce the trapped 60% residual oil from the reservoirs. One of the most advanced, respectively newer and theoretically beneficial technique to recover and/or produce remaining oil from the reservoirs is Microbial Enhance Oil Recovery (MEOR), which involve the injection of sensibly chosen microorganisms into the reservoir through the injection well and then stimulation and subsequent transportation of these in- situ growth microorganisms was done which results in the production of the residual oil. The aim of this paper is to inoculate the low permeability shallow reservoir's crude sample in laboratory for the observation of changes in viscosity, interfacial tension between oil and water and wet ability. As these properties can play a key role for the degradation of Heavy oil into Lighter oils. This inoculation will ultimately identify the potential approach of EOR by using Microbes, so that the practical approach of this technique can be taken into consideration in the nearby future depleted wells. The technique of MEOR can be utilized in the reservoirs by synchronizing the geological based studies and bacterial actions, which might bring the production to its maximum without heavy investments required in other EOR methods.

Paper ID# 37

Integrating Micro Hydro Electric Power Schemes into Grid Systems: Review of Barriers, Procedures, Requirements and Problems

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The grid integration of renewable energy has become more common in recent years. The reasons behind are the increase in world's electricity demand, power capacity improvement of local grids to meet up the escalating demand, increasing cost of fossil fuels, economic benefits of no fuel consumption by renewable energy sources, business opportunities, energy security, energy independence and more importantly the environmental concerns and global warming due to the excessive use of conventional energy sources. Like the grid integration of different forms of renewable energies, the integration of Micro Hydro Electric Power (MHEP) into grid systems is also imminent owing to its tremendous performance and potential benefits in terms of high efficiency, high capacity factors, low output power variations and greatly feasible with low investment costs when compared to other renewable technologies specifically wind, wave and solar power of the same size. This paper presents a review of the factors associated with the grid integration of MHEP schemes and discusses the key barriers, relevant procedures, major requirements and significant problems pertaining to their grid integration. Various strategies to overcome barriers and practicable solutions to mitigate and to compensate the problems encountered during grid integration are also described for consideration.

Paper ID# 38

Analysis of novel maisotsenko cycle applications in power and energy systems

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Maisotsenko (M) cycle is a thermodynamic conception which utilizes latent energy potential in a as working fluid through the evaporation of water. The concept is now widely utilized for air cooling application mostly. Here we present the application of M-cycle based air conditioning a well as waste heat recovery devices. In air-cooling applications, M-cycle is primarily an improvement on indirect evaporative cooling technique thereby allowing sub-wet bulb temperature of supply air through specially designed heat and mass exchanger (HMX). The configuration restricts the addition of moisture in product air and improves the efficiency of cooling system. The emphasis here is to model and analyse the configuration of HMX for produce air quality in different flow and mass transfer configurations through HMX. Different configurations of HMX (namely cross-flow, counter-flow, multi-regenerative counter-flow and hybrid counter-cross) are modelled and their performances are analyzed for air cooling as we waste heat recovery device. For air cooling application, performances of HMX are presented in terms of cooling effectiveness, cooling capacity, and energy efficient ratio. Comparative result presented here show that cross-flow configuration of HMX provides higher cooling capacity, a counter-flow configuration offers higher cooling effectiveness. For the waste-heat recovery application; the M-Cycle is implemented as an air saturator in humid air turbines (HAT). The influence of parameters including bottoming cycle pressure ratio, mass flow rate ratio, turbine inlet temperature is varied to observe their influence on overall plant efficiency, and overall output for HAT cycle. This research identifies possible replacement of energy intensive vapor compression cycles and proposes an energy-efficient way for better waste heat recovery of gas turbines.

Paper ID# 39

Photovoltaic Solar Energy System, A Dominant and Ultimate Source of Energy for Developing Countries

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Energy sustainability plays a vital role in the economic development of a country. The developing countries are passing through energy crisis which is affecting the living standard of people. Renewable energy development can provide a constant supply of energy and Photovoltaic (PV) solar system has increased importance. It is due to the advantages in high dependability, absence of fuel cost and environmental pollution, simplicity of allocation, lack of noise and inexhaustible energy source. This article deals with present energy scenario of developing countries with special emphasis on Pakistan, the energy demand and role of photovoltaic system in dominating the future needs of energy. In terms of available solar energy, Pakistan lies among the richest countries with an annual global irradiance value of 1900–2200 kWh/m2, which is highly suitable for PV solar energy systems. A three-tier mode of policies is created to support solar energy. The 2011 survey shows 73% of PV solar system technologies across the globe, indicating the dominancy rate than hydro power, wind or biomass energy. It is low cost and highly sustainable. According to an estimation, solar energy produced by PV cells in 2013 costs 0.74 s/watt.

Paper ID# 40

An Analysis of The Effect of Carbon Dioxide Injection in The Low Rank Coals

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To date, several studies have been conducted on the enhanced production of Coal Bed Methane by using carbon dioxide for high rank coals. These studies had shown that carbon dioxide injection in coal seams can enhance the production of methane when compared to previously used traditional methods. This enhancement in production of methane gas is mainly due to the higher carbon dioxide absorptivity of coals, which interns desorbs the methane with higher sweep efficiency. However, the studies which have been conducted on the enhanced production of Coal Bed Methane by using carbon dioxide for low rank coals are seems to be very insufficient. The aim of this paper is to understand and investigate the effect of carbon dioxide injection in low rank coals for this purpose coal seams samples of varying depths were collected and various tests had been carried out. This study uses Pakistan's coal samples to understand and investigate the said potential of low rank coal. Tests results confirms the capability of Pakistani coal to provide alternative energy source and overcome any future energy crises and shows that the capability of carbon dioxide in the enhanced recovery of methane is not dependent on rank and/or maturity of coals.

Paper ID# 41

Analysis of Physicochemical Characteristics of Rice Straw Pretreated with Sodium Hydroxide

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Lignocellulosic biomass is supposed to be the world's biggest source of fermentable sugars. Because of their profusion and sustainability, lignocellulosic waste can be utilized for the production and recovery of many value-added products (Mtui, 2009). One of the main recover products is biogas which can be obtained through anaerobic digestion. Lignocellulose is a complex polymer of cellulose, hemicellulose and lignin. Cellulose and hemicellulose which are two major sources of fermentable sugars present in lignocellulosic biomass that can be convey to biogas. However, anaerobic digestion of carbohydrates is hindered by the presence of ligni the cell wall. The crystallinity of cellulose, sheathing of cellulose by lignin, the heterogeneous arrangement of biomass particles, and cellulose protection by hemicellulose and lignin, all re in the recalcitrance of lignocellulosic waste to hydrolysis (Mosier et al., 2005). Therefore, pre-treatment of lignocellulosic biomass is necessary to disintegrate the complex lignocellulos structure and for effective utilization of cellulose and other digestible sugars to be digested efficiently during anaerobic digestion for higher biogas yield.

Paper ID# 43

Effect of Reduced Graphene Oxide as Counter Electrode Material and Low-Cost Natural Dye as Photosensitizer on Dye-Sensitized Solar Cells

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The importance of green power resources is being significantly increased as the energy crises is taking a vital position in every country. Sunlight being an abundant source offers a cost effective and clean solution to problems of energy generation. Dye-Sensitized Solar cells (DSSC) are an economical class of solar cells that address the corresponding issue. In this research, DSSCs were manufactured using ITO coated glass substrate imported from Ossila Limited, United Kingdom, by employing Micro Crystalline Titanium (IV) Anatase purchased from DAEJUNG company, Korea, on the photo-anode, dipped in natural cherry dye prepared by fresh cherry juice. For counter electrode, materials from Graphene family; Graphite, Graphene Oxide (GO), and Reduced Graphene Oxide (rGO) were coated to fabricate three different cells and the results were compared. The internal electrical continuity was established by I^-/I^{-3} electrolyte. The synthesized materials were characterized by PAN alytical XRD, X-ray diffractograms obtained for rGO which show sharp diffraction peaks appeared at 2θ=26.5Å confirming the existence of rGO**.** In FTIR spectra, major absorption peaks of GO and rGO were obtained at 1050cm^{-1} and 1500cm^{-1} respectively [1]. The presence of rGO was further confirmed by the major peak of 260 nm from spectrum obtained by UV-Vis Spectrophotometer [2]. The fabricated DSSCs were characterized by Probe Station Keithley SCS 4200 which gave the I vs V graphs assuring the successful formation of diode. Among the three cells, rGO based DSSC gave the highest value of Voc = 0.65 volts and thus the power conversion efficiency was calculated to be η=5.23% under 11-Watt UV source which was higher as compared to the rGO based DSSC efficiency in the results.

Paper ID# 44

Thermodynamic Optimization of Air Bottoming Cycle for Waste Heat Recovery

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Growing concerns of environmentalists have led the researchers to improve the performance of the gas turbines by reducing its carbon footprints. Besides increasing the turbine inlet temperature and pressure ratio of the gas turbine, one suitable way is to recover the exhaust heat from gas turbine using a waste heat recovery unit or units and employ it to produce useful power with the help of bottoming power cycles. Available steam Rankine bottoming and organic Rankine cycles are not suitable for small power plants (i.e. less than 50MWe); therefore, air bottoming cycle (ABC) is a viable option to be used as a waste-heat system of gas turbine cycle. In this work, we carried out a thermodynamic optimization of an ABC having a gas turbine in topping cycle. Energy analysis is used for this thermodynamic analysis. The component wise methodology is adopted, and sensitivity analysis is carried out to find the maximum thermal efficiency point of the ABC. The sensitivity study is conducted by varying mass flow rate ratio, pressure ratio, and effectiveness of integrated heat exchanger (IHX). It is observed that the increasing the mass flow rate of the bottoming cycle have adverse influence on performance parameters (efficiency and work output). After optimization, it is concluded that using ABC configuration, the overall plant efficiency is increased to ~43% as compared to simple topping cycle.

Paper ID# 45

Design and Fabrication of a Low-Cost Solar Water Desalination Plant for Coastal and Remote Areas

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In Pakistan, most of the population is facing the crisis of potable water shortage. To cope up with the present situation, we have devised a low cost solar desalination system which is equally effective for the coastal and the remote areas of the country. This research focused on the usage of locally available low-cost materials for the fabricating. acrylic glass, EPS (Expanded polystyrene) foam and plastic pipes, and increasing the evaporation rate of the desalination system. Therefore, Crepe Paper(65gm) is used instead of cotton, sponge, fabric, paper etc. that were used previously. In accordance with the latitude of the selected sites, the angle of inclination was opted to be 25.1º which enhanced the efficiency. The first test on the plant was carried out in sea water in the vicinity of Gadani in August and then the plant was tested in muddy water in the area of Khuzdar in September. The temperatures of Crepe Paper(65gm), glass cover, condensate water, and sea water were noted after every hour throughout testing. The maximum temperatures observed for hydrophilic sheet, glass cover, condensate water and seawater were 48.3 ºC,38.9 ºC,23.9 ºC and 29.5 ºC respectively. The Average daily outputs for Gaduin and Khuzdar were recorded up to 2.3 L/m2 and 3.1 L/m2 respectively whereas theoretical discharge was calculated as 4.13 L/m2. Thus, the efficiency of our developed plant was computed for Gadani and Khuzdar as 55.6 % and 75% respectively.

Paper ID# 46

Solar Energy and its Thermal Application in Pakistan, Pakistan

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This paper is an endeavour to debate and focus the use of solar energy in Pakistan and to overcome the energy demands in the Country. The energy usage in all urban cities of Pakistan with the cost reduction and future technological developments along with its thermal applications, so energy crisis has resulted as a consequence of trends in globalization and increase in advancement of technology and industrialization. The need of energy based industries has increased the demand for energy resources. It is however, crucial to recognize and accept the fact that energy resources are on the verge of not only depletion but their degradation; exploitation and extensive use can also put them on the road to extinction. Sustainability of energy resources can build up a nation's base towards development and long-lasting survival. The paper will discuss the solar energy usage in all urban cities of Pakistan as alternative fuel and clean energy with the cost reduction and future technological developments.

Paper ID# 51

Managing Occupational Health and Safety in Small and Medium Sized Construction Companies in Hyderabad

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Issues on the construction site related with health and safety have continuously been key problems. Reliable records show that building site is the most danger oust ask for health and safety management, mainly in UN-industrialized countries. Measures have been taken to solve this problem, but outcomes are still unsatisfactory. Pakistan is enjoying strong construction development, but unfortunately, nearly all sectors of construction industry suffer from poor health and safety management. It may be claimed that related guide lines are out-of-date and unrelated in day-to-day construction processes. The aim of this research is to characterize present practices related to health & safety control in Pakistan. In following these objectives, multiple tactics, are used, whereby a walk-through survey, a check-list and a questionnaire survey for selected site was conducted. Whereas, the total number of respondents on all 4 sites were 201. Furthermore, for questionnaire survey purpose sampling is applied, to obtain the health, safety, and environmental procedures at present used on construction sites. Results showed that most workers have a poor understanding of risk and don't look to take health, safety, and environments an important issue, which results in high rate of minor injuries. In the same way, lack of health and safety management plan, in adequate first aid facilities, lack of personal protective equipment' sand absence of the accident reporting system were also observed. This research will help in highlighting the issues and giving the practical solutions for each problem

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Paper ID# 52

To Convert a Conventional (Large Size) Domestic Building into A Smart Building by Using Information Communication Technologies

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The demand for fossil fuels and their depletion rates are alarmingly high. As a result, environmental degradation due to increase in carbon foot prints from large urban centers, exponentially increased. To cater this, energy conservation efforts need faster implementationagainst such challenges. In this regard, building sector is one of the major consumers of work global energy generation. There is a need to develop this huge sector, more energy efficient, cost-effective and environmental friendly. The concept of smart building has emerged in the two decades in which energy and water conservation, self-energy generation and internally an externally connected infrastructure all work in an integrated way to meet the objectives. In t paper, the aim is to present an assessment for conversion of a large scale urban domestic but into a smart one. The requirements from different perspective are put together to develop KP mathematical model of the smart building is formulated based on the assessed KPI•s. The pa concludes with the recommendations and transformation guidelines to sum up the requirement large scale buildings.

Paper ID# 55

Design Optimization of Single Mixed Refrigerant LNG Process Using Metaheuristic Runner-Root Algorithm

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A metaheuristic runner-root algorithm was investigated for the design optimization of a single mixed refrigerant (SMR) natural gas liquefaction (LNG) process. The optimal design of an LNG process involves multivariable non-linear thermodynamic interactions, which leads to entropy generation and contribute to process irreversibility. As key decision variables, the optimal values of mixed refrigerant flow rates and process operating pressures were determined in roots propagation pattern corresponding to the minimum required energy. SMR process was modeled using the ASPEN HYSYS® and the resulting rigorous model was connected with the runner-root optimization algorithm coded in MATLAB. The optimal operating conditions found by the runner-root algorithm significantly reduced the required energy of the SMR process and improved the coefficient of performance (COP) in comparison with the base case. The runner-root algorithm was also compared with other well-proven optimization algorithms such as genetic and particle swarm optimization algorithms and showed superior performance over the existing approaches.

Paper ID# 58

Optimal Design of Ethylbenzene Process Using Column with Side-Reactor Configuration.

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The design of an intensified column with side-reactor (SRC) configuration is proposed for ethylbenzene production process. The economic steady state design is developed that minimizes the total annual cost of an overall process as an objective function. The design variables include the reactor volume, the number of side-reactor, the number of column trays, and the column pressure. In addition, an effective multi-effect heat integration sequence was examined on the proposed SRC configuration to further reduce the energy consumption. The SRC configuration with the aid of heat-integration sequence resulted in significant savings of capital, energy, and TAC by up to 14.8, 53, and 38.3%, respectively.

Paper ID# 59

Sustainability of Green Buildings; Opportunities and Challenges

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Green building is one of the viable solution been put forward to counter the significant impacts of the building stock on the environment, energy resources and wellbeing of the residents. However, there is lack of knowledge about benefits of green buildings and the lack of systematic review. This paper aims at carrying out systematic review of existing knowledge of green buildings and finds common issues and barriers that resist the development of green building. In this study, many articles related to green buildings were reviewed and it is found that green buildings can help in reducing the environmental impacts, saving of diminishing natural energy resources, and reducing health hazards of occupants or tenants. This paper also reviews the currently operating rating systems and found that most of the rating systems do not follow a uniform procedure to check the standards of a building. This paper also discusses the challenges and opportunities associated with the development of green buildings. The main challenge for the government is the promotion of development of green buildings that can be done by providing incentives to developers. For future, review on economic benefits of green buildings can be carried out.

Paper ID# 60

Home Area Network

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In the 21st century the advancement in technology is shaping itself around the convenience, ease and betterment of mankind, which is empowered by innovation. The world is on the verge of automation. We need an automation system that will reduce our mobility and control the home appliances with single touch of a finger, this will in turn provide benefit to the senior citizens and technically challenged people also because it will be easy to use. Home automation will not only increase our accessibility in different parts of our home simultaneously but also allow us to manipulate the controls remotely. Constant monitoring of the home appliances will help us save energy and reduce electricity bills considerably. This will be a huge step towards a green environment. This narrow sour conversation down to the objective which is to "Design and develop communication system (Home Area Network) that should be able to undertake automation of devices and appliances within a residential facility in an affordable and cost-effective manner". We have proposed solution in which the communication between the smart control device and the appliances in rooms is wireless and from the appliances to a central server is through existing power lines in a home. This allows us to justify the cost effectiveness. In Pakistan, most of the energy is wasted due to the inefficiency by lack of design. Just to provide a glimpse of how much this initiative can impact, if the United States spends up to 520 billion dollars on energy efficiency, including home area networking, this is going to save them about 1.2 trillion dollars to the economy by the end of 2020. This accounts for the decrease in the energy demand which will reduce up to 1.3 Giga tons of greenhouse gas emissions.

Paper ID# 62

Retrofitting for Automation of HVAC System in Mechanical Engineering

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The world is moving towards the building automation system (BAS) for gaining energy and cost benefits. The BAS mainly focuses improvements of Heating, Ventilation and Air-conditioning (HVAC) of a building for effective and efficient energy utilization. This paper presents a proposal for retrofitting of an HVAC system intended for the department of Mechanical Engineering, MUET Jamshoro. Firstly, an intensive review of the existing HVAC control system was presented, followed by possible retrofitting options to be carried out for its automaton. In this regard, the use of Programmable Thermostat Controller (PTC) and Demand Controlled Ventilation (DCV) are discussed. The programmable thermostat is proposed to estimate and control the daily energy consumption of the building according to thermal needs. On the other hand, the DCV seems suitable to sense the high indoor CO2-concentration and signaling to vary airflow for maintaining a proper O2-level of the building. It is estimated that an energy saving of 32% is expected by installing the PTC with existing HVAC of the building under study. Furthermore, the DCV ensures a better control of the moisture and O2-level for creating healthy indoor environment.

Paper ID# 63

Simulating a Simplified model of a Biodiesel Production Plant Using COCO ChemSep; Software Analysis

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A Simulator is a program that mimics or tends to mimic conditions from real life applications, providing knowledge about a certain process or operation. There are various types of real life situation, programmed successfully, and integrated as computer software for educational purposes. These software ranges from subjects relating to arts to subject relating to science. Science simulators include simulators for Mathematics, Engineering, Physics, Chemistry etc. Cape Open to Cape Open (COCO) is one such software. COCO is an open source chemical engineering process simulator that allows studying of various chemical processes such as separation, reaction, mixing, heating/cooling etc. Due to its limitations as an open source software, the simulation of complex chemical processes and operations become somewhat of a challenge. This paper investigates whether it is possible for the transesterification process – a process that converts raw vegetable oil (edible or otherwise) having high viscosity to a lower viscosity oil useful as a competitive fuel source – to be simulated on such a software. The process of transesterification uses complex chemical compounds not all of which may/may not be available in the COCO ChemSep Compound library. Ranging from Component availability to reactor availability, the study showed – after selecting approximate assumption – it is possible to achieve simulation of the Transesterification Process and allow for parametric study of the process, whether the existing real-life biodiesel production plant, can be improved or not.

Paper ID# 64

Sensor-less Machine Control

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With the rapid development in the technologies, our industry also needs to be reshaped. A modified state of the art control system which focuses on providing high profitable margins, help us to achieve this. Our solution is to design a hardware based on the concept of Internet of Things (IoT) that con of an efficient motor control, to provide thorough integration between the devices. The design control will enable the industry to make informed decisions. Our aim is to achieve motor control through cellular devices without time delay. The developed algorithm will take input in form of machine parameters i.e. current, voltage, and position of induction motor. Sensor-less control algorithm will be developed and impel using real time computational hardware for machine automation. This algorithm will include Direct-Quadrature-Zero Transformation to simplify calculations for the control of three-phase inverters. Our main challenge is to achieve time synchronization and reduce latency issues who are required to attain full control. In future, this prototype can customize the industry, making it automated and easy to control the implementation of this, it can turn out to be a foundation, which will be saving basic ene resources in our major energy consuming sectors.

Paper ID# 67

Comparison Between Conventional and Novel Techniques for Extraction of Concentrated Oils

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Citrus peel belongs to orange plant that contains concentrated oils. Orange peel oil is widely used in foods, perfumes and pharmaceutical industry worldwide. In this study, the advantages of citrus concentrated oil extracted by conventional and novel techniques were studied. Microwave extraction techniques have come out as new alternatives to conventional techniques (hydro distillation) for extraction of oils. This paper reviews the novel separation technique with the conventional techniques in terms of extraction time, yields and energy. Extraction of oils with microwave assisted distillation (MAD) was comparatively better in terms of extraction time that is 45 minutes while for solvent free microwave extraction (SFME) is 60 minutes and for hydro distillation (HD) it is 3 hours. Yields percentage was almost same for the three processes that is 1.67%. Energy savings were greater in both MAD and SFME that is 0.4 kWh while in Hydro distillation it is 1.3 kWh. Overall MAD was better in performance than other techniques.

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Paper ID# 68

Exceptionally alkaline stable and Highest Fuel Cell Performance Imidazolium-type Anion Exchange Membranes

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Besides the traditional fossil-fuel energy, the scientific community is now investigating on clean and efficient energy converting technologies. Among all, fuel cell technology bears numerous advantages such as negligible emission of greenhouse gases, wide choice of fuels and high energy conversion efficiency. In recent years, alkaline polyelectrolyte fuel cell (APEFC) technology has attained significant advances. One of the most important components for APEFC is the employment of an anion exchange membrane (AEM) instead of proton exchange membrane between anode and cathode. Up to now, one of the major challenges for APEFC is the lack of suitable AEMs with sufficient alkaline stability. Commonly employed cationic moieties in anion exchange membrane (AEM) have limited alkaline stability which are hardly feasible under harsh fuel cell operating conditions. In this study, we have synthesized highly stable imidazolium-type AEMs and systematically investigated the overall alkaline stablity of the cationic moieties attached to the main chain. 1,2,4,5-tetramethylimidazolium functionalized anion-exchange membrane showed the highest alkaline stability which is more than 94 % after 7 days in 1 M NaOD / D2O/ CD3OD solution at 60 oC. Comparing with the recently reported imidazolium-type membranes, the resultant membrane reaching an exceptional peak power density of 340 mW cm-2 at 80 °C which is highest fuel cell performance to date.

Paper ID# 69

A Review on Renewable Energy Integration's Effects on Frequency and Power System Stability

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This literature review presents the frequency stability challenges of conventional power plant and with integration of renewable energy sources and its mitigation. Frequency stability in power system is of prodigious significance, so for pledge of stable power system load and demand should be balanced. By definition, Power system stability is the ability of an electric power system, for a given initial operating conditions, to retrieve a state of operating Equilibrium after having undergone disturbance, provided the system is grounded so that practically the system as a whole remains intact. Steady state stability is the ability of the power system network to remain or to stay in equilibrium following a gradual system change. Conventional generators can easily takeover frequency instability by droop or inertial control of automatic generation control. However, Power system with renewable integration doesn't have storage and inherent inertia so it can barely support frequency instability. Power system is the mainstay of emerging economy. This paper appraises timeline of frequency's extenuation measures in power system. Imbalance between load and demand originates instability in a power system while Renewable energy integration makes instability shoddier. Various control schemes accessible to astound these deviations were anticipated and equated centered to feasibility, accuracy and cost effectiveness. Accomplishment of any scheme depends on the system reliability and consumer satisfaction. Various control strategies are described and critiqued in this paper to overcome the frequency instability in power systems. Advanced studies on Demand side management and battery storage system integration in smart grids are also discussed.

Paper ID# 70

Lithium Ion Cell Modeling for Electric Vehicle: A Step Towards Zero Carbon Emission

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High Specific Energy Density, extensive range of operational temperature and safety benefits make Lithium-ion-battery a promising technology for energy storage especially in electric Vehicle. Due to lack of supplied information by battery producer and independent verification of Li-ion battery, demand of accurate simulation and modeling scheme of Li-ion battery is increased. In this paper, comparative study on several Li-ion cells is conducted, considering the tradeoffs between thermal runaway and energy density. Various Li-ion cell's performance, cost, nominal voltages, temperature ranges and discharge rate is studied. Selection of Li-ion cell for experimentation purpose is based on the comparative study of cells. Due to non-linearity and chemical phenomena, modeling of Li-ion cell is a complex task. Different model approaches exist in the literature. Equivalent Electrical Circuit Modeling(ECM) is computationally more efficient and robust. Equivalent circuit modeling is based on "double layer theory" proposed by Gouy and chapman. The basic equivalent circuit consists of one internal resistance and one RC branch. The modeling of circuit parameters is done by experimental data obtained under different operating conditions. Parameter Estimation technique is used to extract the required parameters for circuit model. Both Dynamic and steady state characteristics of Li-ion Cells are modeled using ECM. Model parameterization is done by experimental results of Pulse discharge tests and lookup tables for circuit elements. The Results establish relation between battery parameters and factors that affect performance of battery.

Paper ID# 71

La4NiLiO8 As Solid-State Electrolyte for Next Generation Li-ion Batteries (LIBs)

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Li-ion battery technology has proved a very important role in past years and future forecasts the new and advance materials for energy storage. Whereas, issues related to the safety of batteries motivated the solid-state Li-ion batteries as a next generation battery system established on solid electrolytes would regenerate the rechargeable battery field due to their high safety, outstanding stability, long cycle lives and low cost. However, great effort will be needed to implement solid-electrolyte batteries as practicable energy storage systems. Herein, we have synthesized a completely new material La4NiLiO8 as a solid electrolyte. X-ray diffractometry (XRD) analysis confirmed the fabrication of La4NiLiO8. After the successful fabrication of La4NiLiO8 powder, we pressed the powder into pellets and sintered in furnace at different temperatures. Grain boundaries in the pellets are observed by Scanning electron microscopy (SEM) analysis Electrochemical impedance spectra showed that the pellet sintered at 1050 ^{o}C has total resistance around 950 ohms at 20 oC and 550 ohms at 80 oC. Whereas, Pellet sintered at 1200 oC shows total resistance 110 ohm at 20 oC and 25 ohms at 80 oC. Ionic conductivity of La4NiLiO8 pellets showed an increase in ionic conductivity with the increase in temperature. Further Galvano static charge and discharge curves were investigated by using La4NiLiO8 as solid electrolyte, lithium iron phosphate (LFP) as a cathode and graphite as anode material. This new solid electrolyte material showed good performance at various current densities.

Paper ID# 73

Excess Lithium Stored LiFePO4 (LFP) Synthesized by a Novel Reflux Method

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Lithium ion batteries are attractive for use in the field of mobile power source with the favorable properties of high voltage, long cycling life, high energy density, non-memory effect and pollution-free. Olivine-structured Lithium iron (II) phosphate (LFP) is a well-known material because of its wide use as cathode in lithium ion batteries but it is still a challenge to improve its electrochemical properties. In this work we have synthesized LFP by using a novel reflux method by using ethylene glycol as solvent. X-ray diffractometry analysis confirmed the synthesis of LiFePO4. Spherical shape nano size particles are observed by Scanning electron microscopy (SEM) analysis. Transmission electron microscopy (TEM) analysis was confirmed the particles size which is approximately 230 nm. Our synthesized LiFePO4 cell delivered an initial discharge capacity of 145 mAh/g and which is 30 mAh/g higher than the ordinary LiFePO4 cell. Cyclic voltammetry revealed excellent reversibility of the LiFePO4 synthesized through reflux method. High rate capability studies were also performed and showed capacity retention over 93% during the cycling. Electrochemical impedance spectroscopy and cyclic voltammetry measurements illustrated that the prepared LiFePO4 can decrease the charge transfer resistance and increase the Li ions diffusivity through the LiFePO4 particles.

Paper ID# 74

Outstandingly Acid Recovery through Graphene Oxide Sheets-type Anion Exchange Membranes

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Electroplating and steel industries produce large quantities of waste effluents every day. The waste water is usually composed of inorganic acids and mixed metallic salts. It is crucial to develop effective methods to treat these liquid wastes, because their direct dumping endangers the ecological life. To date, several techniques have been developed to handle such wastes including pyro hydrolysis, neutralization, extraction, electrodialysis and diffusion dialysis (DD) techniques. Among them, the DD using an anion exchange membrane (AEM-DD) is the most promising method which separate acid from mixed salts due to its high acid recovery efficiency and negligible energy requirements. AEM-DD can economically recover acid from these wastes and protect ecological systems. Currently, the development of polymeric anion exchange membranes (AEMs) for recycling acid is facing a serious difficulty, the desired acid passage and undesired salt leakage dilemma. Specifically, to improve the acid recovery efficiency, AEMs should be anchored with enough cationic groups to enhance their hydrophilicity, but it can inevitably lead to metallic ions leakage. Here we propose another strategy of "three phase" AEMs to settle this dilemma. We have added graphene oxide (GO) sheets as auxiliary phase domains along with the hydrophobic polymer backbone and hydrophilic cation phase domains. The abundant oxygen containing groups distributing on the GO sheets not only enhanced the proton transport but also captured more metallic ions. The novel "three phase" structured AEM containing only 0.5 wt% GO sheets amplified the acid recovery efficiency up to 40% and separation by 51% compared with the un-treated AEMs.

Paper ID# 75

Development of Talc as An Alternative of Zirconium Silicate in Ceramic Tile Glaze

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The aim of this research work is the use of talc in substituting zirconium silicate in ceramic tile glaze as a opacifying agent. Usually, in ceramic tiles industry zirconium silicate ($ZrSiO_4$) is used as o pacifier so for. However, the high cost of zirconium silicate limits its uses. In this research work, alternative glazes with better whiteness and opacity were found using talc ($Mg_3Si_4O_{10}(OH)_2$) as opacifying agent and by gradually substituting talc content in the glazes in place of zirconium silicate. Six samples of glazes (including reference sample) were prepared, sprayed and fired in single fire roller kiln under the industrial environment. The Scanning Electron Microscope (SEM) and Energy Dispersive X-Ray (EDX) were used in order to find the surface morphology and mineralogical composition of the samples. The thermal expansion of glaze samples was measured by dilatometer. Various physical tests were also done on all the samples of glaze. All the parameter during the characterization were kept in the standard range of ceramic tile glaze. The whiteness and opacity was determined by spectrometer using CIE Lab color scale. The results of EDX and SEM tests revealed that opacity of ceramic glaze is the function of crystals present in the glaze matrix due the crystalline structure of talc. This research proved that talc is a very suitable alternative of zirconium silicate which makes the ceramic glaze more economic, better in fluxing properties and opacity.

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Paper ID# 76

Design and Development of Advance Metering Interface for Smart Grid Implementation

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The recent growth in demand for clean and safe energy has led to a new paradigm in Energy distribution and generation techniques. A more distributed generation system is the reason for a progressive decrease in carbon footprint in the last decade, and to keep up with such a change, utilities must enhance their management and energy distribution so as to achieve and maintain high efficiency. This is the core concept of the Smart Grid (SG). The Smart Meter is one of the most essential parts of the SG. It is a next generation Energy Meter with enhanced communication and metering capabilities. Smart Meters integrates an ability to obtain information from the energy consumer's load devices and measure the energy consumption of the end users while also having the added ability to allow for Bi-directional metering and Bi-directional communication. Data is directly communicated between utility and end users via Radio Frequency (RF) or Power Line Communication (PLC) technologies. In this paper we will look at the design of a Smart Meter which will provide 3-phase AC power reading while also integrating Power Quality Analysis and Home Area Network using Arduino platform in conjunction with Raspberry Pi 3.

Paper ID# 77

A Novel Method of Health Monitoring of Electrical Equipment for Smart Grid Technology

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Some of the most prominent promises of smart grid technology are the increased reliability, durability, reduction in transmission costs and more efficient control techniques for power systems, so as it can cope up with increasing energy demands and growing complexity of electric networks. One of the major causes of power failures are breakdown or failure of electrical devices such as transformers, motors, batteries in renewable energy production units, and the transmission lines. This unreliability and inefficiency can be overcome by on-line and on-field health monitoring of electrical equipment. Health monitoring can improve efficiency, reliability, economics and sustainability of the transmission and production of electricity. Currently available systems for the health monitoring of electrical equipment are based on parameter analysis and cannot conclude their health based on their conditions. Under the domain of this paper, the current waveforms of the equipment are analyzed and various pattern recognition and classification techniques are used to declare the health or state of the electrical equipment. The signal processing tools such Discrete Wavelet Transform, which will perform pattern recognition by feature extraction, are implemented on FPGA based embedded system. The design and use of such system makes both on-line and on-field health monitoring of electrical equipment possible. The proposed system will be able to replace old and inefficient methods of monitoring such as Dissolved Gas Analysis tests for transformers and Motor Conditions Monitoring.

Paper ID# 79

Optimized Solution for A PMU Placement in A Power System for Complete Network Observability

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Synchrophasors are time-synchronized entities that provide wide area time synchronized view of the power system nodes at high reporting rates, capturing its dynamics very efficiently. These numbers are measured by high processing power devices called Phasor Measurement Units (PMU's). PMU has become an indispensable part of the smart grid as it accurately estimates the voltages, current phasors (magnitudes and angles) and data output at a very high rate (10 to 60 frames per second) that is superior to SCADA technology. A power system is identified observable when the voltages of all buses in the power system are known. We can place PMU's on all the busses to get these voltages. The problem here is that synchrophasor is an expensive technology thus we cannot put PMU's on every bus in our system to observe the network otherwise it would not be very economical. The paper presents a solution to the problem of locating the optimal points for placement of PMU units in the system as well as finding the minimum quantity of PMUs to make the system observable. Cost optimization problem is formulated for such a case. After optimal placement of PMU'S we can estimate the phasors and power flow on the other busses to restore, monitor and ensure the stability of our system.

Paper ID# 81

Second Order Generalized Integrator Based Phase Lock Loop for Single Phase Grid Connected Roof Top PV Systems

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Frequency, phase and amplitude of the utility's voltage are the critical parameters required for the synchronization of a grid connected distributed generator. Various Algorithms for the synchronization of grid with the distributed generation system have been proposed in the literature. This paper proposes a Synchronous Reference Frame Phase Lock Loop (SRF-PLL) technique for the grid synchronization of a Single-Phase roof top PV system. Second Order Generalized Integrator (SOGI) is used to convert the grid voltage into orthogonal components which is then used by the SRF-PLL. The significance of SOGI based PLL is the simple implementation and the adaptation to frequency changes in the grid. The complete model of Grid Connected PV System is simulated in MATLAB/Simulink environment. The results shown verify the performance of the system when subjected to frequency deviations.

Paper ID# 82

Comparative Study of Conventional and Microwave Assisted Pyrolysis of Corncob

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Renewable sources of energy are the need of the day in the current energy crises situation. To combat energy crises, energy from the biomass feedstocks could be the possible remedy. Lignocellulose biomass feedstock due to its abundance and carbon neutral nature could be utilized for the production of renewable biofuels. Pyrolysis for such utilization is an efficient method for producing liquid biofuels from waste biomass feedstocks. A comparative study of conventional and microwave assisted pyrolysis (MAP) for biofuel formation from corncob is done in the current review. In this study some of the factors like bio oil yield and sample size in the conventional and MAP were studied. Comparing the two processes, keeping same process variables, a maximum bio oil yield of 26.44% and 41.1% is obtained in the conventional and MAP. Sample size has a prominent effect in the conventional process whereas due to the unique way of heating, sample size has slightly effects on the yield and heating rate in MAP. MAP is proving to be an energetically as well as economically feasible process.

Paper ID# 83

PV Integration with Grid and Anti-Islanding Protection - A Review

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With the decreasing fossil fuel reserves and the increase in CO2 emission from them, the penetration of renewable energy sources has increased enormously in the last two decades. The capturing of renewable sources and their safe integration with the grid is of main importance to all countries. Sun is the biggest renewable energy source and its energy is captured via a photovoltaic cell. However due to the poor efficiency of a photovoltaic cell, Maximum Power Point Tracking(MPPT) is used to extract the maximum efficiency by matching the load curve with the maxima of the solar array's Power-Voltage curve. Integration of the PV system to the grid is done via a Grid-Tied Inverter which synchronizes the PV system with the Grid using a synchronizing algorithm that matches the phase, frequency and amplitude of the utility's voltage with the inverter's output current. Anti-islanding protection is used to cut-off the output of inverter when the Grid is down to protect the equipment and the personnel at the utility. The paper presents a review of the MPPT techniques, synchronizing algorithm and anti-islanding methods.

Paper ID# 87

Variable Frequency Drive for Operating the Induction Motor

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Abstract: Variable frequency drive drives the motor by changing the frequency and voltage supplied to the electric motor. V and F method is used for varying the speed of the induction motor and also the starting current (inrush current) required by the motor is reduced. Gate drive circuitries used for inverter stage. The IR2110 and PIC- 18f4520 are used for controlling the Gate drive circuitries. To accelerate an AC motor to full speed using a full voltage connection, a large inrush current may be required. Additionally, the torque of the AC motor is mostly uncontrolled and can shock the connected equipment, potentially causing damage. As a protection measure an idea of Variable Frequency derive is introduced in this research work. In this research work Variable frequency drives are used in applications where: Complete speed control, Energy savings is required. AC supply: Comes from the facility power network (typically 208V, 230V, 480V, 690V / 50 Hz AC.) Rectifier: Converts (rectifies) network AC power to DC power Chokes and DC bus: Work together to smooth the rectified DC power and provide clean, DC power to the inverter with low ripple content. Inverter: Uses DC power from the DC bus and chokes to invert an output that resembles sine wave AC power using a pulse width modulation (PWM) technique. Pulse width modulation: Switches the inverter semiconductors in varying widths and times that, when averaged, create a sine waveform.

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Paper ID# 93

Simulation of Thermal Performance of Cool Roof options through Building Engineering System Software

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This paper investigates the potential of cool roofs in reducing the building energy loads and focuses on how the different cool roof assembly affects the thermal performance of a building in Hyderabad, Sindh, Pakistan. A building envelope is modeled in Energy Plus software and different cool roofs are employed to the building such as Conventional roof, Marble, EPS, SPF, PVC, XPS, Thermocol sheet, Asphalt tile, Gypsum tile, White paint and Jumbolon-board foam were used to find zone air temperature and roof surface inside and outside temperature of the building. Results include daily and monthly reports of zone air temperatures for all types of cool roof materials. The results, obtained for the maximum to average zone air temperature in month of May, shows that Conventional roof reduces temperature from 33.8oC to 32.1oC. Thermocol sheet and SPF reduces zone air temperature from 29.7oC to 28.8oC. Whereas XPS, Jumbolon-board foam and EPS reduces zone air temperature from 29.6oC to 28.8oC, 29.8oC to 28oC and 30oC to 29.1oC respectively. Whereas Marble, white Paint, Gypsum tile, asphalt tile and PVC found to be less efficient and reduces 33.3 oC to 31.8oC, 31oC to 30oC, 31.8oC to 30.7oC, 31.7oC to 30.6oC & 31.5oC to 30.4oC respectively. From this report the Conventional roof's surface outside and inside temperature difference is 2.9oC. Thermocol sheet, XPS and Jumbolon-board foam found to be more efficient and reduces inside temperature by 9.2oC, 9.3oC and 8.7oC respectively. In this regard EPS is somewhat better than others by reducing outside and inside temperature by 8oC. SPF is next to reduces temperature by 7.5oC. It is concluded that thermocol sheets, XPS and Jumbolon-board foam are optimum cool roof options in order to save energy and costs in future in Hyderabad, Sindh, Pakistan.

Paper ID# 95

Synthesis and application of Cu based MOF as a CO2 adsorbent

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In this paper, the main focus is on the CO_2 adsorption capacity of Copper based Metal-Organic Framework. To investigate the application of Copper based MOF in CO_2 adsorption, the motivating factor was its reversible solvent-exchange property. Copper based MOF was synthesized using solvothermal treatment of terephthalic acid with copper nitrate in DMF. The MOF was characterized by Powder X-ray Diff raction (XRD), Thermal Gravimetric Analysis (TGA) and Scanning Electron Microscopy (SEM). CO_2 adsorption capacity of the MOF was measured by a cyclic adsorption-desorption method with adsorption at 25°C and desorption at 200°C in TGA. The maximum CO_2 adsorption capacity attained was 0.55 $mmolg^{-1}$. This adsorption capacity can further be improved by changing synthesis method and amine modification of prepared MOF. Further adsorption studies will be conducted with sorption analyzer.

Paper ID# 96

Brain Computer Interface

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Ruminate about a person reliant upon others for his day-to-day chores because of his physical disabilities, a person who is unable to speak or suffering from mobility impairments. Altogether these practical hitches are really common nowadays and fosters serious concern worldwide. In Pakistan, disability problem become more severe due to lack of cutting-edge automated solutions for patients having physical impairments. In the absence of regular census, approximate or projected numbers estimate that, total population of people with disability (PWDs) is 5.035 million. Consequently, there is a crucial need of communication between brain and computer. In order to develop an autonomous standalone system which can operate on patient's brain signals directly. Henceforth eliminating the need of a human assistant. We have achieved this by interfacing Emotive headset with MATLAB. Emotive headset is a wireless EEG system that measures brainwaves and allows programmers to use brain activity in their application. Now our challenge is to develop a system that will control the switching on and off of a light bulb through their thoughts.

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Paper ID# 97

Design of Multivariable PID Controller; A Comparative Study

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PID controller is widely used in industry. More than 100 methods of PID tuning are given in the literature. But, most of methods are only suitable for Single imput Single output (SISO) systems. very little work has been done on MIMO systems. A few MIMO PID control techniques are available but it is not clear which method is suitable in which condition. There is need to compare the performance of MIMO PID design method for a particular application Broadly speaking there are two types of MIMO systems

1) Decoupled systems

2) Coupled systems

In this project we shall investigate both coupled and decoupled systems. This work will select four methods for MIMO PID controller. In order to test the performance of the chosen methods, we shall apply the designed PID controller for a Distillation Column Control System. The aim of this project is to study the main methods for MIMO PID controller design and compare their performance through simulation studies. Study of latest methods of MIMO PID controller available in literature. Selection of three methods of MIMO PID controller will be tuned for a distillation control system. Comparison based on steady state analysis. We create a MATLAB programming code to simulate the control system.

Paper ID# 99

Amine Modification of Cu Based MOF For CO2 Adsorption Applications

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The CO2 concentration in the atmosphere is constantly rising mainly through industrial and power plant discharges this has led to urgent calls for strategies to reduce CO2; major greenhouse gas emissions from the environment, thus global warming problem can be alleviated. Metal organic frameworks (MOFs), also known as coordination polymers, represent an interesting type of solid crystalline materials that can be straight forwardly self-assembled through the coordination of metal ions/clusters with organic linkers. These unique advantages enable MOFs to be used as a highly versatile and tunable platform for exploring multifunctional MOF materials. Here, the bright potential of MOF materials is highlighted as one of the most important applications i.e., gas adsorption. Amine groups being basic in nature have excellent affinity towards acidic CO2 group. Amine modified metal organic framework materials have promising tendencies as dry adsorbents for post-combustion CO2 capture, owing to their enhanced CO2 capture capacity. An amine modified MOF material have been synthesized in this research work. The amine modified MOF was synthesized by the physical incorporation of amine on the Cu based MOF (Cu-tpa). Characterization is performed using XRD, SEM, EDS and TGA. Sorption studies will be performed to study adsorption capacity of synthesized material. The aim of this research work is to develop an amine based MOF that will have high capture tendency and selectivity towards CO2 compared to other flue gases and excellent stability moreover, to reduce energy penalty and time-intensive approaches for MOF production at industrial scale.

Paper ID# 100

Recycling of Waste in To Composite

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The aim of this study was to investigate the feasibility of composite formation from tonnage of wastes produce not only environmental problems but also required huge budget on its disposal. The aim of this review is to go through comparative analysis of composite of biodegradable materials (PLA)/Waste Tires, rHDPE/PCB and fibre/matrix (resin) with the most general composites of ceramics. One of the main purpose of this review is to show how theoretical and experimental data that is already available can be used to design new composites from new materials with match properties and to select most suitable waste materials for formation of composites.

Paper ID# 102

Technical Evaluation of scope of Linear Fresnel technology in Pakistan

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Pakistan is a developing country that is currently suffering from acute energy crisis, largely due to the increasing population and rapid urbanization. The heavy reliance of energy sector on imported oil further poses issues at times when the oil prices increase in the international market. However, with 83% of the country being privileged with more than 2000 kWh/m2 Direct Normal Irradiation (DNI) annually, Pakistan has immense potential to produce electricity from Concentrated Solar Power (CSP) technology. This study also accesses the technical potential of producing electricity via Linear Fresnel technology across various locations in Pakistan. Analysis has been carried out via System Advisor Model software using Typical Meteorological Year data acquired from NREL National Solar Radiation Database. The results show that, areas with annual DNI higher than 2000 kWh/m2 are very suitable for setting up Linear Fresnel power plants. In near future, the availability more efficient Thermal Energy Storage (TES) and improved collector technology can also help Pakistan exploit much electricity from areas with annual DNI higher than 1700 kWh/m2 as well.

Paper ID# 104

Potential of Renewable Energy Resources in Pakistan

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The modern life is strongly depending on energy. The energy has become a most essential factor for any nation's development and energy key player for economic and industrialization as well. The various reliable energy sources are most essential to improve and upgrade human being's living status in this planet. The management and rational utilization of conventional energy sources (fossil fuel), and renewable energy source (biomass, wind, solar, hydro, geothermal and nuclear) are vital. These renewable energy sources are fastest growing, environmental friendly, commercially attractive, cost effective as well as mature energy resources for producing electrical energy. Luckily, Pakistan has gifted all these renewable sources in abundant quantity. Pakistan has great potential of renewable energy sources along with some barriers in technology development. The current paper reviews the past, present and the future energy production from available renewable energy sources in Pakistan.

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Paper ID# 108

A Study of Thermal Stratification for Pressurizer Surge Line with Different Turbulence Models and Flow Velocities

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Energy is considered as key input to the economy and sustainable development. Energy security is the major challenge of 21st century. Scientist and researchers are seeking new ways for conservation of energy. Nuclear energy is one of the promising forms of energy. The main problem with nuclear energy is safety concerns. There are different types of nuclear power plants operating across the globe. Pressurizer water reactors (PWR's) are most commonly used operating nuclear power plants and accounted for 65 % of the total operating nuclear power plants. Generally, PWR consist of primary and secondary loops. The pressurizer is connected to primary coolant loop via a surge line known as Pressurizer surge line. The main function of pressurizer is to maintain pressure inside primary coolant loop during in and out surge cases. Thermal stratification is formation of layers in fluid with respect to density. The fluid density is function of temperature and reduces with increase in temperature. The hottest fluid with lower density accumulate in the top inner surface of pipe and followed by higher density layers producing a temperature difference in pressurizer surge line. Thermal stratification is prominent in high temperature operations i.e. pressurizer surge line. Nuclear power plant operation can be affected by any type of damage to the probity of primary loop. One of the main concerns of pressurizer surge line is transient temperature variation and a risk for thermal fatigue. This study mainly focuses on understanding thermal stratification phenomenon in pressurizer surge line. The pressurizer surge line of KORI I nuclear power plant is considered for analysis. CFD analysis is performed on ANSYS CFX to acquire the accurate time dependent temperature distribution for pressurizer surge line. The fluid flow turbulent behavior is evaluated with SST, RNG k-ε and standard k-ε models. The effects of different heat up rates on thermal stratification phenomenon are discussed in detail and flow behavior is studied using SST turbulence model. Three different flow velocities of 0.2 m/s, 0.1 m/s and 0.05 m/s have been considered for flow variation in PWR surge line. The temperature difference is highest for SST as compared to RNG k-ε and standard k-ε turbulence models. The RNG k-ε and standard k-ε shows comparable results after simulation time of 200 s. The SST and RNG k-ε turbulence models shows better results

for turbulent flow behavior in pressurizer surge line under thermal stratification condition. The computational time for similar simulation conditions are significantly less for RNG k-ε turbulence model. The time span of temperature difference for thermal stratification effect is minimum at higher flow velocity as compare to lower flow velocity. Generally thermal stratification effect is reduced as flow velocity is increased which shows the dependence of thermal stratification on Richardson number.

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Paper ID# 109

To Study Over All Downward Slope of Pressurizer Line for Thermal Stratification

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Energy is considered as key input to the economy and sustainable development. Energy security is the major challenge of 21st century. Scientist and researchers are seeking new ways for conservation of energy. Nuclear energy is one of the promising forms of energy. The main problem with nuclear energy is safety concerns. There are different types of nuclear power plants operating across the globe. Pressurizer water reactors (PWR's) are most commonly used operating nuclear power plants and accounted for 65 % of the total operating nuclear power plants. Generally, PWR consist of primary and secondary loops. The pressurizer is connected to primary coolant loop via a surge line known as Pressurizer surge line. The main function of pressurizer is to maintain pressure inside primary coolant loop during in and out surge cases. Thermal stratification is formation of layers in fluid with respect to density. The fluid density is function of temperature and reduces with increase in temperature. The hottest fluid with lower density accumulate in the top inner surface of pipe and followed by higher density layers producing a temperature difference in pressurizer surge line. Thermal stratification is prominent in high temperature operations i.e. pressurizer surge line. Nuclear power plant operation can be affected by any type of damage to the probity of primary loop. One of the main concerns of pressurizer surge line is transient temperature variation and a risk for thermal fatigue. This study mainly focuses on understanding thermal stratification phenomenon in pressurizer surge line. The pressurizer surge line of KORI I nuclear power plant is considered for analysis. CFD analysis is performed on ANSYS CFX to acquire the accurate time dependent temperature distribution for pressurizer surge line. The fluid flow turbulent behavior is evaluated with SST models. This study is conducted to study pressurizer surge line for overall downward slope of 0,3 and 6 degree. Pressurizer surge line of KORI 1 nuclear power plant is considered for analysis. The overall downward slope in the pressurizer surge line affects the flow field and reduces the maximum top and bottom temperature difference along the pressurizer surge line especially in regions near pressurizer end. Increasing over all downward slope the inner wall temperature difference reduces considerably due to fluid mixing.

Paper ID# 110

Synthesis of Alumina/Polysulfone Nano Composite Membrane for Copper Ions Removal from Wastewater

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Copper ions pose a serious threat to environmental pollution due to its toxic effects on environment including human beings as well as plants. Several methods are used for copper ions expulsion; however, due to its conspicuous characteristics, membranes have dominated its use in this field. In this research polymeric nano composite (alumina/polysulfone) membranes have been fabricated to enhance copper ions rejection efficiency and durability of the polysulfone membrane. A novel polymeric nanocomposite membrane was synthesized using polysulfone and alumina nanoparticles. Different membranes with different concentrations of nano alumina were prepared by phase inversion method. Nano alumina was verified by scanning electron microscope. The performance of the synthesized membranes was analyzed in terms of copper ions rejection, static adsorption and reusability test. All the composite membranes showed higher copper ions rejection in contrast to nascent polysulfone membrane. The highest Cu (II) ions uptake (69%) was shown by membrane with 1 wt. % nano alumina and the lowest rejection (29%) was observed for pristine polysulfone membrane. The reusability test of the composite membrane confirmed its durability after several cycles using EDTA as regenerator.

Paper ID# 111

Microbubble Mediated Mass Transfer for Production of Ethyl Acetate

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Contemporary methods being utilized for production of ethyl acetate are highly energy intensive due to the presence of azeotropes and kinetics limitation of reaction. High capital investment and operational cost is required for downstream processing to obtain high purity of ethyl acetate. This research work is dedicated to develop novel and energy efficient process for the production of ethyl acetate through microbubble mediated mass transfer. Microbubbles have high surface area to volume ratios, high interfacial area and high surface energy consequently escalating mass transfer through the gas–liquid boundary layer. This approach is only useful if microbubbles could be produced at very little or no additional cost. In this research work ethanol vapors are fed in the form of microbubbles through the sintered borosilicate diffuser which react with acetic acid mixed with acid catalyst. Unreacted ethanol, acid and water will be vaporized and subsequently separated in a downstream condenser. Ethyl acetate is characterized by using High-performance liquid chromatography (HPLC) and Gas Chromatography with Flame ionization detector (GC-FID). The preliminary lab experiments have demonstrated relatively higher conversion in shorter period of time. It was observed that better control over the process condition and more suitable catalyst could further increase energy efficiency.

Paper ID# 112

High CO2 Selective 1-Butyl-3 Methylimidazolium Tetrafluoroborate Based Ionic Liquid Membrane

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The trend of energy production by utilizing fossil fuels is a growing concern around the globe. Due to the recent climatic changes, acid rains and global warming issues, there is a necessity to increase carbon capture and storage (CCS) for industrial processes at the expense of low energy consumption. Conventionally amine-based separation techniques are used which present many difficulties in maintaining process conditions, regeneration of solvent etc. all resulting in a high consumption of energy. As an alternative membrane technology is employed which significantly lowers the energy consumption and cost? But it also showed some difficulties in the form of selectivity and permeability trade-off. This research work is dedicated to developing novel and energy efficient process with the help of mixed matrix membrane for the capture of CO2. Additionally, the separation properties of these membranes will be enhanced by integrating ionic liquid-like 1-Butyl-3-methylimidazolium tetrafluoroborate and benzimidazole acetate. Characterization technique used are scanning electron microscopy (SEM), Fourier transforms infrared spectroscopy (FTIR) thermogravimetric analysis (TGA) and Density Functional Theory (DFT) to study the interaction between the ionic liquid and mixed matrix membrane. These membranes presented impressive permeability and selectivity results.

Paper ID# 114

Energy Economized Oleic Acid Esterification Accelerated by Microbubbles Technology

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Long term energy and environmental sustainability have focused the world attention on producing biofuels from renewable sources. Biodiesel shows a promising alternative for petroleum diesel, which can be produced from vegetable oils, animal fats, waste cooking oils, and greases. The cost of biodiesel depends upon the quality of feed and selected process. The major technology to decrease free fatty acids (FFA) content and produce biodiesel is esterification of FFA contents using acid catalysis and transesterification of triglycerides of vegetable oil using alkaline catalysis. The conventional methods are energy intensive and require longer period of time to achieve required conversion due to mass transfer limitations-primarily because of insolubility of FFAs in alcohols and making a distinct phase. In this article, we have investigated use of micro bubble mediated mass transfer for esterification of oleic acid. The sintered borosilicate diffuser was used to produce micro bubbles having a high ratio of surface to volume, larger interfacial area and high surface energy which reduces the mass transfer limitations and hence increased conversion in short time. The methanol vapors were reacted with the Oleic acid in the presence of acid catalyst and unreacted methanol is vaporized simultaneously. The FAME is characterized by acid value, HPLC, and GC-FID. The initial data predicts higher conversion in shorter period of time and possibly revolutionizing the equilibrium reaction to a non-equilibrium reaction.

Paper ID# 115

Development of Advance Oxidation Process by using Micro-reactor for wastewater treatment

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Availability of clean water is decreasing due to increase in demand of water as there is an increase in global population and economic development. Wastewater discharge into environment without adequate treatment is increasing and cause of water borne diseases. Globally, fresh water withdrawal at a rate of 3,928 km^3 per year. 44% of this water is used and remaining 56% water is released to environment as wastewater in form of industrial discharge, municipal and agricultural drainage water. 1.8 billion People use drinking water that is contaminated with faeces and cause of typhoid, cholera, polio and dysentery. Conventional treatment like chlorination produce toxin byproducts like Trihalomethanes (THM) which have carcinogenic effect for human and environment. There is a need of advance treatment method, which is efficient and environmental friendly for pollutant removal from waste water. Plasma method effectively combine UV radiations and highly active species like atomic oxygen O, hydroxyl radical OH, hydrogen peroxide, and ozone are generated, which are able to oxidize organic pollutants and consider as an alternative method for wastewater treatment. There is a need of developing economical plasma micro-reactor capable of producing and dozing ozone and other oxidative species directly into wastewater.

Paper ID# 116

Improvement of Waste Water Treatment Efficiency Using Electrical Discharge Plasma Ozonation

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Earth, a water planet, has been assaulted by water related issues at a regularly expanding rate since the beginning of modern upheaval. Pakistan, once a water surplus country, is likewise confronting extreme water shortage now. At present, availability of water in Pakistan is 1000 m3/capita threshold value for scarcity of water. In Pakistan, only less than 20% of the water available is safe for drinking. The large amounts of contamination in water cause certain waterborne diseases. Despite the fact that, the facility of wastewater treatment exists in large urban communities, yet just 50% of the wastewater is collected and out of this only 10% is treated. Textile is the largest industrial sector in Pakistan. The textile operation involves a variety of pollutants such as total suspended solids (TSS), total dissolved solid (TDS), chemical oxygen demand (COD), biological oxygen demand (BOD), organic chemicals, acidity, heavy metal ions, color and many other. Wastewater from industries is treated in several stages- primary, secondary and tertiary. The paper is based on improving the efficiency of waste water treatment process by improving the mass transfer of aeration process and developing plasma micro reactor capable of producing the dosing ozone in situ in waste water for disinfection. Both aeration and generation of ozone is energy intensive process. Oscillatory flow produces micro-bubbles which consequently improve mass transfer efficiency and hence overall efficiency of the process. The studies show that tertiary treatment of wastewater is improved using micro-plasma reactor to generate ozone.

Paper ID# 117

Bio-MOF-11 Based Mixed Matrix Membranes for Gas Separation

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Metal-organic frameworks (MOFs) is the new class of materials which have attained substantial interest of researchers. MOFs inherently have outstanding properties including high surface area, tunable porosity and high thermal and chemical stabilities. MOFs are extensively employed in a variety of applications such as gas separation, storage media for gases, adsorbents, catalysis, sensing, drug delivery, thin film devices, clean energy, luminescence and magnetism. In present work, Bio-MOF-11 based MMMs were prepared using PSf as a polymer. Bio-MOF-11 was synthesized via solvothermal reaction of adenine and cobalt acetate. The as-synthesized MOF was embedded in PSf for membrane fabrication. Bio-MOF-11 has inherently nitrogen based cavities for CO2 adsorption over CH4 and N2. Influence of these active sites (nitrogen rings) in MOF on performance of membranes was studied in this work. The results revealed premier selectivity, privileged CO2 uptake, elevated physicochemical stability and superior heat of adsorption due to strong interactions towards CO2.

Paper ID# 118

Catalytic degradation of Low Density Polyethylene into a plastic derived fuel oil using CaC2 as a catalyst in a lab scale coal furnace

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The main aim of this research was to obtain catalytically derived oil in a lab scale furnace through degradation of used plastic, low density polyethylene (LDPE), in the presence of a catalyst, Calcium Carbide (CaC2). The process comprised of heating LDPE at high temperatures ranging 400 - 600°C in the presence of a catalyst and recovering the liquid product, i.e. catalytically derived oil. A small prototype furnace was designed and fabricated in the lab to carry out the experimental work. Influence of parameters such as temperature, catalyst to feed ratio, sample size and reaction time were studied for the optimal recovery of the desired product. Coal briquettes were used in the furnace as source of energy to achieve required temperature during the experiments. It was found that a maximum recovery of 67 % by weight of the catalytically derived oil was possible when small samples of LDPE were heated for 30 minutes at a temperature of 450°C with the catalyst to feed ratio of 0.25. The catalytically derived oil was also characterized by physical and chemical tests. Different physical tests were carried out according to IP and ASTM standards. Density, specific gravity, API gravity, viscosity, kinematic viscosity, flash point, freezing point and Net calorific value were calculated and compared with standard fuels. The results showed that fractions from distillation column were in the range of gasoline, kerosene and diesel oil. ASTM fractional distillation analysis of the derived oil showed that 20% fraction was in the range of kerosene and diesel (C11-C18), 30% in the range of fuel oil (C18-C27) and 36% in the range of greases and waxes (C25-C30).

Paper ID# 119

Desiccant Based Evaporative Air Conditioning System (Aab-O-Hawa)

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A conventional vapor compression air-conditioning system has a sensible heat ratio 0.75 which means that 75% capacity of the system is used to control the sensible load and the remaining 25% for the latent load. The conditions where latent load is dominant these two processes i.e. overcooling and then reheating again will increase the consumption of electrical energy and emission of refrigerants remarkably, depleting the ozone layer but also directly contributing in the global warming when released in the atmosphere. Desiccant Based Evaporative Cooling system has the potential to be a very reasonable alternative to conventional system. It has the potential to deal with the sensible and latent load both but is also environmental friendly as it involved the use of only desiccant material and not any sort of refrigerant. Air can be conditioned in a cleaner and affordable method using a Desiccant Based Evaporative Cooling system. The objective of this work is to design and develop a solid desiccant based evaporative cooler to control both sensible and latent load in hot and humid environment. The system was developed and evaluated for the climate of Karachi, Pakistan and solved on TRNSYS® software. The results evaluated on the TRNSYS software have been compared with the literature review and with the results obtained from the simulator designed by NOVEL Aire. It is found that lower temperature of the conditioned space is achieved on recirculation mode of the cycle as compared to the ventilation mode.

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