**Saturday, October 22, 2016 2:00PM – 5:00PM**

**Session D; Sustainability, Emerald Hall A**

**Session Chair: Abdul Rasheed Kausar, University of Management and Technology**

**2:00PM D.01 Muhammad Abubaker, Hafiz Muhammad Ali, Muhammad Nabeel Ehtisham, Muhammad Farrukh Rafique, Sehar Aziz, Zill-e-Huma, Abdul Rehman, Zahiruddin Shaikh, Tehmina Ambreen, Muhammad Sufyan Abbas, Muhammad Asif Rasheed Malik, COMSATS Institute of Information and Technology Sahiwal, Pakistan, *Investigation of Retention Angle on Integral-Fin and Pin-Fin Tubes Using Water-Ethanol Mixture* -**In this study, the effect of water-ethanol concentration was carried out on 5 pin-fin and an equivalent integral-fin tube (having same root diameter, fin height, fin thickness and fin spacing). The only geometric parameter varied was circumferential pin spacing in case of pin-fin tubes. Static condensation was performed to measure the retention angle (an angle measured from the top of the tube to the fully flooded flank). Ethanol concentration was varied from 0.5% to 1.5% with the increment of 0.25% in order to find the optimum concentration. Results show that the effect of ethanol concentration was almost negligible on pin-fin tubes. A maximum of only 3˚change in retention angle was observed for pin-fin tube with circumferential pin spacing of 0.75mm. While for Integral-fin tube C-2, significant change in retention angle was measured. The optimum ethanol concentration was observed to be 0.75% and maximum change in retention angle was about 60˚. This study opens an era for integral-fin tubes when dealing with water-ethanol mixtures.

**2:12PM D.02 Fatima Fasih, U of Toronto, Cananda, *The impediments of integrating solar energy technologies through residential buildings* -** Being the fastest growing megacity of the world, Karachi faces severe shortages in supply of electricity, which is provided via conventional fuels, such as oil and coal. This has led to several power outages in the city, causing thousands to die due to heat-related illnesses in the summer of 2015. To solve the energy crisis in Pakistan, but mainly the urban centre of Karachi, renewable energy technologies can be added to the energy mix to meet the shortfall in supply. This paper identified and evaluated those factors to understand what needs to work for Karachi’s energy independence. Solar energy technology, in specific, have shown significant impact in majority of the developing world and with a mix of the appropriate circumstances, it could work at a micro level in Karachi. Solar energy radiation in Karachi is fairly high throughout the year. Market potential is high because of the demand created by a growing middle class population and PV panels made locally and imported from China. The federal government realises the potential in the industry and has placed policies that promote the business and allow people to get access to this technology. The servicing sector is also competent to support this new industry. However, the consumer financing opportunities are low, causing higher interest rates and shorter terms, which are not affordable for majority of Karachi’s population. The existing land management issues in Karachi also prevent building owners of low cost housing units to make their residents accessible to this technology in times of power outages. The solution to Karachi’s energy crisis cannot be a single one, rather a combined meshwork of all these factors that need to support one another.

**2:24PM D.03 Saima Gulzar, U of Management and Technology Lahore, Pakistan, *Energy Efficient Techniques for Environmental Sustainability in Buildings* –** Energy crisis in one of the major environmental challenges (global climate change, excessive fossil fuel dependency etc.) in the present scenario, faced by the developing countries especially Pakistan. The incremental trend of energy consumption is also responsible for the degradation of the environment with the pollutants emission in addition to the depletion of non-renewable resources. Globally building sector accounts for around one third of energy use and is responsible for over half of total greenhouse gas emissions. The drastic rise in energy demands for the building sector further enhanced the issue with reference to Pakistan. This study is focused on the energy efficient solutions for the building sector to regulate the energy consumption for environmentally sustainable buildings.

**2:36PM D.04 Soniya Munir, Iffat Batool, Anam Khalid, Sajid Rashid Ahmad, Areej Tahir, Sana Batool, U of the Punjab Lahore, *Effectiveness of Different Binders on RDF Potential from Agro Waste* -**The energy crisis of Pakistan has led to devise new ways for producing an alternative source of energy and provides opportunity to industrialists for making cheap energy source. Wheat straw is a seasonal agricultural waste which was utilized in this research work for making its RDF briquettes. For this purpose three different particle sizes of wheat straw (10-5mm, 5-2mm and less than 2mm) were taken along with banana peels and wheat bran as binders. Their proximate analysis and energy content was tested according to ASTM standard methods. This illustrated that wheat straw had moisture content 8-12 %wt, volatile matter 70-73%, ash content 5-7% and fixed carbon 11-12%. Among the binders banana peel had least ash content of 1.28% and fixed carbon as 0.32%, compared to wheat bran ash content i.e. 3.52% and fixed carbon be 10.56%. The energy content (tested in bomb calorimeter) of wheat straw of size less than 2mm was highest i.e. 19.91 MJ/kg among other sizes of straw because smaller the size greater will be the surface area for effective burning. So, when this size was combined with both binders separately, the results gave high variation relative to others. The wheat straw of 5-2mm particle size gave the highest peak of calorific value of 42.40 MJ/Kg mixed with wheat bran. In the last step these samples were shaped to briquettes to enhance their efficiency for usage. These briquettes will have therefore a great potential to be used for energy production sector.

**2:48PM D.05 Muhammad Shoaib, Mujahid Ali, Faisal ur Rahman Awan, Ghazanfer Raza Abbasi, Waseem Ahmed Langah, Dawood U of Engineering & Technology Karachi, Pakistan, *Induced Seismicity due to Hydraulic Fracturing in Shale Gas Wells*** - Permeable fractures and faults in shale gas reservoirs are mostly critically stressed. With the application of high fluid pressure during hydraulic fracturing, critically stressed faults and fractures are activated which increase the reservoir permeability around the induced fractures. Along with that, induced seismicity (or minor earthquakes) having low magnitude are generated due to activation of critically stressed faults and natural fractures. Shale gas has totally changed the energy outlook of United States and shale gas production has been increased significantly in the last decade. At the same time, multi-stage hydraulic fracturing has become a common practice in shale gas wells. Hydraulic fracturing has increased the number of earthquakes in United States significantly in recent years along with other environmental issues. With the depletion of conventional hydrocarbon resources in Pakistan, energy outlook of country demands exploitation of shale gas reservoirs. Pakistan has large amount of technically recoverable shale gas reserves but the question arises, whether shale gas can provide affordable, accessible and secure energy while protecting our planet? This paper will discuss different case studies from United States to recommend optimum strategy for sustainable development of shale gas reservoirs in Pakistan with minimal impact due to induced seismicity.

**3:00PM D.06 Adnan Jalil, Muhammad Shoaib, U of Management and Technology Lahore, Pakistan, *Sustainable Technology for Energy Efficient Architecture* –** The current pace of urbanization places a huge strain on world resources. Architects today not only need to satisfy function and stability but also sustainability without leaving a huge carbon footprint on the planet. The study shows that greening the building envelope with vertical greening systems such as climbing plants or living wall systems provides ecological and environmental benefits. Vertical greening can provide a cooling potential on the building surface, which is very important during summer periods in hot climates. The cooling effect of green facades has also an impact on the inner climate in the building by preventing warming up the faÃ§ade leading to a reduction the energy consumption and energy cost by conditioned buildings. Pakistan is already facing energy crisis and there is a need of energy efficient building to minimize its impact. This paper is focused on the analysis of the effect of green facades systems on the building temperature and addressing different types of green facades systems and their thermal effect.

**3:12PM D.07 Sana Malik, Faiqa Khilat, Kamal Arifin, U of Management and Technology Lahore, *NCIA-AMB Masuk Kampong Project- Opportunities and Challenges for achieving Sustainable Development*** – Malaysian government is focused to accomplish world-class living standard of whole nation by year 2025 through sustainable development irrespective of regional, religious and ethnic boundaries. The Northern Corridor Implementation Authority (NCIA) is a legal organization for implementation of this vision. It is responsible for elevating the income levels through agriculture, manufacturing, logistics, education and tourism. The objective of NCIA is to ensure the economic growth through upgrading the rural settlements of Koridor Utara (Northern Economic corridor Region). Koridor Utara connects Perlis, Kedah, Penang and northern region of Perak. Masuk Kampong Project at Pantai Murni, Yan Kedah is one of the NCIA initiatives in collaboration with AMB (Akademi Binaan Malaysia). The execution of this project has involved many opportunities as well as challenges associated with rural development. The paper draws out a framework through interviewing of Kampong folks (villagers) by listing out their concerns. The concerns will help in shaping the policy agenda for future projects of same nature in Malaysia. The findings of the research will be of significance to policy makers, stakeholders, academicians and civil society. This will act as a contribution to understanding of various dimensions of sustainable development of rural areas on a global channel.

**3:24PM D.08 Syed Muhammad Ali Rizvi, Muhammad Baqir, Murtaza Hussain, Asif Ali, Tauqeer Ali, Dawood U of Engineering & Technology Karachi, Pakistan, *Minimizing Environmental Impacts by Implementing ISO 14000 In Petroleum & Gas Industry of Pakistan*** - Oil & gas industry have made robust roots all around the globe. It is widely spread in every region. The experts are trying to develop firm strategies for onshore as well as offshore. A huge investment have been made in order to explore potential oil & gas reserves. However, the exploitation of non-renewable energy have made possible hazardous activities on a large scale which is effecting environment formidably (i.e. oil spills, damaged land, accidents and fires, and incidents of air and water pollution are enhancing exponentially which needs to be reduced). To avoid such type of adverse effects the international standardization organization (ISO), provide a standard environmental management system (EMS). This management system is adopted by 14000 companies throughout the world .Owing to this, the petroleum industry of Pakistan also to follow the standards to avoid these incidents and to perform activities in a cost effective manner. This paper comprises of two sections; first section consists of introduction to ISO 14000, its principles and the implementation methodology. In the next section, implementation of ISO14000 principles in the petroleum industry of Pakistan is discussed along with the proper environmental management system by elaborating the process involved in the petroleum industry, analyzing the impacts of the activities on the environment, implementing the international and national regulatory frameworks, evaluating the key elements of health safety environment management system (HSE-MS) model. As such, implementation and certification of an organization EMS can be achieved without much difficulty with a proper knowledge of the environmental issues, a committed management team, and a proper interpretation of the standard. In future, it will hopefully result in cost saving, enhanced prestige for the organization and a better environment for the country.

**3:36PM D.09 Muhammad Baqir, Syed Muhammad Ali Rizvi, Murtaza Hussain, Asif Ali Turi, Tauqeer Ali, Dawood U of Engineering & Technology Karachi, Pakistan, *Minimizing Environmental Risks of Hydraulic Fracturing*** - The primary task of Petroleum Engineer is to maximize the ultimate recovery and net present value (NPV) of hydrocarbon. Hydraulic fracturing is a popular mean to restore the natural flowing capability of unconventional reservoir with keeping economic values in view. This technique is being used over worldwide, mostly in shale reservoir for the reason that these kind of rock possesses the space to store fluid but don’t have ability to flow through it. After acquiring detailed information about reservoir characteristics, a job is planned with intelligent approach in which million gallons of water, sand and different chemicals are used which assist to produce oil and natural gas to the surface. Moreover, proppants (usually, sand silica & glass beads) are also used to keep the fractures open. The injection fluid pressure must be greater than fracture pressure so that the rock can apart & its ability to flow the fluid enhances. Many environmental risks are also associated with Hydraulic fracturing such as contamination of ground water, surface water contamination, noise pollution, air pollution, blowout due to gas expansion, spill of waste water, chemicals on the surface and can cause a high intensity earthquake which is creating a question mark over its usage. However, knowing its importance as a prudent measure must be taken in order to make it trustworthy. This paper consists of different solutions to reduce the environmental risks of Hydraulic fracturing. These risks can be minimized by proper testing and monitoring oil and natural gas well during drilling and completion. Scientific knowledge should be implemented in a pave way which ultimately shortens the environmental risks. Following hazards can also be lessened by using scientific techniques likewise, recycle the waste water. Hydraulic fracturing can be made environmentally friendly by using less toxic chemical additives. Most methane emissions occur during well completion after fracking when the frack fluid, a combination of water, sand, hydrocarbon liquids and natural gas, flow back to the surface. In this regard, green completion can be replaced, which makes this technique most reliable.

**3:48PM D.10 Memoona Rashid, Yususf Awan, Ayesha Malik, Saima Gulzar, University of Management and Technology Lahore, Pakistan, *Reduction in energy consumption in Building sector through Efficient use of glazing*** - In the last few decades, the language of Architecture, all over the world has focused on transparency in buildings rather than comfort, resulting in fully glazed building envelopes. This trend is accompanied with the excessive use of energy in building sector especially commercial buildings. The major reason for this accelerated energy demand is the inefficient and excessive use of glazing in building envelopes in commercial buildings all over the world. This paper reviews the energy consumptions both in historical context as well as in the modern world to understand the present energy crisis. In the last few years, researches have been carried out to tackle the energy scenario globally and to establish the energy conservation strategies. The only option is Energy Efficient Architecture with reference to Pakistan in the current energy crisis. The conclusions are drawn to propose the policies for the effective use of glazing in commercial industry with reference to local climate that will result into reduction of energy demands and the application of energy effective strategies. Keywords: Energy demand, Glazing, Commercial buildings.

**4:00PM D.11 Muhammad Farooq, John M Andresen, Heriot-Watt University Edinburgh UK, *In-situ Regenerative Activated Carbon for Low-cost CO2 Removal for Sustainable Energy Development*** – An alternative type of a renewable, carbon-less fuel is bio-gas produced by anaerobic digestion of organic matters and has the current potential to replace up to 50% of the UK’s natural gas need. There is an increasing demand for production of bio-methane, to be used as vehicle fuel or injected to the natural gas grid as sustainable energy applications. Since a typical biogas contains 50-65% methane, 30-45% carbon dioxide and traces of other elements, the removal of carbon di-oxide is required for biogas upgrading for the sustainable energy development. A number of methods exist for the removal of carbon dioxide, including water scrubbing, membrane separation, chemical absorption, cryogenic separation and physical adsorption. Among these, adsorption by activated carbons is considered as an efficient and economical approach. The uniqueness of the activated carbon as adsorbents is due to high surface area, developed pore volume and surface properties. The current industry practice is to adsorb gases by using activated carbon which is subsequently disposed as hazard waste. The present research is focused on in-situ regeneration of activated carbon using electric potential for the production of low cost bio-methane. An activated carbon rig has been designed and installed. Standard carbon di-oxide and nitrogen with 10,000 ppm hydrogen sulfide gas mixture passed through the rig and bench-marked against the industry standard achieved carbon. Different samples of activated carbon were tested for the adsorption and desorption analysis where absorption / desorption cycles and regeneration efficiency for activated carbons has been determined. It is envisioned that this method can transform the production of bio-methane. Since the replacement of activated carbon can be up to 20% of the OPEX of a bio-gas to bio-methane plant. The results obtained from the current research could be utilized as a guide for the further design and operation of the sustainable energy development.

**4:12PM D.12 Fariha Tariq, U of Management and Technology Lahore, Pakistan, *City Of Gardens Now A City Of Dust And Concrete*** – The environmental impacts associated with large scale constructions often have significant negative impacts on the environment. Cities around the globe function better when they have a refined public transportation system. Unfortunately, while developing Asian megacities, governments have failed to develop sustainable transportation system and the cities suffer from serious environmental hazards in the midst of urban growth. The absence of efficient policies regarding public transport is notable cause for such prompt escalation of diverse problems like increase in number of personal automobile, which further causes congestion on the road resulting in air pollution, noise pollution which ultimately effect the human’s health. Therefore, Pakistan, as a developing country, has a major crisis on its hands. Urban transport problems in Pakistan are mostly managed by building larger and better roads, but building roads is not the solution. Road projects need to be part of an over-all transportation plan that includes traffic management and bigger and better transit systems and public transport. To solve the traffic problems of metropolitan city of Lahore, the projects like Azadi Square, Kalma Intersection, Orange line train and Metro Bus have been undertaken. Such projects aim at reducing automobile dependency, to limit land waste, to address sustainability of transport system and to make the places healthy where people live and work more urban. But in reality, the city environment is a lot disturbed because of these projects. Noise pollution, air pollution and water pollution are happening since no precautionary measures are being taken to minimize the cause and conformity of the measures that were required to be taken during the course of the projects remain unchecked. There is a lot of nuisance occurring because of them and there are no proper measures to reduce them or minimize the environmental harms being caused by them. This paper will highlight the hazardous impacts of construction of mega transportation projects on the environment of Lahore. Review of EIA and other reports upon these projects is carried out which shows that these mega projects usually do not follow the Environmental impact requirements and standards.

**4:24PM D.13 Saeed Ahmad Qaisrani, Asghar Ali, Farhad Jamil, COMSATS Institute of Information Technology Vehari, *Sustainable energy saving techniques through Polyurethane and insulating materials on civil works and indoor thermal gratification in Pakistan*** **–** About 50 to 70 % heating and cooling costs of the energy used in average Pakistani homes every year (GoP-2015). To help and reduce these costs, enhancing better quality of life, maintaining even temperature, decrease noise pollution in homes and profitmaking properties, constructers turn to firm polyurethane, one of today’s most active insulation materials for roof and wall insulation. Proposed study was performed to check out the effect of polyurethane and insulating material used in new buildings for energy saving, cost effectiveness and enhancing the people’s better living standards in Pakistan. In this experiment, different types of insulating material along with their different combinations on walls, roof and windows was used according to their thickness. U-fact or and R-value was used to attain the energy conservation building code (ECBC) requirements. Automatic Guarded Hot Plate Apparatus was used for gauging the thermal conductivity of the different kinds of ingredients accessible in the business sector having different thicknesses. New Academic Block of Comsats Institute of Information Technology (CIIT) Vehari and other new constructed buildings in Vehari including Family courts building, Judicial Colony Vehari, University of education, Vehari Campus and University of Agriculture Faisalabad, Burewala Campus was selected to check out U-factor and R-value to fulfill ECBC requirements. Control treatment was burnt clay brick wall using reinforced cement concrete (RCC) roof with 50mm thick outside thermal insulation layer and others without any insulation layer. Day and night temperature was measured before and after treatments. Data was analyzed through suitable statistical software and 60-70% energy saving was found through polyurethane. It was recommended for sustainable energy use and enhancing better quality of nation. Keywords: Sustainable energy techniques, Polymers, Polyurethane, Economics of energy, Environment & energy, Civil Engineering, Insulating materials.

**4:36PM D.14 Gul Zareen Ghafoor, Amin U Khan, Faiza Sharif, Government College U Lahore, Pakistan, *Relationship Between Energy Consumption And Carbon Dioxide Emissions In Residential Sector Of Lahore City, Pakistan* -** The natural and anthropogenic alterations in earth’s system, associated with carbon footprint, are responsible for gradual rise in global temperature. A questionnaire based survey was conducted on a sample of 300 residential buildings of city Lahore, Pakistan to calculate their carbon footprint from electricity and natural gas consumption using IPCC methodology (2006 guidelines). It was found that cumulatively both kinds of residential energy resources released 7.65 MMtCO2e from surveyed buildings. Data extrapolation showed 18.64 GtCO2e/year emissions from all residential buildings of Lahore city which had potential to raise temperature by 0.07oC. Further it was found that income class (p &lt; 0.001), house floor area (p &lt; 0.001), size (tons) of air conditioner (p &lt; 0.001), number of kitchens (p &lt; 0.01), building type (p &lt; 0.001) and season (p &lt; 0.001) had significant positive and roof insulation (p &lt; 0.01) had significant negative relation with energy consumption. Considering these factors significant, a dire need of policy formulation was felt to address thermal characteristics of existing and new housing constructions along with raising awareness among dwellers on energy efficiency to reduce residential carbon footprint for the sake of this planet.

**4:48PM D.15 Nazia Iftakhar, Omer Shujat Bhatti, Allama Iqbal Open University Islamabad, Pakistan, *Solar Housing as a case for Sustainable Energy Technology in Built Environment in Pakistan* –** Third world countries has seen severe energy crisis in the previous century and it goes on. Lack of energy resources and poor management, are the major causes with inadequate and inappropriate strategies. Therefore, there is a need to involve in devising methods to generate and save energy required for the livelihood. Pakistan is amongst energy scarce countries with ample solar light available for energy harnessing. The housing sector in built environment is one of the largest energy consumers in the country. As a result, this sector is experiencing the opportunities towards exploration of solar energy to fulfilling the energy needs. The research aims to explore the possibility of solar energy harnessing towards proposing model for energy efficient housing design in the local context as a case towards future exploration for sustainable technologies in energy efficient housing solution. The study will explore the architecture, design techniques, existing case studies, local context and feasible housing orientation analysis providing solution to crisis of energy in the country. In conclusion the study would form the basis for energy efficient housing design model in the local context and define the major factors which make the solar energy harnessing in local context based on the results.