RECENT ADVANCES in ENERGY & ENVIRONMENT

Proceedings of the 4th IASME / WSEAS International Conference on ENERGY & ENVIRONMENT (EE'09)

Cambridge, UK, February 24-26, 2009

Energy and Environmental Engineering Series
A Series of Reference Books and Textbooks

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Preface

This year the 4th IASME / WSEAS International Conference on ENERGY & ENVIRONMENT (EE'09) was held in the University of Cambridge as in 2008. The Conference remains faithful to its original idea of providing a platform to discuss theoretical and applicative aspects of renewable energy sources, power generation, energy conversion and conservation, power system planning and management, environmental management, ecosystems etc. with participants from all over the world, both from academia and from industry.

Its success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

During this last year we witnessed the growth of the European Union interest in Energy and Environment. This is an additional proof that they are seen not only as an exciting research area but also as technologies that may solve current European citizens' concerns with several practical problems.

For a discipline which is central to research and also to industry and which generates interests not only among academicians but also among large companies and government departments and agencies, it is important to look at the market and at its movements.

A Conference such as this can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors

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Plenary Lecture 1

Utilization of Non-Fossil Fuel Energy Options to Mitigate Climate Change and Environmental Impact

P rofessor Marc A. Rosen
Founding Dean
Faculty of Engineering and Applied Science
University of Ontario Institute of Technology
Oshawa, Ontario, Canada
also: President-Elect, Engineering Institute of Canada

Abstract: Non-fossil fuel energy options can help humanity combat climate change and provide the opportunity for sustainable energy solutions. Non-fossil fuel energy options are diverse, ranging from renewables like solar, wind, geothermal, hydropower, biomass, ocean, tidal and wave energy, through to nuclear energy. The latter may not be a renewable resource, but it avoids greenhouse gas emissions and thus contributes to efforts to avoid climate change. Renewable energy resources are normally free of greenhouse gas emissions, although some like biomass can lead to such emissions if not managed carefully.

Non-fossil fuel energy options are not sufficient for avoiding climate change, in that they are not necessarily readily utilizable in their natural forms. Hydrogen energy systems are needed to facilitate the use of non-fossil fuels by allowing them to be converted to two main classes of energy carriers: hydrogen and select hydrogen-derived fuels and electricity. The former allow humanity to meet most of its chemical energy needs, while the latter can satisfy most non-chemical energy demands.

High efficiency is also needed to allow the greatest benefits to be attained from all energy options, including non-fossil fuel ones, in terms of climate change and other factors. Efficiency improvements efforts have many dimensions, including energy conservation, improved energy management, fuel substitution, better matching of energy carriers and energy demands, and more efficiency utilization of both energy quantity and quality. The latter two concepts are best considered via the use of exergy analysis, a thermodynamic tool based primarily on the second law of thermodynamics.

A case study is considered involving the production of hydrogen from non-fossil energy sources via thermochemical water decomposition. This process is mainly driven by thermal energy, and is anticipated to be usable for large-scale hydrogen production. In thermochemical hydrogen production, a series of complex chemical and other processes occur, with the net result being the splitting of water into hydrogen and oxygen. Most preliminary designs of thermochemical hydrogen production processes are based on nuclear energy and solar energy, thus providing different types of non-fossil fuel options for combating climate change.

Brief Biography of the Speaker: Dr. Marc A. Rosen is a Professor of Mechanical Engineering at the University of Ontario Institute of Technology in Oshawa, Canada, where he served as founding Dean of the Faculty of Engineering and Applied Science from 2002 to 2008. Dr. Rosen became President of the Engineering Institute of Canada in 2008. He was President of the Canadian Society for Mechanical Engineering from 2002 to 2004, and is a registered Professional Engineer in Ontario.

Dr. Rosen has received numerous awards and honours, including an Award of Excellence in Research and Technology Development from the Ontario Ministry of Environment and Energy, the Engineering Institute of Canada's Smith Medal for achievement in the development of Canada, and the Canadian Society for Mechanical Engineering's Angus Medal for outstanding contributions to the management and practice of mechanical engineering. He is a Fellow of the Engineering Institute of Canada, the Canadian Academy of Engineering, the Canadian Society for Mechanical Engineering, the American Society of Mechanical Engineers and the International Energy Foundation.

With over 60 research grants and contracts and 500 technical publications, Dr. Rosen is an active teacher and researcher in thermodynamics, energy technology (including cogeneration, district energy, thermal storage and renewable energy), and the environmental impact of energy and industrial systems. Much of his research has been carried out for industry. Dr. Rosen has worked for such organizations as Imatra Power Company in Finland,

Argonne National Laboratory near Chicago, and the Institute for Hydrogen Systems near Toronto. He was also a professor in the Department of Mechanical, Aerospace and Industrial Engineering at Ryerson University in Toronto, Canada for 16 years. While there, Dr. Rosen served as department Chair and Director of the School of Aerospace Engineering.

Plenary Lecture 2

Assessment and Modeling of Embodied Energy in Electric Transportation Systems, a Battlefield of Environmental Education

P rofessor Cornelia Aida Bulucea
Electrical Machines and Environmental Engineering Department
Faculty of Electromechanical and Environmental Engineering
University of Craiova
ROMANIA
E-mail: abulucea@gmail.com

Abstract: Traditionally considered, the basic concepts of energy, exergy and embodied energy are founded in the field of physics, having however environmental, technical and economical significance as well, and could be explained, interpreted and applied in a more universal manner, due to their multidisciplinary traits. It means that in Science unclarified, unindexed and unassimilated worlds are unifying and harmonizing, without contradictory frontiers between microscopic and macroscopic phenomena. If we really want to avoid the concept of „on the edge of chaos" then a set of conditions for performance of sustainable technical systems must be formulated. Hence, this study aims to demonstrate, in terms of sustainability, the usefulness of the embodied energy and exergy concepts for analyzing systems which convert energy or matter, particularly, an electric transportation system in a dualist view, technical and environmental.
It is argued in the study the sustainability framework, which revealed tentative steps in „cradle to grave" embodied energy assessment of an electric train, from the manufacturing processes to the train operation regimes modeling. In particular, this study tries to provide a missing link in the analysis of electric transportation systems, a bond between Environment and Science that could be translated into the paradigm: only the win model of the self-organizing systems of Nature as solution for human technology applied will have survival value.
The understanding of the Universe Creation and Revival will be probably out of reach. We will never know actually when and how was exergy created and transformed into life-supporting light in our Sun. But whatever it was, we should take care of our gift-given home, the Earth. All humans who are considering that the Universe is, in a tragic way, transient and imperfect should think to the fragile and running moments of our happiness and try to accept the right of survival for the living Nature. Looking forward, the environmental education should lead to decisive changes in our lifestyle, if we really want the human society to be a true part of the living Nature. Otherwise, if Science will be not directed towards the right purposes of the humanity, sooner or later everything will be passed, and forgotten, and erased.

Brief Biography of the Speaker: Cornelia Aida Bulucea is currently an Associate Professor in Electrotechnics, Electrical Machines and Environment Electrical Equipments in the Faculty of Electromechanical and Environmental Engineering, University of Craiova, Romania. She is graduate from the Faculty of Electrical Engineering Craiova and she received the Ph.D degree from Bucharest Polytechnic Institute. In Publishing House she is author of four books in electrical engineering area. Research work is focused on improved solutions for electrical networks on basis of new electric equipments and environmental impact of energy and electric transportation systems. She has extensive experience in both experimental and theoretical research work, certified by over 50 journal and conference research papers and 13 research projects from industry. She has held in the Association for Environment Protection OLTENIA and she is a regular invited keynote lecture for environmental engineering symposia organized by Chamber of Commerce and Industry OLTENIA. Due to WSEAS recognition as huge scientific Forum she participated in five WSEAS International Conferences, presenting papers and chairing sessions. She was Plenary Lecturer in the WSEAS International Conference on POWER SYSTEMS, held by the University of Cantabria, Santander, Spain, September 23-25, 2008. She is very proud of her 10 papers published in the WSEAS Conferences Books and 3 papers published in WSEAS TRANSACTIONS ON ENVIRONMENT AND DEVELOPMENT, and in WSEAS TRANSACTIONS ON ADVANCES IN ENGINEERING EDUCATION.

Plenary Lecture 3

Energy Savings and Climate Change Mitigation Effect of the Fluid Transportation Energy Efficiency

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University POLITEHNICA Bucharest
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ROMANIA
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Abstract: The pumping systems energy efficiency improvement represents an important tool for energy savings and greenhouse gases (GHGs) emission mitigation. The paper presents some modern solutions for energy consumption minimization of the main types of pumps and pumping systems (energetic and thermal equipments, clear and waste water systems so.). Also, it is proposed an assessment and optimization method of the energy efficiency solutions, considering relevant and measurable economic and ecologic characteristics. The effects are compared with a references solution, based on an energy savings maximization function, with practical operation restrictions. The method highlights both the best rehabilitation solutions and operation optimization for existing installations and the optimal solutions for the new installations design.

Brief Biography of the Speaker: Mircea Grigoriu is assistant professor of Department of Energy and Environmental Engineering, University POLITEHNICA of Bucharest, Romania, where he is also the coordinator of the Hydraulic Machineries Laboratory and director of the Romanian Cleaner Production Center. His main research interests concern Pumping systems energy efficiency and the energy savings and environmental impact; Pumping systems design, operation, automatics, diagnostics and protection; Climate changes assessment; Management systems. In these fields, he authored or co-authored over 50 scientific papers published in reviewed journals or presented at international conferences. He was minister of Environment counselor, national focal point of the UNFCCC of Romania and now is listed in the Roster of experts of UNFCCC. He is technical counselor of important pumping equipments producers. He is a redactor at the Energetica Journal edited by the National Energy Producers Association (IEA), representing Eurelectric in Romania.

Plenary Lecture 4

SmartGrids and Distributed Generation for the European Electricity Network of the Future

Professor Francesco Muzi
Department of Electrical Engineering and Computer Science
University of L'Aquila, Italy
E-mail: muzi@ing.univaq.it

Abstract: The European electricity system has so far guaranteed the connection between producers and consumers of electrical energy with efficiency and reliability enabling at the same time the social and economical development of UE state members. The system evolution has allowed the management and connection of huge, centralized power plants usually located far away from the main consumer centers. Recent scenarios, however, have greatly changed the two needs of reducing atmospheric emissions and improving electrical energy efficiency in distribution and consumption. In future years electricity systems will have to be greatly modified in order to meet the demands of consumers/clients called to play a more and more active role in a liberalized electricity market. For this transformation to be reliable and economically sustainable, a radical change is required in the planning, management and development of the electrical system as established by the European Commission on the UE SmartGrids technology platform, which can collect contributions from industry, transmission and distribution utilities, research bodies, universities and regulators. The issue is, of course, of great national and international interest, since such innovative developments of the electricity system will place heavy burdens on UE human and financial resources at various levels during the next two decades. This very ambitious program outlines both the goals and the paths to follow in a well-consolidated, experienced context. The scheduled development will require very high-level technological competence, as well as interdisciplinarity and innovation spirit in order to face the challenges coming from a rapidly evolving world. As a matter of fact, the need to reform the UE electricity system meets the growing demand for electric energy, the rise of a liberalized global electricity market and the challenge to integrate more sustainable generation resources, including renewable alternatives. The new distribution grids, which are active for the presence of distributed generation and where customers are consumers and producers at the same time, require the development of new, important technologies and can certainly offer promising opportunities for the countries willing to face the challenge.

Brief Biography of the Speaker: Francesco Muzi is a professor of Power Systems at the University of L'Aquila, Italy, where he has also the scientific responsibility for the Power System Group. His main research interests concern Power systems transients and dynamics, Reliability and power quality in distribution systems, Power systems diagnostics and protection. In these fields, he authored or co-authored over 100 scientific papers published in reviewed journals or presented at international conferences. He received mentions in books edited by John Wiley & Sons, New York and participated to the outline of the "IEEE Guide for improving the lightning performance of electric lines", IEEE Standards Department, New York. He has also a patent for an industrial invention, namely "Power system controlled by a microprocessor". He is a regional chairman of the Italian National Lighting Society and was a chairman or keynote lecturer in a number of international conferences organized by different prestigious societies. He is a technical reviewer for the following international journals: IEEE Transactions on Power Delivery, Electric Power Systems Research by Elsevier Science, IET Generation, Transmission & Distribution.

Plenary Lecture 5

Indoor Air Quality Assessment

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Department of Environmental Physics and Meteorology
Faculty of Physics
National and Kapodistrian University of Athens
Building PHYS-5, University Campus, 157 84 Athens, Greece
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Abstract: During the last two decades there has been an increasing concern on the effects of indoor air quality on health, since people spend almost 90 percent of their time indoors (in homes, offices, public buildings, shopping malls, restaurants, vehicles etc.). Also recently there is an increase interest in indoor areas of hospitals, clinics, athletic halls and large public areas in urban areas where the mixture of pollutants, the relevant emissions and the outdoor pollution can affect the indoor air quality status. Furthermore, the closure of natural openings of buildings for energy saving purposes and the poor air exchange rates affect the indoor air quality. The indoor exposure of humans depends on a number of parameters such as the indoor sources and sinks, the outdoor concentrations, the ventilation rate and the specific characteristics of the indoor environment (surface to volume ratio, etc.).
In this invited talk a review regarding the quantitatively examination, theoretically and experimentally, of the relative contribution of the main mechanisms that control indoor air quality, will be given. Results from measurements conducted in apartments and offices in Athens, Greece, which aimed at the characterization of the air quality both indoors and outdoors, the estimation of the controlling parameters of transport, photochemical and deposition mechanisms using analytical and numerical methods and the evolution of pollutants' concentrations produced from smoking in a controlled indoor environment will be presented. Furthermore, experimental studies of indoor air quality in selected rooms of the Athens Traffic Control Tower (ATCT) buildings in Hellinicon (old) and Spata (new) international airport as well as in two large athletic halls, especially during events, with different type of ventilation will be given. Also the indoor air quality assessment in three different clinics of the Athens University School of Dentistry, in order to identify possible sources and specific dental activities associated with pollution levels, will be presented. Finally results of the application of a CFD model and the arithmetical Multi chamber Indoor Air Quality (MIAQ) model in order to investigate the airflow and temperature fields, the dispersion of gaseous pollutants and the estimation of the relative contribution of the indoor sources and relevant mechanisms to the indoor air quality, will be given also.

Brief Biography of the Speaker:
Studies First Degree: BSc, University of Athens, Faculty of Physics, 1972
Post Graduate Titles: MSc in Electronics, University of Athens, 1975
MSc in Automation, University of Athens, 1976
PhD in Physics, University of Athens, 1981
Academic Positions:
Head of the Dept. of Applied Physics, Faculty of Physics, University of Athens.
Assoc. Professor, Dept. of Applied Physics, Faculty of Physics, University of Athens.
Fields of Scientific activities:
- Atmospheric Physics
- Development of instrumentation for remote and in-situ measurements
- Air Pollution meteorology
- Indoor and Outdoor Air Pollution

He has 92 publications in journals, 167 announcements in conference proceeding, 86 participations in technical reports and 20 other publications. He has participated in the EEA on air quality (ETC/AQ) during 1996-2001 and in 89 research projects, in 37 of the above he acted as the Principal Investigator.

Plenary Lecture 6

Influence of Gasoline-Methanol Mixtures in a Two-Stroke Engine

Professor Charalampos Arapatsakos
Department of Production and Management Engineering
Democritus University of Thrace, Xanthi
Greece
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Abstract: One of the alternative fuels that are used is methanol. Methanol (CH3OH) is an alcohol that is produced from natural gas, biomass, coal and also municipal solid wastes and sewage. It is quite corrosive and poisonous and has lower volatility compared to gasoline, which means that is not instantly flammable. Usually methanol is used as a gasoline-blending compound, but it can be used directly as an automobile fuel with some modifications of the automobile engine.
This paper refers to the use of gasoline-methanol mixtures in a two-stroke small engine. The mixtures that were used are: gasoline, gasoline-10%methanol 20%methanol, gasoline-30%methanol, without any regulation of the engine relatively to the air/fuel ratio, maintaining the original adjustment that concerned gasoline was maintained. An important reduction of emission(CO, HC) was noted while the percentage of the methanol was increased. During the tests the fuel consumption was recorded for every mixture separately. It was observed a small increase of consumption when the percentage of methanol in the fuel was increased.

Brief Biography of the Speaker:
Born in: Athens, Greece
Citizenship: Greek
Titles:
-Mechanical Engineer, Ph.D. (Democitus University of Thrace-Greece), Assoc. Professor on University of Thrace-Greece
Present Responsibilities:
-Member of Technical Chamber of Greece
-Member of Electrical and Mechanical Engineering Association
-Member of Combustion Institute of Greece
Participations:
I took part in many research programs, which referred to biofuels, gas emissions, antipollution technology.
Research domains:
Biofuels and their use in internal combustion engines, power variation from the use of biofuels, gas emissions and mechanical damages.

Plenary Lecture 7

Dimethyl Ether (DME): A Clean Fuel of the 21st Century and Catalysts for It

Assistant Professor Kaoru Takeishi
Department of Materials Science and Chemical Engineering,
Faculty of Engineering
Shizuoka University
Japan
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Abstract: Dimethyl ether (DME) is the smallest ether, and its chemical formula is CH3OCH3. DME usually exists as gas, but it is easy to liquefy by cooling at -25oC at atmospheric pressure and by pressurizing under 5 atm at room temperature. Therefore, DME is easy to handle like liquefied petroleum gas (LPG). DME will be used as fuel of substitute of LPG. In China, DME is mixed into LPG and used as a domestic fuel. Cetane number of DME is 55-60, so DME will be used as a diesel fuel. In Japan, China, Sweden and so on, DME buses and trucks are testing on public roads. DME does not contain poisonous substances, and it burns with no particulate matters (PM), no sulphur oxides (SOx), and less nitrogen oxides (NOx). Therefore, DME is expected as a clean fuel of the 21st century. DME is able to replace light oil and LPG, and its physical properties are similar to those of LPG. It is possible that DME infrastructures will be settled more rapidly than hydrogen, because existing LPG infrastructures can be used for DME.

On the other hand, it is expected that fuel cell is one of the methods to restrain the global green effect. Steam reforming of methane, LPG, gasoline, and methanol is actively researched and developed as hydrogen supply methods for the fuel cells. Methanol steam reforming is easy to perform at around 250-300oC. However, the toxicity of methanol is high, and its infrastructure is not well developed. The infrastructures for natural gas, LPG, and gasoline are well established, but those steam reforming are difficult even at high temperatures around 800oC, and they contain sulphur resulting in catalyst poisoning. DME is expected as excellent hydrogen carrier and hydrogen storage, because DME will be easy to reform into hydrogen if there will be excellent catalysts of DME steam reforming. Therefore, I have been studying on DME steam reforming for hydrogen production, and researching on catalysts for DME steam reforming and DME synthesis.

The results of steam reforming of DME over several catalysts suggested the following facts: H2 production with steam reforming of DME consists of two steps. The first step is hydrolysis of DME into methanol. The second step is steam reforming of methanol that produces H2 and CO2. The rate determining step is hydrolysis of DME into methanol. The copper alumina catalysts prepared by the sol-gel method are excellent for H2 production by steam reforming of DME. The reason is that gamma-Al2O3 for the hydrolysis and Cu for methanol-steam reforming are co-existing closely on the catalyst surface. The consecutive reactions smoothly occur. Addition of Zn, Mn, or Fe into Cu(30wt.%)/Al2O3 activates steam reforming of DME. The Cu-Zn(29-1wt.%)/Al2O3 catalyst shows the excellent activity of DME steam reforming; the DME conversion is 95%, H2 yield is 95%, and CO concentration was 0.8 mol.%. I have developed a new catalyst for H2 production from DME, and the catalyst give us a great potential for H2 supply from DME. Also I have developed catalysts for direct DME synthesis from syngas (mixture of hydrogen and carbon monoxide). The catalysts are prepared by the sol-gel method, and the surface of the catalysts is optimum for direct DME synthesis. Copper sites for methanol synthesis from syngas, gamma-Al2O3 sites for dehydration of methanol into DME, and copper sites for water-gas shift reaction from H2O & CO into H2 & CO2, are co-existing closely on the catalyst surface. The consecutive reactions (methanol synthesis, methanol dehydration, and water-gas shift reaction) smoothly occur, and DME is produced fast. Therefore, these catalysts will be very effective for new energy system of DME and hydrogen.

Brief Biography of the Speaker:
Oct 1994 – Present: Assistant Professor, Faculty of Engineering, Shizuoka University
Mar. 2005: Doctor of Engineering, Tokyo Institute of Technology
Apr. 1989 – Sep. 1994: Assistant Professor, Junior College of Engineering, Shizuoka University
Apr. 1987 – Mar. 1989: Researcher, Gotemba R&D Laboratory, Dow Chemical Japan

Apr. 1985 – Mar. 1987: Master Course of Electronic Chemistry, Tokyo Institute of Technology (Master of Science)
Apr. 1981 – Mar. 1985: Undergraduate Course of Chemistry, Science University of Tokyo (Bachelor of Science)
My main research field is catalysis chemistry. Now, I have specially been working for catalyst development for new fuels such as dimethyl ether (DME) and hydrogen.

Plenary Lecture 8

Cooling Water and the Environment

Professor T. Reg. Bott
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Abstract: In the Industrial Revolution particularly in respect of the invention of the steam engine used to drive machinery, the use of heat energy derived from the combustion of fossil fuels was greatly intensified. Combustion technology was later adapted for the production of electricity through the use of steam turbines. In order to maximise the conversion of the pressure energy in the steam into electricity water-cooled condensers were incorporated into the power plant design, to maximise the pressure drop across the turbines, Large quantities of water were required to remove the latent heat in the steam. In order to satisfy this demand water was, and still is taken from natural resources such as lakes, rivers and the sea depending on the location of the power plant. The choice of location may often be dictated by the availability of large quantities of water. The water may be "once through" or recycled through cooling towers to reduce the cooling water temperature, although "make up" water will be required to replace evaporative losses and to maintain the quality of the circulating water. The use of this "natural" resource can have serious implications for the environment in a number of ways not least in combating the fouling problem in the condensers and associated equipment.
The conversion efficiency will depend at least in part. on the design and operation of the steam condensers. In addition during operation the heat transfer surfaces are likely to become fouled, thereby impeding heat removal that ultimately reduces the electrical energy obtained for a given quantity of fossil fuel. A deposit is also likely to present a rough surface to the water flow, with an attendant increase in pressure drop and hence a higher pumping energy requirement with the increase in greenhouse gas emission linked to that additional energy requirement.
The fouling can arise from a number of causes such as particulate deposition, salt precipitation, corrosion and particularly biofouling – the accumulation of micro-organisms originally contained in the water, principally bacteria although fungi and algae may be involved in some circumstances. Some species can initiate corrosion. It is probably true that the accumulation of living matter makes the largest contribution to inefficiency. There are a number of ways by which the problem can be overcome or its effects reduced. Amongst the methods available the most common way of combating biofouling is the use of chemical additives to act either as biocides to kill the micro - organisms or acting as surface - active agents to reduce their adhesion to the heat exchanger surface.
From the review of the use of cooling water taken from, and returned to, a natural source, in the production of electrical power, it is evident that there are a number of environmental implications including water above ambient temperature and water containing chemicals. Many governments have introduced legislation to control these environmental risks, representing a challenge to plant designers and operators alike. The paper discusses techniques available to meet this challenge.

Brief Biography of the Speaker: After graduating in chemical engineering Reg. Bott carried out large-scale development work in the plastics and gas industries before being invited to join the staff and the University of Birmingham. During a period as the Institution of Chemical Engineers Industrial Fellow in Heat Transfer he was able to carry out a survey of industrial heat exchanger usage. He discovered that very little was known about the fouling of heat exchangers except its effect on performance! It was clear that this would be a very worthwhile topic for research. As a result the rest of his academic career has been devoted to aspects of this topic. He has been author or co-author of some 300 papers and written two books on heat exchanger fouling and editor of four others.
Reg. Bott has been presented with a number of awards including the Arnold Greene and Brennan Medals from The Institution of Chemical Engineers, the Donald Q, Kern award from The American Institute of Chemical Engineers. He was made a Grand Commander of the Order of Prince Henry the Navigator, by the President of Portugal for

services to higher education in Portugal. For his contribution to chemical engineering and energy management he was awarded the M.B.E, by Her Majesty Queen Elizabeth.
In addition Reg, is also a fully ordained priest in the Church of England serving in a parish in Birmingham.

Plenary Lecture 9

Analyzing Malaysian Wind Speed Data Using Statistical Distribution

Associate Professor Azami Zaharim
Coordinator Fundamental Engineering Studies
Faculty of Engineering and Built Environment
Universiti Kebangsaan Malaysia
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Abstract: Many studies have been carried out to develop a suitable statistical model in order to describe wind energy potential. The most important parameter in estimating the wind energy potential is wind speed. Wind speed is a random phenomenon; statistical methods will be very useful in estimating it. For this reason, wind speed probabilities can be estimated by using probability distributions. An accurate determination of probability distribution for wind speed values is very important in evaluating wind speed energy potential of a region Based on the past literature; Weibul and Rayleigh are two widely used distributions. However, in this paper, Burr, Lognormal and Frechet distribution were applied to data sets for a specific location in Pahang, Malaysia. In determining the proper distribution, an approach consisting Kolmogorov-Smirnov (Ks), Anderson Darling (AD) and chi square (??2) test also the fitted graphics of probability distribution function (PDF) and cumulative distribution function (CDF) have been used. Based on the graphical and the computed goodness of fit results, general inference can be made that Burr distribution would be the best model which fitted the data very well.

Brief Biography of the Speaker: Azami Zaharim worked first 13 years as a lecturer in the Universiti Teknologi MARA (University of MARA Technology - UiTM) before joining the Universiti Kebangsaan Malaysia (National University of Malaysia - UKM) in the year 2003. He is Associate Professor at the Faculty of Engineering and Built Environment UKM, and is currently Coordinator for the Unit Fundamental Engineering Studies. He obtained his BSc(Statistics and Computing) with Honours from North London University, UK in 1988 and PhD (Statistics) in 1996 from University of Newcastle Upon Tyne, UK. He specialize in statistics, public opinion, engineering education and renewable energy resources.
He has until now published over 80 research papers in Journals and conferences, conducted more than 15 public opinion consultancies and delivered 3 keynotes/invited speeches at national and international meetings. He is currently the head of Renewable Energy Resources and Social Impact Research Group under the Solar Energy Research Institute (SERI). In the year 2007, he headed the Engineering Mathematics Research Group. At the same time, he is currently active involve in outcome based education (OBE) approach at the national level and the chairman of the Engineering Education Research Group since 2005. He is also involved actively in the research for the future of engineering education in Malaysia 2006 under the Ministry of Higher Education of Malaysia.

Plenary Lecture 10

Advances in Solar Assisted Drying Systems for Agricultural Produce

Professor Kamaruzzaman Sopian
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Abstract: There are many innovative ways of using solar assisted drying systems for agricultural produce and it depends of many factors including the drying temperature and duration of time to achieve the required quality of produce. The technical development of solar drying systems can proceed in two directions. Firstly, simple, low power, short life, and comparatively low efficiency-drying system. Secondly, high efficiency, high power, long life expensive drying system. The latter is characterized not only by an integrated structure but also integrating in an energy system involving process other than drying such as hot water when the drying system is not in use. In addition, air based solar collectors are not the only available systems. Water based collectors can also be used. A water to air heat exchanger can be used. The hot air that will be used to dry the product can be forced to flow in the water to air heat exchanger. In addition, the hot water tanks of the farm can be used as heat storage of the solar drying system. This paper will review the advances in solar assisted drying system for agricultural produce. The solar assisted drying systems are (a) the solar assisted drying systems with the V- grove collector (b) solar assisted drying systems with the double pass collector and (c) solar assisted dehumidification system and (d) solar assisted heat pump system The first two systems are air based solar collector systems and next two systems are a water based system.

Brief Biography of the Speaker: Prof. Dr. Kamaruzzaman Bin Sopian obtained his BSc in Mechanical Engineering from the University of Wisconsin-Madison in 1985, MSc in Energy Resources from the University of Pittsburgh in 1989 and PhD. in Mechanical Engineering from the Dorgan Solar Laboratory, University of Miami in 1997. He is presently the Professor in Renewable Energy at the Department of Mechanical and Material Engineering, Universiti Kebangsaan Malaysia. Currently, he is the Director of the Solar Energy Research Institute, a center of excellence for the research and development in solar energy technology. He has been involved in the field of solar energy for more than twenty years. His main contributions are in solar radiation modeling, alternative material for solar absorber, solar water heating system with integrated storage system, solar desalination, solar cooling, daylighting using solar light pipes, solar assisted drying systems, grid-connected photovoltaic system, thin film silicon solar cells, combined photovoltaic thermal or hybrid collector and solar hydrogen production system.
He has published over 400 research papers in journals and conferences. He has delivered keynotes speeches at national and international conferences on renewable energy. He is the founding member of the Malaysian Institute of Energy, member of the World Renewable Energy Network based in the United Kingdom and is an associate editor of the Renewable Energy published by Elsevier Ltd. He heads several national subcommittees on renewable energy by the Malaysian government to promote awareness, market enhancement, policy studies and the applications renewable energy.

Plenary Lecture 11

Evaluation of Thermal Comfort in the Main Indoor Arenas and Amphitheatres used in the Olympic Games "Athens 2004" with a CFD Model

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Abstract: A Computational Fluid Dynamics (CFD) model was used to evaluate the thermal comfort conditions in the main indoor arenas and amphitheatres used in the Olympic Games "Athens 2004". The CFD code was applied to calculate the 3-D airflow and temperature fields in the arenas and amphitheatres for various values of temperatures of conditioned inlet air (Tin). Calculated mean velocities and temperatures were used to determine the thermal comfort indices PMV (Predicted Mean Vote) and PPD (Predicted Percentage of Dissatisfied) and to evaluate the thermal conditions in the various regions of the arenas and amphitheatres. Calculated PMV and PPD values showed that thermal conditions in the arenas and amphitheatres were generally satisfactory for specific values of Tin; only a small percentage of the spectators were expected to be slightly uncomfortable.

Brief Biography of the Speaker: Prof. Stamou is a Dr. Civil Eng. (NTUA), Dipl. Rural and Surveying Eng. (NTUA) with postgraduate studies in the Imperial College of Science and Technology and the University of Karlsruhe. His specialisation is "Computational Methods in Environmental Fluid Mechanics and in the Design of Relevant Hydraulic Works". He has a continuous 25-years experience of teaching, research and consulting in the development and application of mathematical models in applied hydraulics, environmental fluid mechanics and water management. He has participated in 42 research projects, in 23 of whish as a Project Leader (PL) and he has supervised over 70 diploma and PhD theses in the NTUA, University of Thessaly and other European Universities. He acted as a consultant and/or project manager in projects/studies for Ministries, Water Authorities, International Organisations, Consulting Companies, Multinational Companies, Construction Companies and the Technical Chamber of Greece. He has participated in over 105 engineering studies dealing with the following: (1) Environmental Impact Studies, environmental hydraulics and relevant works, such as sewage treatment plants, (2) development and application of mathematical models for: 3-D flows in complex hydraulic works, hydrodynamic behaviour and efficiency of water/wastewater treatment units, hydrodynamic circulation and water quality-pollution in surface waters (rivers, lakes, coastal waters, fisheries-aquacultures), propagation of waves, due to dam break, and (3) water management, e.g. water supply, drainage, wastewater transportation, storm water protection, irrigation etc.

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