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# Recent Advances in Environmental Science

- > *Proceedings of the 9<sup>th</sup> International Conference on Energy, Environment, Ecosystems and Sustainable Development (EEESD '13)*
- > *Proceedings of the 7<sup>th</sup> International Conference on Waste Management, Water Pollution, Air Pollution, Indoor Climate (WWAI '13)*
- > *Proceedings of the 6<sup>th</sup> International Conference on Natural Hazards (NAHA '13)*
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Lemesos, Cyprus, March 21-23, 2013

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Published by WSEAS Press

[www.wseas.org](http://www.wseas.org)

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All papers of the present volume were peer reviewed by no less than two independent reviewers. Acceptance was granted when both reviewers' recommendations were positive.  
See also: <http://www.worldses.org/review/index.html>

ISSN: 2227-4359

ISBN: 978-1-61804-167-8

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## Plenary Lecture 1

### Possibility of Energy Storage in Modern Low-Energy Buildings in the Conditions of Sustainable Development



**Associate Professor Petr Mastny**

Centre of Research and Utilization of Renewable Energy Sources  
Brno University of Technology  
Czech Republic  
E-mail: mastny@feec.vutbr.cz

**Abstract:** Reducing consumption of primary energy sources and possibilities to reduce the energy demands of buildings using alternative energy sources are nowadays frequently discussed topics. Current research is at the research center "Centre for Research and Utilization of Renewable Energy Sources" (CRURES) focused on the possibility of increasing the efficiency of multivalent energy systems consisting of renewable energy sources and the possibility of energy storage with respect to its economical use. Regarding current needs the research is focused on the possibilities of using these multivalent systems in modern low-energy construction while meeting the energy-economic indicators.

The aim of the lecture is to describe the current situation within the field of energy storage utilization in modern low-energy construction in the Czech Republic and to show the specifics of the power systems design applying such sources. There are presented the results obtained during the solution of several research projects that demonstrate specific features of multivalent energy systems regarding the energy and economic evaluation of its operation.

**Brief Biography of the Speaker:** Petr Mastny was born in 1976. He graduated in Electrical Power engineering in 2000 from Brno University of Technology. His Ph.D. he obtained in October 2006. In December 2010 he has been appointed as Associate Professor at Brno University of Technology.

He has been with Department of Electrical Power Engineering, Brno University of Technology, Czech Republic since 2005. His current position is assistant professor. His field of interest covers the problems of utilization of renewable energy source and questions of energy management systems with renewable energy sources and their influence on environment. At present he is head worker or co-worker of five research projects in the field of Alternative Power Sources and he cooperates with several private companies to solve of real applications.

Petr Mastny has been member of WSEAS (The World Scientific and Engineering Academy and Society) since 2007, member of NAUN since 2009, member of IEEAM since 2010 and member of CIRED since 2009. He is author of about 75 publications in international scientific journals and conferences in field of Power Engineering and Alternative Power Sources. He has more than 55 presentations in international conferences and technical seminars and he has more than 10 citations in international scientific journals.

## Plenary Lecture 2

### The Air Pollution Variation when Used Palm Oil as Fuel in a Diesel Engine



#### Professor Charalampos Arapatsakos

Department of Production and Management Engineering  
Democritus University of Thrace  
GREECE

E-mail: xarapat@pme.duth.gr

**Abstract:** There are many types of air pollution, including smog, acid rain, the greenhouse effect and holes in the ozone layer. Besides natural sources there are many anthropogenic sources that contribute to the air pollution. It is common knowledge that internal combustion engines and all types of industries, contribute significantly to the emissions of air pollutants. Additionally, various agricultural activities require the extensive use of diesel or gasoline engines that produce vast quantities of CO and HC. It's a fact that it has not been taken under consideration seriously the environmental consequences of the combustion engines use in agriculture. Therefore, there is a big need for alternative sources to be developed in order to cover energy demands without harming the environment. Renewable fuels can be considered as alternative to conventional fuels.

Natural sources related to dust from natural source, usually large areas of land with little or no vegetation, the smoke and carbon monoxide from wildfires, volcanic activity etc. The main causes by air pollution related deaths include aggravated asthma, bronchitis, emphysema, lung and heart diseases to human beings. There are several many types of air pollutant. These include smog, acid rain, the greenhouse effect and holes in the ozone layer. The atmospheric conditions such as the wind, rain, stability affect the transportation of the air pollutant. Furthermore, depending on the geographical location temperature, wind and weather factors, pollution is dispersed differently. For instance, the wind and rain may effectively dilute pollution to relatively safe concentrations despite a fairly high rate of emissions. In contrast when atmospheric conditions are stable relatively low emissions can cause buildup of pollution to hazardous levels. The quality of fuel affects diesel engine emissions (HC, CO, NO<sub>x</sub> and particulate emissions) very strongly. The fuel that is used in diesel engines is a mixture of hydrocarbons and its boiling temperature is approximately 170°C to 360°C. Diesel fuel emissions composition and characteristics depend on mixture formation and combustion. In order to compare the quality of fuels the following criteria are tested: ketene rating, density, viscosity, boiling characteristics, aromatics content and sulph content. For environmental compatibility, the fuel must have low density, low content of aromatic compounds, low sulph content and high ketene rating. This work examines the use of diesel-palm oil mixtures in diesel engine. For those mixtures the gas emissions of carbon monoxide (CO), hydrocarbons (HC), nitrogen monoxide (NO) and smoke emissions are being examined.

**Brief Biography of the Speaker:** Dr Charalampos Arapatsakos is a Greek citizen, who has been born in Athens. He has studied Mechanical of Engineering. He is Professor on Democritus University of Thrace in Greece. Prof C. Arapatsakos has participated in many research programs about biofuels, gas emissions and antipollution technology. His research domains are mainly on biofuels and their use in internal combustion engines, the power variation from the use of biofuels, the gas emissions and mechanical damages.

### Plenary Lecture 3

## The Aerosol Modeling System for the Simulations of High Aerosol Concentration Events in East Asia



**Professor Emeritus Soon-Ung Park**  
School of Earth and Environmental Sciences  
Seoul National University, Seoul, Korea

Also with:  
Director of Center for Atmospheric and Environmental Modeling  
Seoul, Korea  
E-mail: supark@snu.ac.kr

**Abstract:** Atmospheric aerosols play an important role on the climate, biogeochemistry, regional air quality and health problems. East Asia is a major source of natural (Asian dust) and anthropogenic aerosols over the Northern Hemisphere. The frequent occurrences of Asian dust events from northern China and Mongolia in an arid and semi-arid regions cause high dust aerosol concentration and anthropogenic aerosols originated from human activities and the formation by gas-to-aerosol conversion of pollutants are also abundant due to high pollutants emissions in East Asia. The mixture of these aerosols frequently causes severely adverse environmental problems, including severe dust storms, dense haze and mist events. The Aerosol Modeling System (AMS) composed of the Asian Dust Aerosol Model 2 (ADAM2) and the Community Multi-scale Air Quality (CMAQ) model has been developed to simulate the prolonged dense haze event occurred on 10-16 January 2013 in East Asia. During this period eastern China has experienced several days of the worst air pollution with the measured maximum PM<sub>2.5</sub> concentration at the Beijing site exceeding 990  $\mu\text{g m}^{-3}$ . The simulation results indicate that the AMS model has a great potential to be used as the aerosol forecasting model for the high aerosol concentration events in East Asia. The AMS model and the simulation results are to be discussed in this presentation.

**Brief Biography of the Speaker:** Dr. Soon-Ung Park holds a BSc in Meteorology from the Seoul National University in Korea, an MSc in Meteorology from the University of Wisconsin-Madison in USA and a PhD in Atmospheric Sciences from Oregon State University in USA. He worked as a Research Associate and an Assistant Professor in University of Wisconsin-Milwaukee in USA (1978-1981). Since 1981, he had been served at the Department of Atmospheric Sciences of Seoul National University in Korea as an Assistant Professor, Associate Professor and Professor before he retired from Seoul National University in 2006. As a Professor Emeritus of Seoul National University, he founded "Center for Atmospheric and Environmental Modeling (CAEM)" in 2006 to pursue further studies on Atmospheric Environmental Issues including air pollution dispersion, anthropogenic aerosols, dust aerosols, acidic rain and carbon cycles in the forests. He has developed an operational Asian Dust Aerosol Model 2 (ADAM2) that is now used as an Asian dust forecasting model in Korea Meteorological Administration (KMA). He is interested in the development of an Aerosol Modeling System that includes both dust aerosols and anthropogenic aerosols. He has published more than 200 papers in major reviewed journals, more than 150 in conference proceedings and more than 100 granted technical reports. Recently he served as a chairman of Asian Node of World meteorological Organization (WMO) Sand and Dust Storm Warning and Assessment System (SDS-WAS) from 2008 to 2012. He is now the Director of CAEM and a committee member of Regional Steering Group WMO SDS-WAS. He had been awarded an Academic Prize and a Distinguished Service Medal from Korean Meteorological Society, Letter of Commendations by President of Korea, Minister of Science and Technology of Korea and Minister of Education of Korea. He had received Seoul Citizen Cultural Prize by Mayor of Seoul and A Distinguished Service Red Color Decoration by the Republic of Korea. He had been cited 2000 outstanding scientists of the 21 century by American Biographical Institute and International Biographical Center, Cambridge, England.

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