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Plenary Lecture 1

Prospect of Popular Grid-Connected Renewable Power System

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Abstract: Grid-connected renewable power system can mitigate the pollution generated by conventional central power plants. A valuable feature of renewable power systems is the ability to connect with the power grid and selling electricity to the utility. A grid-connected renewable energy power system can have one or more of energy sources. A system with more than one type of energy technology is called a hybrid system. Factors affecting grid connected renewable power system and the effect of grid connected renewable power system on the power grid will be evaluated. An overall image of the advantages, disadvantage, drawbacks, shortcoming, and limitations-restriction-constrains will be shown. Prospect of popular grid-connected renewable power system in terms of cost, performance, simplicity, and system capacity will be highlighted also.

Brief Biography of the Speaker: Assoc. Prof. Dr. Mohammad Alghoul obtained his BSc in Physics, MSc in Solar Energy & Energy Technology and PhD in Solar Energy. He is presently senior research fellow at solar energy Research Institute, a center of excellence for the research and development in solar energy technology, Universiti Kebangsaan Malaysia. He has been involved in the field of solar energy for more than 12 years. His main contributions are in active/passive solar (Thermal/Photovoltaic) applications i.e. desalination, heating, cooling, drying, (PV/T) collectors, solar radiation modeling, daylighting and energy efficiency. He has published over 60 research papers in journals and conferences. He has delivered keynotes speeches at national conferences on renewable energy.

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Plenary Lecture 2

Energetic Audit and Efficiency Improvement of Water Pumping Installations Used in Agriculture

Professor Anca Constantin
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Abstract: Electric energy is needed more and more over time, being a support of our entire life. Therefore the discovery of new sources of clean energy and new technologies became an important goal for scientists. The same attention has to be paid to the reduction of energy consumption as well as to the efficiency improvement of the consumers. Water pumping stations are among the most important electrical energy consumers all over the world and especially in Dobroudja region, Romania, where they play a leading role in the agricultural land improvement. A problem encountered by water suppliers is the ageing of the infrastructure. Most of the existing pumping stations have been in service for over thirty years. This long duration has resulted in unreliable service, and low energy efficiency. Therefore the old pumping stations have to be modernized.
An energetic perspective on the old pumping stations must take into account both the pumps and the pipeline. These two components of the hydraulic system should work in good compliance that means the pumps have to meet the energetic needs of the fluid to overcome the resistance to movement opposed by the pipelines. The increase in efficiency of the existing pumping stations involves an energetic audit of the pumps, a thorough study on the pipelines and identification of optimal technical measures to improve the energetic transfer to the liquid. The paper presents a hydraulic study as a basis for decision-making with respect to the technical solutions adopted for the modernization of three pumping stations and the gain in energy efficiency.
The increasing operation efficiency of a pumping installation results in a significant saving of electric energy which means:
- a substantial reduction of the pumped water price, which will definitely have a positive social impact
- an important decrease of the indirect air pollution, assuming electrical energy produced from coal.

Brief Biography of the Speaker: Anca Constantin was born in Constanta, Romania, in 1959. She graduated in mechanical engineering at The Polytechnic University of Bucharest, Romania, in 1983 and took her PhD degree in hydraulics and fluid mechanics at The Faculty of Civil Engineering, "Ovidius" University, Constanta, in 1998. She worked as a researcher in the Romanian Navy, and since 1999 she has been teaching at "Ovidius" University, Constanta, Faculty of Civil Engineering. At present she is Associate Professor and head of department.
She published 5 books and over 60 scientific articles. Her research field is fluid mechanics and applied hydraulics. As a researcher she participated in over 50 projects and received 7 innovation licenses. Anca Constantin is a member of The General Association of the Engineers in Romania since 2004 and a member of the Romanian Committee for the History and Philosophy of Science and Technique, Romanian Academy, since 2010.

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Plenary Lecture 3

Trace Analysis of Toxic PAHs in Water by Combining SERS with SERDS

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Abstract: During the last decades, much attention has been paid to trace detection of polycyclic aromatic hydrocarbons (PAHs) in water, because they are known to be toxic to biota and may bioaccumulate in aquatic organisms. Furthermore, PAH molecules are dissolved in water with extremely low concentrations because of their high octanol/water coefficients. Hence, for PAH detection a molecule specific technique that is capable to measure small concentrations is necessary. Raman scattering is a vibrational spectroscopic technique that allows specific substance identification due to its inherent molecule fingerprinting capability, by detecting the inelastically scattered laser light from molecules. However, conventional Raman spectroscopy has the drawback of very small cross sections and usually a broad and strong fluorescence based background, both limiting trace analysis of chemicals. To overcome the first drawback, surface enhanced Raman spectroscopy (SERS) has successfully been used. SERS is a powerful analytical tool that is based on Raman signal amplification of analytes by the local field of noble metal nanostructures excited with laser light. To remove the fluorescence background shifted excitation Raman difference spectroscopy (SERDS) has been invented.
In this presentation a general introduction in the techniques of SERS and SERDS as well as in the unique optical properties of noble metal nanoparticles will be given, followed by an explanation of the preparation of the nanoparticle ensembles, which serve as SERS substrates. Afterwards I will demonstrate that combining SERS with SERDS allows trace detection of pollutant chemicals. I will show how crucial the Raman signal of pyrene depends on the morphology of the nanoparticles and demonstrate that the Raman intensity is maximized if optimised nanoparticles are used. For this purpose, we have determined the limit of detection (LOD) for pyrene and fluoranthene in aqueous solution by applying SERS in combination with SERDS, using different morphologies of the SERS substrates. With an optimised SERS substrate the LOD of pyrene and fluranthene has been determined to be as low as 2 nmol/L (figure 1.), which is sufficient for trace analysis. Finally, I show the Raman response as a function of time. Since response times clearly below 10 minutes are observed, the system is capable to be implemented in an alarm sensor that can detect traces of PAHs in water in a short time.

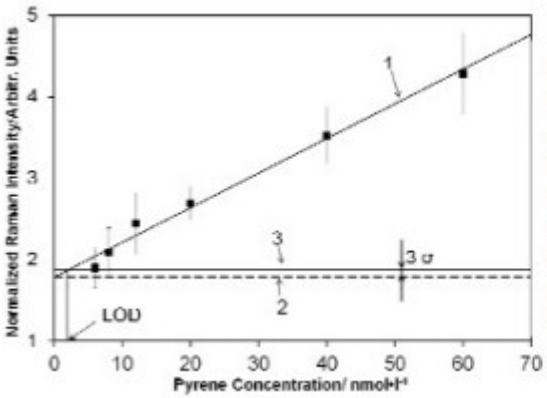

Figure 1: Standard approach for LOD calculation. The Raman band of pyrene at 1239 cm^{-1} was used for creating the calibration curve at low concentrations up to 60 nmol/L (solid line 1). The dashed (2), long dashed doted (3) and vertical solid (4) lines mark the mean blank signal, the blank signal standard deviation and the LOD projection, respectively.

[1] Y.-H. Kwon, R. Ossig, F. Hubenthal, H.-D. Kronfeldt, J. Raman. Spec., DOI 10.1002/jrs.4093
[2] F. Hubenthal, D. Blázquez Sánchez, N. Borg, H. Schmidt, H.-D. Kronfeldt, F. Träger; Appl. Phys. B 95, 351 (2009)

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Brief Biography of the Speaker: Frank Hubenthal finished his PhD work in 2001 at the University of Kassel and received his Habilitation in 2007. In the same year he was awarded as associated professor. Frank Hubenthal is a member of the Center for Interdisciplinary Nanostructure Science and Technology – CINSaT at the University of Kassel, a member of the American Nano Society and the German Physics Society. His research concentrates on the production, characterisation and application of noble metal nanoparticles. In particular, his interest is to exploit the local near fields of noble metal nanoparticles for surface enhanced Raman spectroscopy and surface structuring. Furthermore, Frank Hubenthal investigates the ultrafast electron dynamics and determines the dephasing times of localized surface plasmon resonances and the damping parameters of noble metal nanoparticles. By quantifying the different damping contributions to the dephasing time, he contributes to the fundamental understanding of the plasmons nature. Frank Hubenthal has written more than 45 publications and contributed to the major reference work Comprehensive Nanoscience and Technology Eds.: Andrews DL, Scholes, GD and Wiederrecht GP, Oxford: Academic Press.

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