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ORAL PRESENTATIONS

Environment change & Eco Systems Management

Paper Session 01

16th December 2013

10.45-12.45p.m.

1	Studies of properties of physicochemical sorbents based on fly ash	DominikaBukalak IzabelaMajchrzak-Kucęba
2	Study of sorption capacity on various types of adsorbents depending on the temperature and CO ₂ content	Anna Majchrzak IzabelaMajchrzak – Kucęba
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Studies of properties of physicochemical sorbents based on fly ash

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The occurrence of the greenhouse effect is caused by increased emissions of harmful gases such as water vapor, carbon dioxide, methane, ozone and chlorofluorocarbons. Among these, CO₂ has the most impact on the environment. The largest anthropogenic source of carbon dioxide emissions is undoubtedly energy industry. World energy is based on fossil fuels, and each year there are millions of tons of gaseous combustion products emitted into the atmosphere, including CO₂. It is necessary to improve the existing carbon capture technology and search for new solutions. This paper presents the study of physicochemical properties of sorbents obtained by impregnation of zeolite materials synthesized from fly ash. X-type zeolite has been subjected by wet impregnation method using amine solutions. For received materials thermal stability test was carried out, CHN content was determined, SEM analysis was carried out, BET surface area, pore diameter and pore volume were determined. To determine sorption properties of each sorbent temperature-programmed adsorption test was carried out using thermogravimetric methods.

Study of sorption capacity on various types of adsorbents depending on the temperature and CO₂ content

Anna Majchrzak¹, IzabelaMajchrzak – Kucęba²

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Testing materials for CO₂ removal from flue gas, is the main idea of this paper. CO₂ capture was tested by adsorption with using zeolites, activated carbon and carbon molecular sieves. Choosing the right adsorbent for the adsorption of CO₂ separation plant was made on the basis of information about its sorption capacity, regeneration capacity, operating window (best: temperature adsorption and desorption), profiles of adsorption / desorption, stability in the number of cycles and adsorption kinetics. The studies have characterized the selected physical adsorbents under so far untested flue gas conditions of combustion in oxygen and oxygen enriched atmospheres. The aim was to select the most effective sorbent for the separation of CO₂ from flue gas. The study was carried out using 100% CO₂ and modeling flue gas mixtures with different content of CO₂: 90%, 50%, 40%, 30%, 20%. The summary of the main characteristics of the physical and physicochemical properties of adsorbents was presented as the selection criteria of solid CO₂ adsorbents. The advantages and disadvantages of various adsorbents and their usefulness as a filling in adsorption systems for CO₂ capture (PSA, TSA) were made based on the gathered results of experiments.

Keywords: adsorbents, CO₂ capture, adsorption

Analysis of biomass and carbon distribution in the Ecuadorian alpine grassland

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Climate change has motivated many studies around the quantification of carbon stocks and biomass in terrestrial ecosystems. Large extensions of land require the approximation of in-situ measurements to be extrapolated in order to be able to be used in climatic and hydrological models. However, these estimates are not so accurate and hardly contemplate the difference in altitudinal gradients. Aside of this the total amount of carbon in a plant requires to include not only the above quantity but as well the underground carbon stock. In this study it is presented a relationship between carbon stocks and altitudinal gradients along an alpine region in Ecuador. To estimate the carbon stocks, and above and belowground biomass along the alpine grasslands, allometric equations were generated for the main growth forms of vegetation. An ANOVA analysis, Euclidean dissimilarity and Multidimensional scaling were used to assess the variations and to estimate a linear relationship among altitude and total carbon. The three dominant growth forms (tussock, acaulescent rosettes and cushions) showed a significant difference along altitudes ranges. Both carbon pools and carbon proportions decrease along gradients of increasing altitude. Similar results were obtained in biomass and carbon stocks, implying an effect of the soil type, biogeochemical and micro-climate factors on the results.

Keywords: carbon altitudinal gradient, biomass calculation, Ecuadorian Andes páramo

Effect Of Weed Extracts On Environment And On Wheat Crop

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Generally herbicides (pesticides) have the potential to pollute the environment. Ground water, ponds, lakes and rivers are strongly affected by herbicide pollution. The herbicides that find their way into rivers, streams and lakes end up poisoning the marine life and have an adverse effect on the fishing industry. So in field studies, the phytotoxic effects of organic weed extracts were determined on the weeds and wheat crop. Ethanol or CHCl₃ (trichloromethane or chloroform) extracts of toothpick weed (*Ammivisnaga* L.) and field bindweed (*Convolvulus arvensis* L.) were applied at 1000 and 500 ppm. One month after wheat sowing. The CHCl₃ extract of field bindweed at 1000 ppm and toothpick weed at 500 ppm drastically reduced the weeds population (33.67 weeds m⁻² each than 101 m⁻² in untreated control) but increased the wheat grain yield. The CHCl₃ extract of bindweed applied at 500 ppm gave maximum wheat yield (1.2 t/ha), while toothpick weed extract in the same solvent and applied at 1000 ppm gave wheat yield of 1.1 t/ha. Judicious control measures for noxious weeds of allelopathic extracts are recommended to be adopted for harvesting better quantity and quality of wheat and also avoid the air pollution as well.

Keywords: Allelochemicals, environmentally friendly, phytotoxic effect on weeds, organic extracts, wheat crop

Biofilters for Air Pollution Control

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The biofiltration process, which has a number of advantages over conventional treatment systems, is based on biological oxidation which takes place in biological reactors known as biofilters. Biofiltration converts nuisance odors and volatile organic compounds (VOCs) from a contaminated air streams into harmless final products. Suitable bacteria are immobilized on biofilter media and packed in biological reactors known as biofilters. Through several case studies, this work demonstrates that industries can enjoy a cleaner fresh air cost effectively when biofilters are selected for air pollution control.

A Study of Impact of Changing Environment on Sports Person in India

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Due to the reduced oxygen pressure at altitude, athletes are unable to maintain high intensity training and subsequently their aerobic fitness may slowly decrease. This reduction in fitness may offset any positive physiological adaptations from altitude exposure. Athletes can become 'overtrained' as it is a common mistake to adopt the same training zone based on heart rates or times, time to perform a certain distance and/or lactate concentration. The state of the environment can have significant impacts on sport. Sportsmen and women can be affected by environmental conditions such as air and water quality and exposure to harmful substances. Changes in climate and the loss of natural spaces may make participating in sport more difficult. The impact of the environment and especially of climate change becomes most obvious when looking at winter sports. If global warming affects the mountain snow cover, skiing or snowboarding and other winter sports will no longer be possible.

Keywords: concentration, Sportsmen, global warming, training, Athletes

**A New Approach to derive Clearance levels for Wastes Containing Naturally Occurring Radioactive Materials (NORM)
Case Study: Iranian Offshore Drilling Rigs**

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³ *Graduate Faculty of Civil Engineering, Tarbiat Modarres University, Tehran, Iran*

Naturally Occurring Radioactive Materials (NORM) exists with different concentrations in earth's crust. Human activities such as oil and gas production and mineral extraction and processing could enhance the natural level of NORM in by-product waste streams. To protect general public and workers from these enhanced NORM sources, Clearance levels should be established. Clearance levels are regulatory limits which are defined in order to protect the environment and human from radiation sources. Generic Clearance levels are the context of regulatory surveillance for macro environmental assessment and specific Clearance levels investigate any micro assessment associated with industries. Generic Clearance levels are reliable tools to distinguish between the radiological hazardous and inert wastes. This study proposes a new approach to derive both generic and specific Clearance levels. This approach simultaneously considers both human health and economic considerations. For better understanding the implication of this method, Iranian offshore drilling rigs in Persian Gulf have been chosen as case study subject. The comparison between the generic and specific approaches for offshore rigs indicates that most exposure scenarios in generic approach which could result in extremely conservative values do not exist in specific scenarios. So expanding generic Clearance levels for all industries is not recommended.

Keywords: NORM, Clearance Level, Waste Management

Environment & Energy

Paper Session 02

16th December 2013

2.00-3.30p.m.

1	Estimation of Solar Energy over India using Satellite Data	NagarajBhat K C Gouda P Goswami
2	A review of Small Scale Distributed Power Generation Technologies Using Solar Energy Driven Stirling Engine	Salem Ghozzi RabahBoukhanouf
3	Solving Economic Emission Dispatch Problem Using Adaptive Clonal Selection Algorithm	BalusuSrinivasa Rao K. Vaisakh
4	Temporal and spatial variability of lightning strikes and the impact on Brazilian high voltage transmission networks	Jorge A. Martins Leila D. Martins Anaclara R. Camargo Maurício N. Capucim Veronika S. Brand Carolyne B. Machado Rita Y. Ynoue Carlos A. Morales
5	Status and future design needs for enhancing dissemination of biogas technology based on Danish experiences	RikkeLybæk Thomas Budde Christensen Jan Andersen

Estimation of Solar Energy over India using Satellite Data

Nagaraj Bhat¹, K C Gouda², P Goswami³

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In the recent time several studies reveal that the climate change affects the total energy system in the globe. Solar radiation is an important parameter needs to be studied extensively as radiation and insolation plays major role in the weather and climate mechanism and also due to global warming and climate change it is suggested to use the solar energy in a better way. In this study an estimation of the solar energy over the continental India is being analyzed using high resolution satellite data like MODIS. The spatio-temporal variation of solar energy in terms of net radiation, shortwave, long wave radiation, diffuse radiation and global radiation etc. are presented and the results shows that there is a strong variation in distribution of solar energy spatially and temporally. A clear annual cycle and inter annual variability is present in the solar energy over all India and regional scale. In this study also NASA derived solar data are being analyzed to classify the radiation both in time and space (monthly to annual and over India Its clearly visible that east part receives more diffuse radiation in May and north part receives comparatively low radiation both in April and May.

Keywords: Solar energy, satellite data, spatio-temporal variation

A review of Small Scale Distributed Power Generation Technologies Using Solar Energy Driven Stirling Engine

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Traditionally, off-grid power generation and supply in remote and inaccessible areas is provided by fossil fuelled technologies such as diesel gensets. Currently the emphasis however has shifted towards deploying renewable energy technologies which are becoming increasingly an important part of many countries power generation infrastructure. Small scale solar energy projects are mainly dominated by PV technology whereas large schemes use Concentrated Solar Power (CSP). This paper gives an insight into current solar energy technologies that can be deployed for power generation either as stand-alone or connected to the main power grid. Then an alternative technology using Stirling Cycle will be described giving its potential application and limitation. A conceived new design of Free Piston Stirling Engine is under research will be discussed and introduced.

Keywords: Concentrating Solar Power (CSP), Stirling cycle and Stirling engine, Free Piston Stirling Engine, Schmidt analysis.

Solving Economic Emission Dispatch Problem Using Adaptive Clonal Selection Algorithm

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This paper presents an Artificial Immune System (AIS) based Adaptive Clonal Selection Algorithm (ACSA) to solve combined economic emission dispatch (EED) problem of thermal generators in power system. Here the emission substance like NOX, power demand equality constraint and operating limit constraints are considered. The Clonal selection principle is one of the models used to incorporate the behaviour of the artificial immune system. The biological principles of clone generation, proliferation and maturation are mimicked and incorporated into this algorithm. To show the effectiveness of the proposed multi-objective ACSA for solving EED problem it has been tested on two test systems.

Keywords: Adaptive Clonal selection algorithm, optimal power flow, single objective optimization, Fuel cost, Economic emission dispatch, Multi-objective optimization

Temporal and spatial variability of lightning strikes and the impact on Brazilian high voltage transmission networks

Jorge A. Martins¹, Leila D. Martins², Anaclara R. Camargo³, Maurício N. Capucim⁴, Veronika S. Brand⁵, Carolyne B. Machado⁶, Rita Y. Ynoue⁷, Carlos A. Morales⁸

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Lightning strikes hit transmission lines or substations worldwide and cause serious economical losses. Although a number of studies have been conducted in order to map the global distribution of atmospheric lightning discharge, just a few have been dedicated to the temporal and spatial distribution with focus on localization of the transmission lines. In this study we analyzed lightning data from the Sferics and Timing Ranging Network – STARNET focusing the Brazilian transmission network. Brazil has a modern electricity industry that depends heavily on hydropower and the distribution of such electricity is strongly dependent from one of the largest transmission networks in the world. As a consequence, such network is very sensitive to the spatial distribution of lightning phenomena. The analysis of the data provided by STARNET revealed that flash density presents strong spatial variability, varying more than an order of magnitude in a same transmission line. In addition, the areas with higher flash density are the same areas where most power stations are installed and also the higher transmission lines density.

Keywords: lightning, hydropower, transmission line

Status and future design needs for enhancing dissemination of biogas technology based on Danish experiences

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This paper elaborates on different concepts of biogas technology understood in a Danish context. It emphasizes how energy from biogas is distributed, either as biogas to regional combined heat and power plants (CHP) or as district heating (DH) to small scale local networks. Advantages of biogas technology are emphasized; its capacity as a renewable energy and GHG avoiding technology and as a waste processing and environmental technology. It is argued that biogas can provide a platform for the use of household waste and other types of organic-materials (gas-boosters) to enhance gas yield as is the case of biomass from nature conservation, straw and deep litter, etc. The paper discusses whether or not biogas technology can create new job opportunities in rural areas that lack development. The paper ends with concluding a need to develop new ways of implementing biogas technology, for example how new organizational models can be designed providing alternative means of cooperation between farmers. It emphasizes how the use of alternative gas boosters (like blue biomass) can be applied. Finally, biogas is discussed in global and European contexts, and emphasis is on the need for digesting organic waste in combination with manure to provide valuable nutrients to farmland.

Keywords: Biogas plants, new design, renewable energy, climate change

Environment & Other Issues- I

Paper Session 03

16th December 2013

4.00-5.30p.m.

1	Spatiotemporal Variation of Dust Fallout in Riyadh City, Saudi Arabia	Abdullah SaadModaihsha Mohamed Osman MahjoubaAdel Mohamed Ghoneima
2	Physico-Chemical Status Of River Gadavari At Kopargaon, DistAhmednagar Ms. India.	Misal N.V
3	Air Pollution Due To Automobile And Its Effects On Health	PansambalShreyas S. Chopade B.B.
4	Environmental pollution: A Burning Issue	PansambalSambhaji U.
5	Escherichia coli in Water from Hand Pumps of Selected Barangays in Iligan City, Philippines	Lady Jane C. Fanuncio Olga M. Nuñeza
6	Degradation Of Micropollutants In Water By Hydrodynamic-Acoustic-Cavitation	PatrickBraeutigam Marcus franke Franziskaanschuetz Rudolf J. Schneider Bernd Ondruschka

Spatiotemporal Variation of Dust Fallout in Riyadh City, Saudi Arabia

Abdullah Saad Modaihsha¹, Mohamed Osman Mahjoub², Adel Mohamed Ghoneima³

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The primary goal of this study is to carry out a comprehensive study of spatiotemporal variation of falling dust in Riyadh city, the capital of Saudi Arabia, and provide the scientific background for the further control of air pollution. To characterize the ambient falling dust pollution, 14 typical sampling sites were chosen for falling dust collection at time interval of one month. This study mainly examined the spatiotemporal variation of dust falling in Riyadh city over a period of twelve months (January 2012 – December 2012). The average monthly deposition value for all sites in twelve months was 47.76 Tons km⁻². Results indicated that considerable spatiotemporal variation exists in the average monthly fall-out of the dust. The mean monthly maxima and minima of dust fallout were recorded in March (70.67 tonnes km⁻²) and November 2012 (25.78 tonnes km⁻²) respectively. The finding indicated that dust deposition rates across the city were high in sites exposed to anthropogenic activities. Sites located near construction activities (169.60 tonnes km⁻²) and near Al-Azzezya cement factory (114.96 tonnes km⁻²) being the worst affected. Sites located in Eastern Riyadh received relatively higher rates. The results revealed that the dust flux in Riyadh city is influenced mainly by proximity to construction and industrial activities and to a lesser extent to climatic factors.

Keywords: Dust flux, Saudi Arabia, Riyadh

Physico-Chemical Status of River Gadavari at Kopargaon, Dist Ahmednagar Ms. India.

Dr. Misal N.V

Arts, Commerce & Science College, Sonai Tal. Newasa, Dist. A. Nagar MS. India

The Present investigation deals with the distribution and seasonal variation of certain physico-chemical parameters of water of river Godavari at Kopargaon, MS, India) during the year 2010-2011. The water quality is going to decline due to direct discharge of domestic waste, municipal waste and industrial wastes from various area of town. This directly or indirectly effect the biotic community of aquatic habitat. The gradual disposal of solid and liquid waste from surrounding, chemicals and rapid rate of encroachment with lack of proper maintenance together make this large water body polluted. The D.O. and B.O.D .levels has been marginally beyond permissible limits which is a serious threat to the aquatic life in the river.

Keywords: Physico-Chemical Characteristics, Godavari River B.O.D., O.D.

Air Pollution Due To Automobile and Its Effects on Health

Prof.PansambalShreyas S.¹, Dr. Chopade B.B.²

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Year 1980 mobile sources alone accounted for 60% of the total quantum of emissions in the city of Tokyo. Similar values for other cities or country as a whole may differ depending upon various factors like population of motor vehicles, driving pattern, maintenance, emission control devices employed, vehicle miles travelled etc.

Environmental pollution: A Burning Issue

PansambalSambhaji U

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Pollution of the air by various toxic gases and particulate matters has been a global phenomenon. The ever increasing impact of increasing population and of industrializing society accounts for the deteriorating air quality. Since contamination of the air adversely affects the growth of vegetation and health of animals and human beings control of the various pollutants at source level has always been and major concern of most of the developed and developing countries.

***Escherichia coli* in Water from Hand Pumps of Selected Barangays in Iligan City, Philippines**

Lady Jane C. Fanuncio¹, Olga M. Nuñez²

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The lack of sustainability of water supply prompted installation of water hand pumps (WHPs) to meet domestic water needs in some developing countries in the African, South American, and Asian regions. In Iligan City, Philippines, some areas that have no access to or have shortage of water supply from the local piped distribution system use WHPs to augment household water demands. This study was conducted to assess *Escherichia coli* load of water from selected WHPs in six barangays of the city. Fifty WHPs were chosen as test sites where water samples were collected twice per month for three months and tested for presence and concentration of *E. coli* isolates. Thirty-one (62%) of the WHPs were used as source of water for drinking, household activities, and hygiene and sanitary practices. All water facilities (100%) yielded positive *E. coli* growth at least once in the six sampling periods with more than 100 colony-forming units per 100 mL of water. *E. coli* detection indicates water contamination with human and animal wastes signifying the need to treat water for domestic uses and much more for drinking purposes as 91% of the households utilizing the WHPs never employ any treatment procedure prior to water usage.

Keywords: colony-forming units, contamination, drinking water, treatment

Degradation of Micropollutants in Water by Hydrodynamic-Acoustic-Cavitation

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Due to scientific-technological progress, increasing industrialization and continually improved health system micropollutants like pharmaceuticals, pesticides or industrial chemicals can be found along the water cycle ubiquitous. The contaminants are in the range of ng L^{-1} to $\mu\text{g L}^{-1}$ and have a negative effect on the water quality and ecosystem even at low concentrations. Initial effects include the feminization of rainbow trout by the contraceptive 17 α -ethinylestradiol and the increasing antibiotics-resistance of bacteria. As a preventive step, an efficient technique for waste water treatment plants is needed to stop the entry of these substances in the aquatic environment. Cavitation, the formation, growth and subsequent collapse of gas- or vapor-filled bubbles in fluids, is applied to solve this problem. In the collapse-phase high temperatures are generated in the bubbles ($\sim 5000 \text{ K}$) leading to homolytic cleavage of water molecules to form high reactive OH- or OOH-radicals used for oxidative degradation of contaminants in aqueous systems. In the presentation, the technique of the combination of hydrodynamic and acoustic cavitation, showing different advantages with respect to the single methods, is introduced. The influence of different parameters on the degradation and energy-efficiency will be shown at the example of different micropollutants like carbamazepine, diclofenac and chloroform.

Keywords: micropollutants, wastewater-treatment, hydrodynamic-acoustic-cavitation

Paper Session 04

Environment & Other Issues - II

17th December 2013

10.45-12.45p.m.

1	Antibiotic Phenotypic Profiles of Fecal Escherichia Coli from Institutionalized Pediatric Patients of Mindanao Sanitarium and Hospital, Iligan City, Philippines	KerenJollia M Nuñez Dominique Michelle M. AbellaLucilyn L. Maratas Lady Jane C. Fanuncio
2	The Effect Of Lead(II) Towards The Biodegradation Of BTEX By An Environmental Bacterial Consortium	PalsanSannasi Fellie Edwin Amir SalmijahSurif Jalil Kader
3	Environment Protection Act 1986, Biomedical Waste (management and handling) Rules 1998: Evaluation of compliance and associated actions.	N Dhaliwal A K Gupta P K Gupta P Arora
4	Evaluation the operation parameters of sun collectors	IstvánPatkó AndrásMedve HosamBayoumiHamuda AndrásSzeder
5	Pollution Potential Of The Drains Polluting The River	SunitaVerma DivyaTiwari Ajay Verma
6	Phytochemical Activities Of Leaf Extracts Of Somemedicinal Plant Against <i>Aspergillus Niger</i> A Causalorganism Of Market Disease Of Amla	Sonawane B.N. Sumia Fatima
7	Effects of Arsenic and Vitamin E on Reproductive Functions of Male Rabbit	Muhammad Zubair Maqool Ahmad

Antibiotic Phenotypic Profiles of Fecal Escherichia Coli from Institutionalized Pediatric Patients of Mindanao Sanitarium and Hospital, Iligan City, Philippines

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Diarrhea is said to be the leading cause of disease among children in the Philippines. With the emergence of antibiotic resistant strains of *E. coli*, it is important to determine the antibiotic profiles of the bacterial strains especially from the pediatric population since this is the group which is more susceptible to disease. In this study, the antibiotic susceptibility of *Escherichia coli* in the institutionalized pediatric population of Mindanao Sanitarium and Hospital in Iligan City, Philippines was tested against four antibiotics. Fecal samples were taken from 0-5 years-old patients with diarrhea. The presence of *E. coli* was determined through the use of 3M petrifilm. Susceptibility testing of *E. coli* against four antibiotics was done. Out of 26 samples, only 15 samples were found with bacterial growth. These bacteria were found to be resistant to two antibiotics, ampicillin and amoxicillin. Ciprofloxacin had a 96% efficacy rate which is the highest among the four antibiotics. The second most effective was doxycycline with an efficacy rate of 77%. Age appears to be unrelated to antibiotic resistance of enteropathogens. Resistance patterns may have been influenced by local pediatric prescription patterns.

Keywords: amoxicillin, bacteria, diarrhea, resistant strains, susceptibility

The Effect of Lead (II) Towards the Biodegradation of BTEX by an Environmental Bacterial Consortium

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Aromatic hydrocarbons i.e. benzene, toluene, ethylbenzene, and xylene isomers (BTEX) are widely known environmental priority pollutants commonly found in crude petroleum and petroleum hydrocarbon products. Aply, microbial based bioremediation efforts for BTEX removal have been established; however the effectiveness of bioremediation is dependent on various factors at the site of pollution. Amongst which, the presence of heavy metals such as Pb(II), as co-contaminant can be detrimental to bioremediation as it affects the biocatalytic activity of enzymes. This study reports the effect of Pb(II) towards growth and BTEX biodegradation capability of a locally developed environmental bacterial mixed culture, collectively known as Consortium Culture (CC). Results indicate that the addition of Pb(II) at the threshold concentration (50 mg/L) with individual BTEX compounds at 30 mg/L stimulated growth, whereas CC growth was inhibited by 3-8% ($p > 0.05$) at 50 and 100 mg/L. Biodegradation was noted albeit lower and slower; ranging from 18-35% by 24 h and 41-61% after 48 h. In comparison, biodegradation

was reduced by 19.85% for toluene, 25.77% (benzene), 35.50% (ethylbenzene), 75.25% (*p*-xylene), 76.79% (*o*-xylene), and 77.47% (*m*-xylene) in the presence of Pb(II) as opposed to Pb(II)-free cells ($p < 0.05$). A comprehensive understanding of bacterial interactions with heavy metals and hydrocarbons coupled with means to attenuate the toxic effects of heavy metal ions is crucial for effective management of bioremediation efforts in the local scene.

Keywords: Consortium culture, BTEX, Lead, Biodegradation.

Environment Protection Act 1986, Biomedical Waste (management and handling) Rules 1998: Evaluation of compliance and associated actions.

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Improper management of health care waste leads to violation of “Right to life” in terms of deprivation of Right to clean air, water, and environment. To prevent this violation, Environment Protection Act 1986 and Biomedical Waste (management and handling) Rules 1998 were enacted and adopted. To study compliance to the above rules and associated actions, information was gathered from 1st Jan 2011 to 30th June 2012 from all State Pollution control boards of India under RTI Act 2005. This intermediate study comprises data from states of Maharashtra, Gujrat, Himachal Pradesh and Chandigarh. On analysis (n=509), compliance was observed in 77.3% of public health care providers and only 22.2% of private health care providers. Registered health care providers were 80% but annual report had not been submitted in 37.9% cases. Fifty seven percent of offenders were asked to submit a compliance report within 7-15 days. Significant difference ($p < 0.05$) was observed amongst private and public health care providers in joining the Common Biomedical Waste Treatment Facility but equal distribution of violation was seen ($p > 0.05$) in all four states. Eight offenders were asked to close down units till further orders and 7 among them were private providers. ($p < 0.01$). This clearly indicates that implementation of Biomedical Waste (management and handling) Rules 1998 requires stern implementation measures.

Key words: Compliance, Biomedical Waste (management and handling) Rules 1998, private health care providers.

Evaluation the operation parameters of sun collectors

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In order to efficiently solve the problems created by the deepening energy crisis affecting Europe and the world, governments cannot neglect the opportunities of using the energy produced by sun collectors. In many of the EU countries there are sun collectors producing heat energy, e.g. in 2011 in the area of EU27 (countries which belong to European Union) + Switzerland altogether 37519126 m² were operated, which are capable of producing 26.3 GWh heat energy. The energy produced by these sun collectors is utilized at the place of production. In the near future governments will have to focus more on spreading and using sun collectors. Among the complex problems of operating sun collectors, this article deals with determining the optimal tilt angle, directions of sun collectors. We evaluate the contamination of glass surface of sun collector to the produced energy. Our theoretically results are confirmed by laboratory measurements. The purpose of our work is to help users and engineers in determination of optimal operation parameters of sun collectors.

Keywords: heat energy, direction of sun collector, contamination of surface

Pollution Potential Of The Drains Polluting The River

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Knowledge about the volume and the composition of municipal and industrial wastes to which a river is exposed is imperative in river pollution study. The maximum discharge of effluents was through Ganda Nala drain (40.8%) with a maximum BOD load 12.73 tones per day. Maximum suspended solid load discharged from Panki Thermal Power Plant drain (53.2%) carrying ash from the power plant. All the effluents were light to dark murky in color. Stretch of the Panki municipal drain was highly colored due to reddish brown waste that drained out from Lohia Machine Limited outlet. Transparency was quite low ranging from almost nil to hardly 1.9 cms. Temperature of effluents was within the biokinetic range of 10-45° C while odour varied from faecal foul to ammoniacal or organic pungent. Chemical Oxygen Demand of the effluents were high, remarkably high in Ganda Nala effluent. Phosphate concentration in diverse effluents ranged from 0.46 mg-1 to 1.90 mg-1. Urea and comparatively high ammonia coupled with low nitrate concentration reported in Panki municipal effluent. Chloride content in diverse effluents varied from 97 mg-1 to 200 mg 1. Oils and grease were also present in appreciable amount in these wastes. The concentrations of heavy metals i.e. copper, zinc, nickel, lead and chromium had been estimated in drain effluents. Cyanophyceae dominated and was represented by five species as compared to three and two species of bacillariophyceae and chlorophyceae respectively. The respective contributions in the total algal population were cyanophyceae (53.79%) bacillariophyceae (28.11%) and chlorophyceae (18.10%).

Keywords : Pollution potential, river Pandu, heavy metals, Algae

Phytochemical Activities of Leaf Extracts of Some medicinal Plant against *Aspergillus Niger* a Causal organism of Market Disease of Amla

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Amla (*Emblicae officinalis*) is one of the most important fruit plants grown in India. It is a good source of vitamin-C. Among fruits, amla is a plant of India with a constant demand. In order to regulate the supply and to enable the farmer to get a remunerative price for the produce, long term storage of amla is a prerequisite. Losses of amla during storage are considerable, mainly due to sprouting and contamination by microorganisms. Nearly 40% of the production is lost during post-harvest handling and sprouting, out of which microbial spoilage alone contributes approximately 15-20% of the total loss (Pantasticon and Bantista, 1976; Bhagchandani et al., 1980). *Aspergillus niger* is known to be a toxic fungus to plants. The nature of their plant extracts. Though complete inhibition of the pathogen was not observed in any of the plant extracts tested, but a considerable amount of inhibition was noticed in some of them. Among the 10th plant extracts tested against *Aspergillus niger*, *Tinospora cordifolia* (77.41%) were significantly superior over all other plant extracts. Next best was *Boerhavia diffusa* (74.07%), *Ocimum sanctum* (70.00%), *Tribulus terrestris* (60.00%), *Adathodavasicash* showed less inhibitory effect (6.66%). In India, Rajam (1992) reported that among the post-harvest diseases of amla, black mould rot caused by *Aspergillus niger* was the predominant one. The spoilage caused by *Aspergillus niger* was as high as 80% as stated earlier by Quadri et al. (1982). *A. niger*, a soil saprophyte being ubiquitous in occurrence, attacks amla by producing various enzymes and toxins and establishes itself in fruit tissues. Chemically it is controlled (Dang and Gupta, 1984), but chemical control may cause poisoning to the amla fruits. Hence, in the present study, an attempt has been made to find out suitable plant extracts which were used to control *Aspergillus niger* and which will be free from hazardous chemical residues.

Effects of Arsenic and Vitamin E on Reproductive Functions of Male Rabbit

Muhammad Zubair¹, Maqool Ahmad²

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Arsenite is a major environmental chemical and a known reproductive toxicant via the depression of spermatogenesis and androgenesis in males. The aims of this study were to investigate the adverse effects of sodium arsenite on the reproductive system of male rabbit as well as to examine whether vitamin E is able to ameliorate these effects. Adult rabbits were divided into four groups: 1/ control, 2/ arsenic (10 mg/kg/day), 3/ vitamin E (100 mg/kg/day), and 4/ sodium arsenite + vitamin E group. After treatment, male reproductive functions; sperm count, motility, morphology and HOS-coiling were evaluated. A significant depletion in sperm count, sperm motility, sperm viability and HOS-coiling were reported in arsenic group. In the sodium arsenite + vitamin E group, vitamin E meliorated ($p < 0.001$) the adverse effects of sodium arsenite on male reproductive functions. In addition, the treatment of rabbits with vitamin E alone significantly ($p < 0.001$) increased the motility, number and HOS coiling of sperms.

Key words: Sodium Arsenite, % Sperm Analysis, % Male Reproduction and rabbit

Environment Sustainability

Paper Session 05

17th December 2013

2.00-4.00 p.m.

1	Green Marketing Initiatives By Indian Corporate- Prospects And Confronts In Facing Global Competition	Zine D.E.
2	Analysis of Green IT Adoption Trends Among Green Awarded Organizations in Sri Lanka :A survey among green awarded organizations	Jayathilake M.T.D.A Fernando S
3	Real Options Analysis on Greentech Investment under the Uncertain Chinese ETS	Han Qin L.K.Chu
4	Applications of Nanotechnology: A Review	Kardile H.J. Dandwate S. R.
5	Mode of Occurrence of Trace Elements in Some Indian Coal	Sk. Md. Equeenuddin Sabyasachi Prakash
6	Modeling of Photovoltaic System and Design of MPPT Controller using PSO Algorithm	prakash.jl Sarat Kumar Sahoo Sathiyathan. M Pongiannan. R. K
7	A New Species PhoreiobothriumGawali From CarchariasAcutus [Muller And Henle, 1906] At Bancot, Ratnagiri M.S.	R. R. Dandawate
8	Distribution and Conservation Status of Mammals in Mt. Diwata Range, Mindanao, Philippines	Olga Nuneza Berna Lou Aba

Green Marketing Initiatives By Indian Corporate- Prospects And Confronts In Facing Global Competition

Zine D.E.

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Currently, there is escalating awareness among the consumers all over the world concerning protection of environment. The growing awareness among the consumers regarding the environmental protection had inculcated the interest among people to bestow a clean earth to their progeny. Various studies by environmentalists indicate that people are more concerned about the environment and are changing their behavior pattern so as to be less hostile towards it. Now we can see that most of the consumers, both individual and industrial, are becoming more concerned about environment-friendly products. Most of them believe that environment-friendly products are safe to use. Now is the era of recyclable, non-toxic and environment-friendly goods. As a result, green marketing has emerged, which aims at marketing sustainable and socially-responsible products and services in the society. This has become the new mantra for marketers to satisfy the needs of consumers and earn better profits. In this article the authors limelight the essence of green marketing and its relevance in improving the competence levels of the organisations in the global competition.

Keywords: environment, industrial, products, competence.

Analysis of Green IT Adoption Trends among Green Awarded Organizations in Sri Lanka: A survey among green awarded organizations

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The Green concepts have been now identified as the right element to connect both corporate innovation and environmental integration. It is encouraging to identify that few Sri Lankan organizations have initiated green concepts including green IT practices. There are internal as well as external factors which motivate Organizations towards 'Greening'. This paper Analysis Green IT initiatives and adoption trends among forty five Sri Lankan 'Green awarded' organizations. This data can be utilized in setting green targets of the country and for the benefit of organizations who are planning to 'Go green' in future facing minimal barriers with maximum productivity. The results show Green IT initiatives taken by majority of the green awarded Sri Lankan companies have aimed at cost minimization. Government energy efficiency regulations, , Greenhouse gas regulations, regulations on discarding e-waste, encouragement from industry associations show very low impact on motivating organizations towards achieving green IT. Green awarded organizations with clear vision and mission, are more focused and are more successful in retaining green concepts and Green IT initiatives. In addition Defining a vision & mission will help an organizational management to educate their employees and motivate towards participating in greening their IT processes.

Keywords: Green IT, Motivation Factors, Trends,

Real Options Analysis on Greentech Investment under the Uncertain Chinese ETS

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Green technology (greentech) investment in China is faced with new opportunities as pilot Chinese Emission Trading Schemes (CETS) come into implementation gradually. Besides Certified Emissions Reduction (CER) from international Clean Development Mechanism (CDM), Chinese Certified Emissions Reduction (CCER) from domestic emission trading scheme could be the other income source from carbon emissions trading. This study focuses on investors from developing countries like China that try to optimize their greentech projects investment under uncertainty. The prices of carbon and electricity are modeled as mean reverting process. A real options approach (ROA) is applied to analyze the effects of climate policy uncertainty on private investor's decision-making behavior in greentech investment in China. The calculation of real options model is implemented within a dynamic programming framework, in which the different sources of uncertainties are interpreted by the least-squares Monte Carlo (LSM) approach. A case of wind power plant project is studied, and results indicate that uncertainty in prices will delay the investment in greentech projects. Based on the test of different policy scenarios, investment and policy suggestions are proposed.

Keywords: real options, greentech investment, carbon emissions trading

Applications of Nanotechnology: A Review

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Abstract: Now a days, tremendous research is going on in the field of nanotechnology. Nanotechnology has numerous applications. The ability to see nano-sized materials has opened up a world of possibilities in a variety of industries and scientific endeavors. Nano, that is a billionth of meter size is possible to "see", it has many applications in multidisciplinary fields. Nanotechnology is applicable in Engineering, Medicine, Industry, Textiles, Physics, Chemistry, Biology, Biotechnology, Energy, Environment, Space, Defense, Cosmetics, Food, Agriculture and so on. Study of nanotechnology enables to prepare materials and devices applicable in multidisciplinary fields. The study of nanotechnology reveals revolutionary changes all over the world. The purpose of current paper is to throw light on some of the selected applications of nanotechnology. Mainly the literature survey is carried out for applications of nanomaterials in medical, Energy conservation, Information Technology, Telecommunication etc. fields.

Keywords: Nanotechnology, applications, multidisciplinary, medicine, energy, environment

Mode of Occurrence of Trace Elements in Some Indian Coal

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Coal is the most important source of energy. In India about 70% of the total electricity generation is from coal-based thermal power plants; total estimated coal reserve is 255 billion tones. According to coal India vision-2025, its production in 2025 is projected to 1086 million tones against 384 million tones (2012-13). Coal contains most of the elements in the periodic table. Coal combustion is one of the important anthropogenic sources that release trace elements into the environment. Mobilization of elements is the major concern of ecosystems and health problems. Their release into surrounding environment largely depends on the modes of occurrence, which is defined as their distribution within coal. Mostly elements present in the mineral matter but some may be directly associated with the organic matter. In this paper an attempt has been made to understand the distribution of Ni, Mn, Cr, Cu, Pb and Zn in coal from east-central India (Mand-Raigarh coalfield), south India (Neyveli lignite) and north India (Rangit valley) representing distinct geological setting. Nickel and Cr are present in higher concentrations with respect to their world averages. Copper, Pb and Zn are associated mostly with sulphides and disulphides. Chromium preferably occurs with silicate minerals; Ni is nearly equally distributed in silicate, disulphides and sulphide minerals. Manganese primarily occurs as carbonates. Copper and Zn are mostly associated with organic part in lignite.

Keywords: Trace elements, Indian coal, Sequential Extraction

Modeling of Photovoltaic System and Design of MPPT Controller using PSO Algorithm

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This paper presents modeling and simulation of Grid Connected Photovoltaic (PV) system by using improved mathematical model. The model is used to study different parameter variations and effects on the PV array including operating temperature and solar irradiation level. In this paper PSO algorithm is proposed for MPPT control. This algorithm will identify the suitable duty ratio in which the DC-DC converter should be operated to maximize the power output. Photo voltaic array with proposed PSO-MPPT controller can operate in the maximum power point for the whole range of solar data (irradiance and temperature).

Keywords: Photovoltaic (PV), Maximum Power Point Tracking (MPPT), Boost converter, Particle Swarm Optimization (PSO).

A NEW SPECIES PHOREIOBOTHRIUM GAWALI FROM CARCHARIAS ACUTUS [MULLER AND HENLE, 1906] AT BANCOT, RATNAGIRI M.S.

R. R. Dandawate

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The Genus Phoriobothrium was erected by Linton 1889 to accommodate a Cestode recovered from Dusky Shark *Carcharias obscurus* at woodland hole with its type species *P. lasium* in 1901. Later he also reported *P. trioculatum* from *Carcharius obscurus* and also *P. exceptum* and *P. pectum* from *Carcharius obscurus* and *Carcharias acutus* (Muller & Henle, 1841;)¹ We have described this new species in the Genus Phoriobothrium (Linton, 1889)² collected from Bancot, Ratnagiri, west Coast of India. A new species of cestode Phoriobothrium gawali was erected from the marine *P. gawali* has been found different from other species in body measurement, scolex length, breadth, sucker, neck, testes, ovary, vagina, genital pore, vitellaria, host & locality.

Keywords: Dusky shark, Bothridia, Corticulator

Distribution and Conservation Status of Mammals in Mt. Diwata Range, Mindanao, Philippines

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Mt Diwata Range is a key conservation site located at the southern end of Agusan del Sur and Surigao del Sur Provinces in north-eastern Mindanao, Philippines. Fieldwork was conducted in five sampling sites at elevation of 206 to 1050 meters above sea level to assess the distribution and conservation status of mammals. Primary data were collected using a combination of mist netting and trapping methods. We documented 30 species comprising 17 volant and 13 nonvolant mammals. A high level of endemism (60%) was recorded. Of the 18 endemic species, four are Mindanao endemic. Species richness was highest in Site 2, the mixed primary-secondary forest in Mt. Sambilikan. Three threatened species were recorded comprising two vulnerable and one endangered species. Ten species were observed to be locally threatened due to hunting, food utilization, and habitat loss. Five species of non-volant mammals were considered socio-economically important, being utilized as food. Despite the present conversion of forest lands to agriculture and tree plantations, results indicate that the forest still hosts a considerable number of endemic and threatened species. However, actions need to be taken to conserve the remaining habitats.

Keywords: endemic, forest, threatened, nonvolant, volant

Poster Presentations

Poster Session

1	Environmental monitoring of wastewater sludge applied to soil on heavy metal accumulation and consequent responses of sunflower plant	Hosam E.A.F. BayoumiHamuda IstvánPatkó AndrásMedve Andrea Paukó
2	Biomass as a Source of Renewable Energy for Turkey	Turgut T. Onay BurakDemirel

Environmental monitoring of wastewater sludge applied to soil on heavy metal accumulation and consequent responses of sunflower plant

Hosam E.A.F. Bayoumi Hamuda¹, István Patkó², András Medve³, Andrea Paukó⁴

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Microorganisms play key of geoactive roles in the biosphere, particularly in biotransformation and biogeochemical recycling, bioweathering, soil formation and bioremediation of heavy metal contaminated soil and wastewater. Soil is an important natural resource that needs to be preserved and its quality and productive capacity improved. Microbial activities are considered as early indicator of changes in soil properties resulting from soil amendment. Municipal sewage sludge (MWS) uses in agriculture is an alternative disposal technique of waste. The impacts of heavy metal containing MWS on soil bioactivities were investigated in two agricultural soils of different textures at five different levels for eight weeks. In a pot experiment, high heavy metals content of MWS (Hódmezővásárhely, Hungary) at 0, 15, 30, 45 and 60% (w/w) was amended to two agricultural soils (clay loam brown forest soil; Gödöllő and chernozem meadow; Szeged) for eight weeks in greenhouse. Results indicated that microbial biomass carbon and nitrogen, CO₂-release and some enzymatic activities determined in fresh soil samples were affected by soil types and increased by organic matter (OM) application as well as the rate of heavy metals content in the MWS, also, the investigated parameters were higher in soil of Szeged than the soil originated from Gödöllő.

Keywords: soil biology, sunflower plants, wastewater sludge

Biomass as a Source of Renewable Energy for Turkey

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As fossil fuel energy sources deplete, both Turkey and Europe will face energy shortages, significantly increasing energy prices, and energy insecurity within the next few decades. In addition, Turkey's continued reliance on fossil fuel consumption will contribute to accelerating rates of domestic environmental quality destruction and global warming. Hydropower, biomass, biofuels, wind power, solar energy, and geothermal energy are the major resources to provide Turkey with most of its renewable energy in the future. Turkish renewable energy capacity can meet 13.2% of national energy needs, mainly in the form of combustible renewable and wastes, hydropower and other renewable energy sources. One of the most important renewable energy sources is biomass for Turkey. Biomass represents a significant share of total energy consumption in Turkey, despite a drop from 20% in 1980 to 8% in 2005. Bioenergy represents about the two-third of renewable energy production in Turkey. Total biomass potential was expected to be 16.92 Mtoe in 2008. However, advanced and innovative use is still immature because of technical and financial problems. In this study, a general discussion on biomass generation and its alternative utilization as renewable energy source is provided in terms of legal perspective and country's potentials.

Keywords: Biomass, Biogas, Renewable Energy Sources

Virtual Presentations

Virtual Session

<http://www.youtube.com/user/ICRDSRILANKA>

1	Diversity of data center cooling energy requirement based on locations with different climatic conditions within Sri Lanka	KasunAnjanaHewaMatarage VirajNimarshanaPemattuHewaRahulaAnuraAttalage
2	Influence of Pyrolysis Temperature on Biochar Produced From Slow Pyrolysis of Oil Palm Shell	AdilahShariff NurSyairahMohamad AzizNurhayati Abdullah
3	Vertical Distribution of Ambient NO ₂ in an Urban Area: Exposure Risk Assessment	M. Kalaiarasan K. W. D. Cheong K.W. Tham
4	Experimental and Analytical Modelling on Multi Effect Tubular Solar Still with parabolic trough	Joseph Stalin Barath Gokulamanikandan Ajith
5	Analysis Approach For Vertical Axis Wind Turbines	Abdul Akbar Mohammed Mustafa V

Diversity of data center cooling energy requirement based on locations with different climatic conditions within Sri Lanka

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Growth of data centers (DC) includes their size and required power density (Watts per square meter). Therefore they require more power for operation and cooling. Almost all of the current DCs use air as the cooling medium. Therefore cooling and humidification or dehumidification require considerable amount of energy. Also in tropical countries, there is a significant cooling load addition to dehumidify the cooling air. In Sri Lanka most of the DCs are located in the Colombo city area which is in the sea level. It is commonly observed that with the increase of altitude, the ambient temperature and humidity tends to decrease. Therefore cooling power requirement for DCs reduces in higher altitudes. This paper discusses the potential savings of cooling power if a DC is located in a higher altitude location where ambient air can directly or with less amount of cooling be used for cooling. Power consumption is calculated using numerical simulation and compared with results with results from an existing DC location. Benefits of power saving is compared with the potential complexities and associated costs elements.

Keywords:Data center, Cooling,Energy

Influence of Pyrolysis Temperature on Biochar Produced From Slow Pyrolysis of Oil Palm Shell

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Oil palm shell (OPS) is one of the oil palm wastes generated from the mill. It can be used to produce biochar via slow pyrolysis process. Slow pyrolysis is a suitable thermal energy conversion process to produce biochar from the OPS. The operating parameters of the pyrolysis process play important roles in the determination of the properties of the biocharproduced.The objective of this work is to investigate the influence of pyrolysis temperature on the yield and characteristics ofbiochar generated from laboratory-scale slow pyrolysis experiment. The properties of oil palm shell feedstock were investigated via proximate analysis, elemental analysis and high heating value determination. The OPS were pyrolyzed at 6 different pyrolysis temperature; 400°C, 450°C, 500°C, 550°C, 600°C and 650°C. Biochar produced from slow pyrolysis experiments were analyzed by proximate analysis, elemental analysis, scanning electron microscopy (SEM) analysis and Brunauer-Emmett-Teller (BET) surface area analysis.It was found the biochar yield decreases as the temperature elevated. The biochar with the highest fixed carbon content was produced at 550°C.

Keywords:Biochar, slow pyrolysis, oil palm shell

Vertical Distribution of Ambient NO₂ in an Urban Area: Exposure Risk Assessment

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The aim of the study is to perform a potential health risk assessment on children in contracting respiratory symptoms due to inhaling traffic-generated nitrogen dioxide (NO₂) in two typical high-rise naturally-ventilated residential building designs (slab and point block) located close to busy major expressways in a tropical climate. A total of six buildings were selected for the study. Ogawa passive samplers (PS-100) were used for NO₂ measurements in each building over a period of 5 weeks during the predominant monsoon seasons. Health risk assessment showed children residing at the mid floors of the buildings had the highest health risk regardless of their age .i.e. infants, children (1 year and under), children (8-10 years) compared to those residents residing at the high and low floors. This was expected since the highest concentration of traffic-generated NO₂ concentration occurred at the mid floors of the buildings. In a typical floor, children (1 year and under) had the highest followed by children (8-10 years) whilst new born infants had the least potential health risk in contracting respiratory symptoms. The reason might could be new born infants obtain passive immunity from their mothers and in children (1 year and under), the passive immunity fall during this age period as they are developing their very own immunity against respiratory symptoms. Children (8-10 years) had the their potential health risk to respiratory symptoms in between the other two age groups as these children could have developed more immunity against respiratory symptoms compared to the children (1 year and under) but less immunity compared to infants. Based on the mean overall HR values, children living in a slab block has about 1.27 times more risk in contracting a respiratory symptoms due to NO₂ inhalation compared to those living in a point block.

Keywords: Traffic-generated NO₂, Outdoor NO₂, Indoor NO₂, Health risk assessment, Slab block design, Point block design

Experimental and Analytical Modelling on Multi Effect Tubular Solar Still with parabolic trough

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Multi Effect Tubular solar still coupled with parabolic trough has been designed and fabricated. The thermal performance of the multi effect tubular solar still has been analysed with and without parabolic trough. In our research work, the temperatures of humid air, water, glass and cover in the multi tubular solar still are noted using thermocouple and the hourly yield of fresh water for the two basins are plotted. Solar radiation and ambient temperature are also noted in weather monitoring station in Madurai. The energy balance equations of water, trough, humid air and cover are balanced for inner and outer basin. Numerical analysis is done by varying different boundary values with maximum possible iterations. The proposed model was validated by taking readings in the experimental set up. The productivity is further increased by flowing water and also by passing air over the outer cover surface thereby increasing the overall efficiency of the system. The main parameters like water temperature, glass temperature and cover temperature for multi effect solar still with and without concentrator is compared. It has been observed that the calculated results had a good agreement with the field data resulting in a better efficient multi effect tubular solar still.

Keywords: multi effect tubular solar still, parabolic trough, hourly yield.

ANALYSIS APPROACH FOR VERTICAL AXIS WIND TURBINES

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Among renewable energy sources, wind energy is the fastest growing type. Among wind energy converters, Vertical Axis Wind Turbines (VAWT's) have received renewed interest in the past decade due to their easiness of getting integrated in to the urban landscape. The aerodynamics of Vertical Axis Wind Turbines (VAWT's) is more complex than their horizontal axis counterparts. In addition, the range of 3-D shapes possible with VAWT's is enormous. These reasons highlight the need of better analytical tools for the analysis of VAWT's. The current paper discusses a general form of Double Multiple Stream Tube Theory (DMST) that can be applied for the analysis of any general shaped VAWT. A method of defining the shape of even the most complex shaped VAWT is introduced whereby just by varying certain coefficient's any shape can be generated. The method utilizes a finite element type of an approach wherein the VAWT is divided into number of elements with each element analyzed as a conventional straight bladed VAWT. The modifications to DMST theory and its most general form based on the shape definition is discussed which can be implemented in algorithms for developing computer programs to predict the output of VAWT's closely.

Keywords: Renewable Energy, Green Energy, Vertical Axis Wind Turbine

