2014 SCIEI
Madrid, Spain
CONFERENCES PROGRAM

2014 The 5th International Conference on Mechanical and Aerospace Engineering (ICMAE 2014)

2014 The 3rd International Conference on Pure and Applied Mathematics (ICPAM 2014)

2014 International Conference on Energy and Environment Research (ICEER 2014)

Madrid, Spain
July 18-19, 2014

HOTEL CATALONIA GRAN VIA

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DAILY SCHEDULE OF EVENTS

17th	Registration (Lobby)	14:00p.m-18:00p.m
	PPT copy	14:00p.m-18:00p.m

July 18th | Friday | ROOM: Güell	Registration (Lobby)	9:00a.m-17:00p.m
	Opening Remarks: Prof. Dashnor Hoxha (Orleans University, France)	14:00p.m-14:10p.m
	Plenary Speech 1: Prof. Anh Dung NGO (École de technologie supérieure (U. du Québec), Canada)	14:10p.m-15:00p.m
	Plenary Speech 2: Dr. Ian McAndrew (Embry Riddle Aeronautical University, UK)	15:00p.m-15:50p.m
	COFFEE BREAK	15:50p.m-16:20p.m
	Plenary Speech 3: Dr. Ken Witcher (Embry Riddle Aeronautical University, USA)	16:20p.m-17:10p.m
	Plenary Speech 4 Prof. Dashnor Hoxha (Orleans University, France)	17:10p.m-18:00p.m
	BUFFET DINNER	18:30p.m-19:30p.m

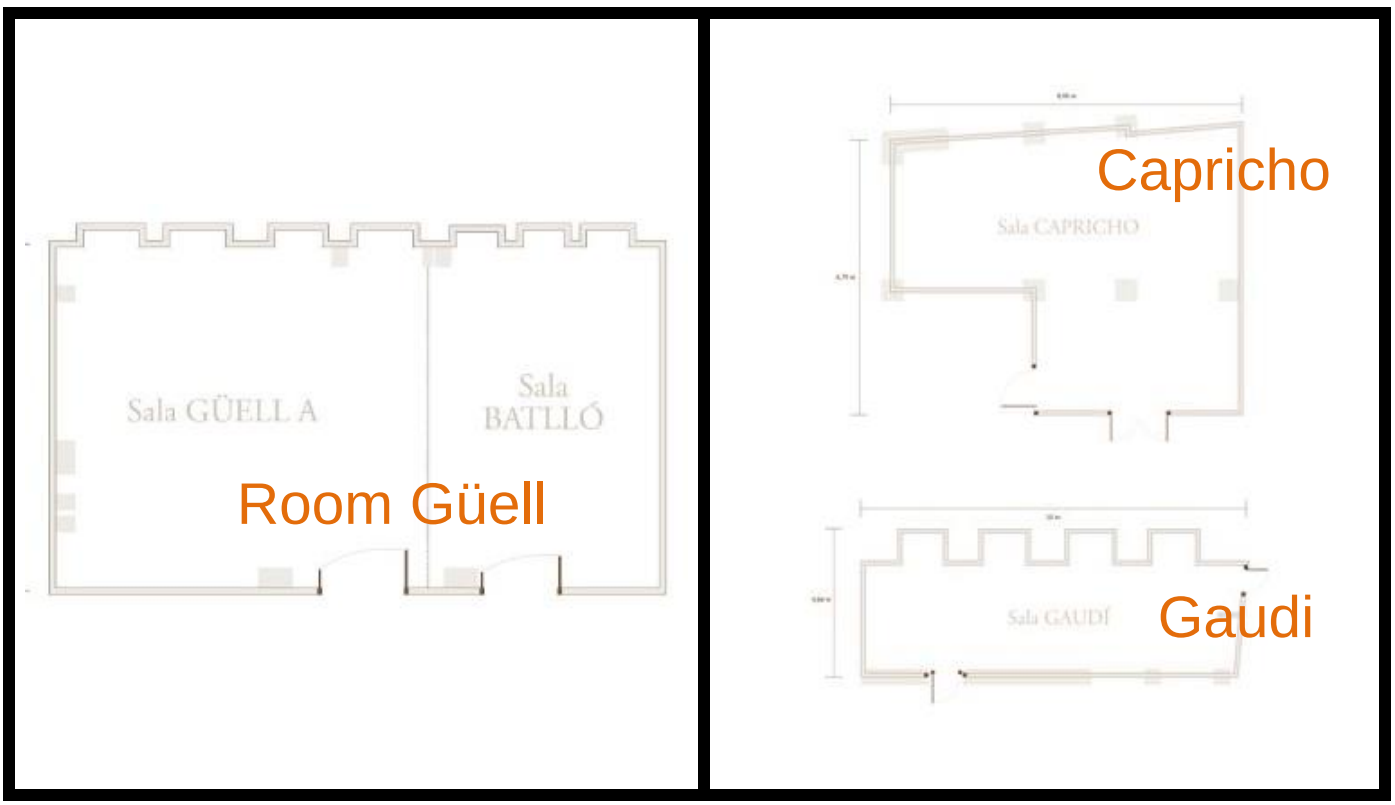
July 19th | Saturday | ROOM:Batlló	Registration (Lobby)	9:00a.m-17:00p.m
	Session 1: Civil Engineering and Industrial Engineering (ICMAE 2014-8)	8:30am-10:10am
	COFFEE BREAK	10:10am-10:30am
	Session 2: Gear and Electronic Circuit (ICMAE 2014-9)	10:30am-12:30pm
	BUFFET LUNCH	12:30pm-13:30pm
	Session 3A: General Mechanical Engineering and Information Technology (ICMAE 2014-6)	13:30pm-14:45pm
	BREAK	14:45pm-15:00pm
	Session 3B: General Mechanical Engineering and Information Technology (ICMAE 2014-6)	15:00pm-16:15pm
	COFFEE BREAK	16:15pm-16:30pm
	Session 4A: Air Mechanical Engineering (ICMAE 2014-6)	16:30pm-17:45pm
	BREAK	17:45pm-18:00pm
	Session 4B: Air Mechanical Engineering (ICMAE 2014-5)	18:00pm-19:00pm
	BUFFET DINNER	19:00pm-20:00pm

July 19th | Saturday | ROOM: Güell A	Registration (Lobby)	9:00a.m-17:00p.m
	Session 5: Advanced Materials Engineering and Processing Technologies (ICMAE 2014-9)	8:30am-10:10am
	COFFEE BREAK	10:10am-10:30am
	Session 6: Advanced Materials Engineering and Processing Technologies & Applied Mechanics (ICMAE 2014-10)	10:30am-12:30pm
	BUFFET LUNCH	12:30pm-13:30pm
	Session 7A: General Mechanical Engineering (ICMAE 2014-6)	13:30pm-14:45pm
	BREAK	14:45pm-15:00pm
	Session 7B: General Mechanical Engineering (ICMAE 2014-6)	15:00pm-16:15pm
	COFFEE BREAK	16:15pm-16:30pm
	Session 8A: General Mechanical Engineering (ICMAE 2014-6)	16:30pm-17:45pm
	BREAK	17:45pm-18:00pm
	Session 8B: General Mechanical Engineering (ICMAE 2014-6)	18:00pm-19:00pm
	BUFFET DINNER	19:00pm-20:00pm

July 19th | Saturday | ROOM: Capricho		
	Registration (Lobby)	9:00a.m-17:00p.m
	Session 9: Functions and Differential Equations (ICPAM 2014-7)	8:30am-10:10am
	COFFEE BREAK	10:10am-10:30am
	Session 10: Physics and Applied Mathematics (ICPAM 2014-7)	10:30am-12:10pm
	BUFFET LUNCH	12:30pm-13:30pm
	Session 11A: Electrical Engineering and Electric (ICMAE 2014-6)	13:30pm-14:45pm
	BREAK	14:45pm-15:00pm
	Session 11B: Electrical Engineering and Electric (ICMAE 2014-6)	15:00pm-16:15pm
	COFFEE BREAK	16:15pm-16:30pm
	Session 12A: Control and Automation of Manufacturing (ICMAE 2014-6)	16:30pm-17:45pm
	BREAK	17:45pm-18:00pm
	Session 12B: Control and Automation of Manufacturing (ICMAE 2014-5)	18:00pm-19:00pm
	BUFFET DINNER	19:00pm-20:00pm

July 19th | Saturday | ROOM:Gaudi		
	Registration (Lobby)	9:00a.m-17:00p.m
	Session 13: Energy & Modeling (ICEER 2014-8)	8:30am-10:10am
	COFFEE BREAK	10:10am-10:30am
	Session 14: Clean Energy (ICEER 2014-8)	10:30am-12:10pm
	BUFFET LUNCH	12:30pm-13:30pm
	Session 15A: Environmental Engineering (ICEER 2014-7)	13:30pm-14:55pm
	BREAK	14:55pm-15:05pm
	Session 15B: Environmental Engineering (ICEER 2014-7)	15:05pm-16:30pm
	COFFEE BREAK	16:30pm-16:45pm
	Session 16A: Electric Energy & Refrigeration Technology (ICEER 2014-5)	16:45pm-17:45pm
	BREAK	17:45pm-18:00pm
	Session 16B: Electric Energy (ICEER 2014-4)	18:00pm-19:00pm
	BUFFET DINNER	19:00pm-20:00pm

Floor Plans



July 17th- July 19th | Lobby

Gran Vía 9, 28013 Madrid, Spain | Tel. +34 91.531.22.22

July 17th	2:00p.m-6:00 p.m
July 18th	9:00a.m-5:00 p.m
July 19th	9:00a.m-4:00 p.m

Onsite Registration

Onsite Registration

July 17th- July 19th, 2014, / Lobby

Time	July 17th 14:00p.m-17:00p.m, July 18th 9:00a.m-17:00p.m, July 19th 9:00a.m-15:00p.m
Venue	HOTEL CATALONIA GRAN VIA
Staff	Celine Xi, Renne Gao, Cindy Lau
Add & Tel	Gran Vía 9, 28013 Madrid, Spain ｜ Tel. +34 91.531.22.22

*Collecting conference materials
**Delegates will get the certificate at the registration desk.
***The organizer won't provide accommodation, and we suggest you make an early reservation.

Your attention Please

**ICMAE 2014* conference papers were selected and will get published on relevant journals, which will not be available on conference site, and will be delivered to authors' address after conference.

**ICPAM 2014* conference papers were selected and will get published in International Journal of Modeling and Optimization (IJMO, ISSN: 2010-3697, DOI: 10.7763/IJMO), Authors can get the Journal onsite.

**ICEER 2014* conference papers were selected and published in Journal of Clean Energy Technologies (JOCET, Quarterly, 1793-821X, DOI: 10.7763/JOCET). Authors can get the Journal onsite.

**One best presentation* will be selected from each session; the winner will be announced at the end of the ses sion and awarded the certificate at the Dinner Party. The winners' photos will be updated on SCIEI official web site: www.sciei.org.

*Best Presentation will be evaluated from: Originality; Applicability; Technical Merit; PPT; English.

*If you didn't put a formal photo in your registration from, please take a formal one inch photo.

Instructions for Oral Presentations

Devices Provided by the Conference Organizer:

Laptops (with MS-Office & Adobe Reader)

Projectors & Screen

Laser Sticks

Materials Provided by the Presenters:

PowerPoint or PDF files

(Files shall be copied to the Conference Computer 10 minutes earlier before each Session)

Duration of each Presentation (Tentatively):

Regular Oral Session: about 13 Minutes of Presentation, including Q&A

Dress code

Please wearing formal clothes or national characteristics of clothing

July 18th| Friday | Güell

2:00p.m-6:00p.m

Opening&
Plenary Speeches

Plenary Speeches

July 18th, 2014, Wednesday 14:00 PM – 18:00PM/ Salón Güell

Opening Remarks Prof. Dashnor Hoxha Orleans University, France	14:00p.m-14:10p.m	ROOM Salón Güell
Plenary Speech 1 Prof. Anh Dung NGO École de technologie supérieure (U. du Québec), Canada	14:10p.m-15:00p.m	ROOM Salón Güell
Plenary Speech 2 Dr. Ian McAndrew Embry Riddle Aeronautical University, UK	15:00p.m-15:50p.m	ROOM Salón Güell
Coffee Break & Group Photo July 18th 15:50p.m-16:20p.m		
Plenary Speech 3 Dr. Ken Witcher Embry Riddle Aeronautical University, USA	16:20p.m-17:10p.m	ROOM Salón Güell
Plenary Speech 4 Prof. Dashnor Hoxha Orleans University, France	17:10p.m-18:00p.m	ROOM Salón Güell
Buffet Dinner	18:30p.m-19:30p.m	Restaurant

Abstract

Prof. Anh Dung NGO
École de technologie supérieure, Canada

The Accident Prevention on Press-Brake Operations in Manufacturing

Press-brakes are used in most manufacturing workshops for bending, forming, straightening, punching and trimming. Unfortunately, these versatile machines cause many accidents to workers, who in many cases, must hold the work piece too close to the dies, or must put their hands within the dangerous zones in order to keep up with the rate of production. It is known that the movement of the ram in hydraulic press-brakes can be stopped instantaneously at any time during the process. For this reason, only a protective system for hydraulic press-brakes is recommended.

A type of protective device is recommended in machine guarding standards consisting of an electro-sensitive protective device which uses an active protective optoelectronic device in the form of an immaterial barrier created by a light curtain. But their implementation still appears problematic and complex. In order to evaluate the feasibility and the safety of light curtains on a press-brake, a test bench has been constructed at the École de Technologie Supérieure. This test bench enables the simulation of the hazardous motions of a press-brake. The bending of work pieces is done manually on the test bench, using models made out of cardboard in the presence of a light curtain. The results show that the feasibility and the safety of a light curtain depend on the mode of operation which is selected and the geometry of the work pieces to be bent.

It has also been observed that most existing systems have a fixed interdiction volume, provoking stoppage of the press-brake whenever the hands of the worker enter this area. These protective systems cannot distinguish motions which are entering directed towards the cutting zone from motions aiming at the exterior of this dangerous zone. They are therefore too restrictive to meet production needs. In order to improve the flexibility of the protective system, it is necessary to develop a new one taking the motion of the worker's hands into account.

The proposed innovative solution consists of generating a flexible interdiction zone, whose dimensions and shape depend on the instantaneous velocity of the inspected point, the machine stopping time, and the calculation time of the

processing loop. The instantaneous motion of an inspected point on the worker's hand is tracked using camera sets giving different views. The machine is stopped whenever the inspected point interferes with the flexible interdiction zone. The interference between the inspected point and the flexible interdiction zone is verified using the spatial traversability vector. Two approaches relating to the number of inspected points are presented. The inspected point on the worker's hand is a single virtual point in the first principle, whereas several virtual points are in the second principle. The first approach deals with the processing time, while the second is aimed at improving the precision.

Dr. Ian McAndrew
Embry Riddle Aeronautical University, UK

Reliability in Aviation – Are pilots still needed?

In the early days of aviation the pilot and aircraft were considered a morganatic marriage. There were many incidences where one or the other caused concerns and disasters. These problems in most situations allowed for progress and development in design, use and training. The reliability of aircraft nowadays has advanced in incremental stages and UTOPS is an excellent example of the reliability changes and operational changes to flight. The majority of aviation commercial accidents nowadays are attributable to human error. In this presentation it is proposed that we are now at the point where we can seriously consider flight, both commercially, military and transportation as not only capable but should be without pilots based on aircraft or systems that are autonomous. These aspects will be discussed, argued and presented from both a passenger aspect an d design application.

Dr. Ken Witcher
Embry Riddle Aeronautical University, USA

Current status of the Unmanned Aircraft System (UAS) Industry within the United States and impact on future aerospace manufacturing.

Most industry experts agree utilization of Unmanned Aircraft Systems will experience significant growth globally. Within the United States, before this potential can be realized safe integration into the National Airspace System must be achieved and privacy issues must be addressed. Currently, early adoption is expected to relate to small UAS. Manufacturing and operations of these platforms will require different techniques and skills when compared to legacy manned platforms. Preparing future engineers and operators for these challenges will be the focus of this presentation.

Prof. Dashnor Hoxha
Orleans University, France

July 18th| Friday

Güell A/Batlló/Capricho/Gaudi

8:00a.m-19:00p.m

Oral Sessions

Poster Sessions

Oral Presentation Sessions

July 19th, 2014, Thursday 8:30 AM – 19:00PM/ Batlló

Session 1: Civil Engineering and Industrial Engineering
Time: 8:30am-10:10am; Room: Batlló
Session chair: Prof. Dashnor Hoxha
Orleans University, France

E031:
A Novel Technique for Dynamic Analysis of Beam-Like Structures on Tensionless Elastic Foundations Subjected to Moving Loads
Mr. Mostafa Attar Khorassani, Ali Karrech and Klaus Regenauer-Lieb
University of Western Australia, Australia

In this paper, a novel method is proposed to address the non-linear dynamic response of a beam-like structure supported by a tensionless foundation due to moving loads. A lattice spring model (LSM) is developed to describe the structure as a discrete assembly of particles interacting via shear and rotational springs while the tensionless foundation is simulated using a chain of one-way normal springs connecting the particles to the ground. The total time for the travelling load to traverse the beam is divided into a number of steps and the generalised explicit matrix equation can be solved for each time step to obtain the time-history response of the structure. An iterative procedure is adopted to obtain the correct sign of lateral displacement for all particles at each time step, which determines the lift-off regions throughout the beam.

E047:
Bicriteria Heuristic for Unrelated Parallel Machine Scheduling Problem
Assoc. Prof. Yang-Kuei Lin, and Hao-Chen Lin
Feng-Chia University, Taiwan

In this research, a bi-criteria heuristic is proposed to find non-dominated solutions for scheduling unrelated parallel machines with release dates that minimizes makespan and total weighted tardiness.

E057:
The Approach to the Noise and Vibration Management in the Power Products Design
Dr. Grzegorz Kmita, Kozupa Michal, Platek Robert, Krol Julita, Juszkiewicz Grzegorz
ABB, Corporate Research Center, Krakow, Poland

Design considerations related to noise pollution have become extremely important recently in many industries. Despite the wide range of applications and various noise spectrum the methodology remains quite common. The power products operating in the power systems are very often affected by a noise emission side effect and must be carefully designed with respect to the resulting noise emission and its influence on the surrounding environment consequently. Noise management, design concept examples as well as the modern techniques for noise sources characterization in transformers are presented in this paper.

E068:
Experimental and Numerical Analysis Applied on Steel Bars Cooling
Mr. Paul Silva, Paulo Seixas, Caroline Rodrigues and Rudolf Huebner
UFMG, Brazil

AISI 1020 steel bars cooling have been investigated aiming to obtain their cooling rate during heat treatment. Hot steel bars just taken out of the furnace are piled over other ones that were taken out of the furnace earlier. A mathematical model has been created and implemented using the software EES, Engineering Equation Solver. An experiment was conducted to validate the mathematical model. The experiment consists in three loads of three bars each with a time interval of 5 minutes between them. The initial temperature of each bar was 150 oC. The mathematical model can obtain the thermal profile of each bar and the average and maximum deviation when confronted with experimental data were about 8% and 20% respectively.

E1019:
A Game Theoretic Analysis on Cloud Manufacturing Model
Assoc. Prof. Chen Qiyu, Wu Zhiheng, Luo Liangchuan,and Tong Jigang
Institute of Mechanical and Electrical Engineering of Guangdong General Research Institute of Industrial Technology, Guangzhou 510651, China

As one of the new models of service of integrated manufacturing system, Cloud manufacturing (CM) is a service oriented, customer centric, demand driven manufacturing model. Application providers offer manufacturing services through the network, to make the cooperation among the participants of CM more effective. The behaviors of participants have great effect to the development of CM, especially in the beginning of its application. In this paper, we make analysis on interaction among all the participants of CM based on game theory, and give some suggestions to promote the application of CM.

E3016:
Guidance Solutions for Multiple Vehicle Assembly
Dr. Mohamed Okasha
Dept. of Mechanical Engineering, IIUM Univ., Kuala Lumpur 50725, Malaysia

This paper exploits the guidance algorithms to assembly multiple vehicle in close proximity. The objective is to move each vehicle in the assembly to its final location. The guidance laws are determined such that, each vehicle should attract to the others on long distances and avoid collision with them in short distances. These laws are based on Lyapunov's second method that utilize the potential function theory to insure the stability of the assembly process. Numerical investigations were performed for different configurations of the assembly. The proposed algorithms may prove useful for future mission applications such as satellite formation flying, structures assembly in space and mobile robots control.

E3020:
Corrosion of Reinforcing Bars Astm A706 in Self-Compacting Concrete Subjected to Chloride Attack and Carbonation
Assoc. Prof. Willian Aperador, Jairo Cortes and Julian Carrillo
Universidad Militar Nueva Granada, Colombia

Self-compacting concrete is characterized as a system that has a mix design that increased strength and reduced amount of empty space within material. Reinforced concrete structures exposed to carbonation and chloride ion, are exposed to environmental conditions that cause degradation. Concrete were exposed to an accelerated carbonation test (3% CO2, 65% relative humidity, and 25 º C temperatures) and next it was tested under complete immersion, in 3.5 wt. % NaCl solution. . Monitoring of open-circuit potential, polarization resistance measurement and electrochemical impedance spectroscopy were used to evaluate the corrosion behavior of steel bar.

E4021:
Stochastic Models in Preventive Maintenance Policies
Mr. Onur Gölbaşı and Nuray Demirel
Middle East Technical University, Turkey

In recent decades, philosophy behind maintenance has varied consistently due to the changes in complexity of designs, advances in automation and mechanization, adaptation to the fast growing market demand, commercial computation in the sectors, and environmental issues. In mid-forties, simplicity of designs, limited maintenance opportunities, and immaturity of trade culture made enough to perform only fix it when it broke approach, i.e. corrective maintenance, after failures. Last quarter of the 21th century made essential to constitute more conservative and preventive maintenance policies in order to ensure safety, reliability, and availability of systems with longer lifetime and cost effectiveness. Preventive maintenance can provide an economic saving more than 18% of operating cost of systems. In this basis, various stochastic models were proposed as a tool to constitute a maintenance policy to measure system availability and to obtain optimal maintenance periods. This paper presents a general perspective on common stochastic models in maintenance planning such as Homogenous Poisson Process, Non-Homogenous Poisson Process, and Imperfect Maintenance. The paper also introduces two common maintenance policies, block and age replacement policy, using these stochastic models.

10:10-10:30 COFFEE BREAK

Session 2: Gear and Electronic Circuit
Time: 10:30am-12:30pm; Room: Batlló
Session chair: Dr. Ken Witcher
Embry Riddle Aeronautical University, USA

E007:
Influence of Power on the Microstructure and Optical Properties of Microcrystalline Si Films
Dr. Hua Cheng, Feng Jiang, Changzheng Ma, Kuo Jiang
Changchun Institute of Engineering Technology, China

Microcrystalline silicon films were deposited using Ar diluted SiH4 gaseous mixture by electron cyclotron resonance plasma-enhanced chemical vapor deposition (ECR-PECVD). The effects of power on microstrcture and optical properties of microcrystalline silicon films were investigated. The results show that, with the increasing of the power, the crystallinity increased, but the concentration of hydrogen decreased monotonously. Furthermore, the absorption coefficient of the films increased monotonously, and the optical bandgap changed from 1.89eV to 1.75eV with the microwave power ranging from 400 W to 650W.

E036:
Experimental Validation of the Modified Continuously Variable Command Law of a Semi-Active Suspension Integrating a Magneto-Rheological (MR) Damper
Mr. Said Boukerroum and Nacer Hamzaoui
USTHB, Laboratoire de Mécanique Avancée (LMA)，Algeria

The present work consists of an experimental performances analysis of a suspension system with two degrees of freedom governed by a semi-active modified continuously variable command (MCVC) law. The internal dynamics of Magneto-Rheological (MR) damper used in this study is highlighted by the modified Bouc-Wen model in the mathematical modelling of the secondary suspension system. After the dynamic characterization of the MR damper, a comparison of performance obtained by this control scheme is carried out from the responses calculated using a numerical model and measured experimentally from a test bench of a semi-active

suspension incorporating an MR damper and controlled by a dSPACE control chain.

For a better representativeness of the modified Bouc-Wen numerical model, a rapprochement between the calculated and measured responses for the same dynamic characteristics of the test bench is possible by adjusting the most influential parameters of the numerical model. Through better management of the suspension during the low speeds, the modified Bouc-Wen model is more representative of the real behaviour of the MR damper, given its sensitivity at these low speeds during transitions between compression and expansion phases of the damper.

E095:
Real-Time Monitoring of Harmonic Currents: A Case Study of a Shopping Center
Assoc. prof. Paiboon Nakmahachalasint and Suwicha Buain
Thammasat University, Department of Electrical & Computer Engineering, Thailand

This paper presents a case study for the design and implementation of real-time harmonic monitoring at the main 3-phase 4-wire distribution system in a shopping center. The implemented monitoring system automatically acquires real-time data from a power-quality measuring instrument over Ethernet connection. The acquired data are subsequently stored in a database and can be retrieved for further processing and analysis. As a result, harmonic currents of all three phases and a neutral can be monitor up to 31st order.

E0117:
On the Physical Mechanism of the Interaction of Themicrowave Radiation with Thesemiconductor Diodes
Assoc. Prof. V. V. Shurenkov
National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), Russian Federation

The electronic systems of aerospace techniques include power microwave devices and analog and digital semiconductor devices. The radiation of power microwave devices may effect on the semiconductor devices. So it's necessary to know the electromagnetic effects of this radiation on the semiconductor devices. The electromagetic effects of the microwave radiation exposure on the semiconductor diodes, the main part of any semiconductor devices, are considered. The changes of current – voltage characteristics of the diodes are explained, outgoing from the model of the recombination of carriers through deep energy level recombination center in forbidden gap induced by microwave radiation field.

E0139:
Near-Field Beamforming Source Localization for Gear Transmission in a Semi-Anechoic Room
Dr. Derouiche Abbassia
Université des Sciences et de la Technologie Houari Boumediene (USTHB, Algiers)

In this study, we discussed the sound sources localization and characterization for a spur gear transmission, which deals with a vibro-acoustic surveillance for predictive maintenance. The technique uses is based on the near-field Beamforming using Bartlett and Capon estimators. The measurements done on the gear transmission with a rectangular phased array of microphones were performed in acoustics and vibration laboratory (LVA) of the INSA of Lyon, in a semi-anechoic room. The gear transmission was considered sometimes open and sometimes closed. The results are presented as an image showing the acoustic field distribution radiated by the gear transmission at the most energetic frequencies. Both estimators have satisfactory results, but even better for the method with high resolution capon.

E3005:
Acoustic Optimization Design Method of Gear System
Dr. Zeyin He, Tengjiao Lin, Wen Liu and Bo Liu
State Key Laboratory of Mechanical Transmission, Chongqing University, China

The Response Surface Method (RSM) and Simulated Annealing Algorithm (SAA) are utilized to analysis and optimize the vibro-acoustic properties of gear system. A simple case is illustrated to demonstrate the capabilities of the acoustic optimization design method. The results show that the method of acoustic optimization design based on RSM and SAA can effectively reduce radiation noise, and provide theoretical fundament and guidance for further study on acoustic optimization design of complicated gear system.

E3008:
The Synthesis of the Robust Stabilization System of Cable Tension for the Test Bench of Weightlessness Simulation
Dr. Tatiana Ezangina, Sergey Gayvoronskiy
National Research Tomsk Polytechnic University, Russia

The structure of the robust stabilization system of cable tension for the test bench of weightlessness simulation was developed. The algorithm of a parametric synthesis of the robust PI–controller based on the coefficient method and the criterion of maximum degree of stability was suggested. The operability of the synthesized robust system was confirmed by the results of digital simulation.

E4011:
Numerical Simulation of Powered High-Lift Flow
Dr. Zhibin Gong, Jie Li, and Bin Tian
School of Aeronautics, Northwestern Polytechnical University, Xi'an, Shaanxi, 710072, P. R. China

The externally blown flap (EBF) is an approach of powered lift technology utilizing conventional wing

mounted engines to blow exhaust over the flaps surfaces. Based upon the multi-block point-matched structured grid generation techniques, three-dimensional Reynolds-Averaged Navier-Stokes (RANS) computational analysis of a high-lift configuration with and without externally blown flap jet effects is conducted in this study. Insights on the changes of the space flow characteristics around the flaps, the surface pressure distributions as well as the aerodynamic forces are presented. The predictive capability of the RANS method for powered lift characteristics is assessed.

E4017:
Modeling and Analysis of Kinetic Characteristics of a Gear-Linkage Mechanism
Assoc. Prof. Xiang Zhang, Cunyun Pan, Hu Chen, Weiyang Zhang, Wenbo Zhang
College of Mechatronics Engineering and Automation, National University of Defense Technology, China

A gear-linkage mechanism, composed of a planetary gear mechanism and a four-bar mechanism, has the characteristic of step-cyclical output rotation under a reasonable geometric parameters. The analysis of stepping movement of the base unit and the motion characteristic of the combined mechanism was made, and the parameter equation was figured out. Motion simulation was carried out to analyze the influence of transmission ratio on the variation of the output shaft angular displacement, which proved that the output steps was in correspondence with , and as value of increasing, the rollback of the output motion was more apparent. The gear-linkage mechanism can be applied to engines, pumps and compressors.

12:20-13:30 BUFFET LUNCH

Session 3A: General Mechanical Engineering and Information Technology
Time: 13:30pm-14:45pm; Room: Batlló
Session chair: Dr. Simon M Barrans
University of Huddersfield, UK

E006:
Hybrid Hidden Markov Models and Neural Networks based on Face Recognition
Dr. Mingqian Wang, Dabing Gao, Zuoxin Hong, Qiang Gao
Changchun Institute of Engineering Technology, China

In this paper, the basic principles of HMM, HMM studied three major issues need to be addressed as well as overflow problems in the practical application of how to solve the HMM. Because artificial neural network (ANN) with anti-noise, adaptive, learning ability, recognition speed, etc., taking into account the characteristics of the common features of speech recognition and pattern recognition and artificial neural networks have, this article will get a mixed combination of HMM in ANN model, using ANN to make up for some deficiencies of HMM. Experiments show that the hybrid model recognition rate than the HMM model increased by 4%, but the algorithm still has many defects to be resolved.

E029:
Application of Differential Quadrature Method to Heat Transfer and Entropy Generation Problems
Melih Fidanoglu, Guven Komurgoz, Ibrahim Ozkol
Istanbul Technical University, Turkey

In this study, the entropy generation due to the flow of a gravity-driven laminar viscous incompressible fluid through an incline channel is investigated. Fully developed flow field is solved for a Newtonian fluid. Then, the temperature field is numerically resolved using Differential Quadrature Method (DQM) subject to isothermal boundary conditions on the walls and constant rectangular profile at the inlet. The result of DQM is compared to analytical solution and method of lines (MOL) numerical method. Rate of entropy generation is found and its relation with temperature and velocity field is examined.

E035:
Constitutive Models for Uniaxially-Post-Buckled Square Lattices
Mr. Edgar Alejandro Flores Parra and Alessandro Spadoni
École polytechnique fédérale de Lausanne, Switzerland

The objective of this paper is to analyse the mechanical stress-strain response of an ini- tially uniaxially-post-buckled periodic structure. This requires selecting a representative volume ele- ment (RVE) that contains all the micro-structural features and responds as the infinite medium when subjected to uniform load and boundary conditions. Selection is done by analysing the stress-strain response for macro-cells of increasing size as well as identifying dominant length scales with a 2D- FFT. For a uniaxially–post buckled square lattice, the RVE is found to be a Y_{3x3} (3x3 unit cells for the undeformed configuration). A study for the post-buckled behaviour of the pre-stressed RVE, with in- ternal components modelled as long slender beams, beyond elastic buckling is presented. Incremental constitutive models are then formulated analytically and numerically for loads above the critical load.

E069:
Symbolic Trajectory Description using Frescoes
Prof.Vladimir Popov
Ural Federal University, Russia

Investigation of symbolic representations of environments plays an important role for solution of various problems of robot visual navigation. In this paper, we study methods of symbolic trajectory description for mobile robot navigation. For this purpose, we use the fresco approach. We consider the problem of salient frescoes selection. In particular, we consider various

modifications of the Levenshtein distance method. Also, we use different circular strings methods.

E089:
Experimental and Numerical Analysis of a Ladle Teeming Process
Bruno Ribeiro, **Prof. Leandro Oliveira** and Roberto Tavares
Department of Mechanical Engineering,Universidade Federal de Minas Gerais, Brazil

In the continuous casting process, significant amounts of molten steel are left in the ladle during teeming as an established practice to avoid vortexing funnel formation in the end of the teeming process, preventing the ladle slag to be carried over to the tundish. Thus, it was the objective of this work to experimentally and numerically analyze the funnel formation in ladle teeming process. Experiments were designed and carried out to verify the numerical results.

E096:
Analysis of Variable Viscosity Channel Flow under Constant Magnetic Field via Generalized Differential Quadrature Method
Elgiz Baskaya, Guven Komurgoz, Ibrahim Ozkol (**Melih Fidanoglu**)

In this work, the application of Generalized Differential Quadrature Method (GDQM) to solve a variable viscosity channel flow under constant magnetic field is investigated. The governing equations for channel flow in between two infinite horizontal parallel porous plates subject to convective surface boundary conditions are given in dimensional and non-dimensional forms, pointing out the dimensionless parameters used. These equations are discretized using the GDQM, and solved via Newton Raphson Method. Effects of magnetic field on incompressible electrically conducting fluid velocity and temperature profiles are presented in plots.

14:45-15:00 BREAK

Session 3B: General Mechanical Engineering and Information Technology
Time: 15:00pm-16:15pm; Room: Batlló
Session chair: Dr. Simon M Barrans University of Huddersfield, UK

E0155:
Aeroacoustics Investigation of an Automotive Exhaust Muffler
Mr. Fabrício Torres Borghi, Jose Barros e Ramon Molina Valle

Traffic is a major source of environmental noise in modern society. Subsequently, the development of new vehicles is subjected to heavy governmental legislations. The major noise source on common road vehicles during acceleration is the flow noise caused by turbulent exhaust gas. The main goal of this work is to develop an appropriate Aeroacoustic simulation method to investigate the acoustic of sound on exhaust automotive muffler. The range of validity of the method is studied comparing results to experimental data. The Computational Aeroacoustics (CAA) results are compared with an experimental test in a vehicle during its acceleration and the mean flow model of the muffler has a satisfactory mesh with a suitable inlet boundary provided by an engine dynamometer data. The present work describes a good agreement between computational and experimental approach for the Aeroacoustics behavior of a specific configuration of exhaust muffler.

E0112:
Computational Studies of Turbulent Flows in Rotating Radial and 200 Backward Swept Diverging Channels
Dr. Nitheesh George and M. Govardhan
Ms Scholar, Indian Institute of Technology, Madras, Chennai, India

Computational study is carried out in radial and 200 backward swept diverging channels rotating about the axial direction. Centrifugal and Coriolis forces, which are developed due to the rotation, affect the secondary flows and flow pattern inside the channel. Reynolds number of Re=36000 with Rotation numbers ranging from 0.0 and 1.5 are chosen for investigation. The variation of velocity and turbulence kinetic energy is studied at several locations of the curved channels. Positive Richardson numbers on the suction side indicates stabilizations of the flow. The stabilization effect increases with increasing Rotation numbers at both the channels.

E0147:
SOA-Cloud Computing Based Fast and Scalable Simulation Architecture for Advanced Flight Management System
Dr. Dachuan Li, Qing Li, Nong Cheng, Jingyan Song
Tsinghua University, China

This paper presents a SOA and cloud computing based architecture for the distributed simulation of advanced flight management system (FMS). The architecture is designed to facilitate the fast simulation, validation and evaluation of different FMS system designs and functionalities with customized system configurations and widely varying aircraft equipage levels under various operation conditions. It is also intended to accommodate the potential evolutionary extensions of new avionics concepts and functionalities such as the future CNS/ATM and 4-D trajectory based technologies. To address the requirements of flexibility, scalability and reusability, the design of the simulation architecture takes advantage of the cloud computing and service oriented architecture (SOA) and the key enabling technologies are developed: simulation unit service encapsulation, simulation agent technology and simulation orchestration. Based on the proposed architecture associated technologies, the simulation components are encapsulated as services or accessed through agents, and the configuration of different FMS system frameworks and simulation tasks

can be achieved through simulation orchestration. A prototype avionic simulation system that implements the SOA/cloud computing architecture is developed and illustrated with application cases. The applications demonstrate that the proposed architecture enables fast and scalable simulation of both existing and new FMS design and technologies.

E1018:
Surface Morphology and Deformation Mechanism of Single Crystal Copper Treated by Laser Shock Peening
Ms. Yuanxun Liu, Xi Wang, Xianqian Wu, Chenguang Huang
China Academy of Engineering Physics, China

To study the relation between surface morphology and deformation mechanism of the target material under the shock, a flexible boundary loading, in laser shock peening (LSP), the macroscopic and microscopic surface morphology of a single crystal copper treated by LSP was investigated. The optical profilometer shows a 200-μm-deep pit forms on the shocked surface under LSP. The optical microscopy shows a set of parallel slip bands appear at the center of the shocked region and many vertical cross slip bands appear at the edge of shocked region. This indicates a large plastic deformation occurs by means of slip for the single crystal copper under LSP and the distributing features of slip bands correspond to the spatial distribution of the shock pressure. The results confirm that the surface morphology of materials under LSP can reflect the deformation mechanism and it can be a new method of studying the deformation mechanism of materials under LSP.

E3017:
Best Attack Position Model for BVR multi-target Air Combat
Dr. Rong Yang, Fangming Huang, and Huanjun Gong
The 28th Institute, CETC, Nanjing, Jiangsu, China

Refer to the characteristics of BVR air combat and multi-target attack for the Fourth Generation Fighters, this paper constructs and computes the model of probability distributions in multi-target kill zone, the model of the best attack path/attack position of multi-target attack. The model of probability distributions in multi-target kill zone considers heading angle and approaching angle of target, distance between fighter and target, maximum off-boresight launching angle and killing angle. The model of the best attack path/attack position considers damage probability to targets by missiles, threat degree to fighter of targets, and threat degree to fighter of residual targets. The paper calculates the simulation data according to the models, analyzes probability distributions in multi-target kill zone of missiles, the best attack path/attack position. The models and simulated results show that the method, which uses kill zone probability model, can improve the damage probability and reduce threat degree from enemy targets.

E4020:
State-Space Rotor Aeroelastic Modeling for Real-Time Helicopter Flight Simulation
Mr. Riccardo Gori, Francesca Pausilli, Marilena D. Pavel and Massimo Gennaretti
University Roma Tre, Italy

This paper introduces a new approach for the identification of linear state-space models of dynamical systems of arbitrary complexity. The identification procedure is described and applied for modeling aeroelastic response of helicopter main rotors. With the aim of developing a tool that might be conveniently applied for real-time simulations of helicopter flight dynamics, the state-space model considered is a reduced-order description of loads transmitted to the airframe due to hub motion and blade pitch controls. In order to validate the proposed approach, loads from the state-space, reduced-order model are compared with those predicted by the complete full-state, nonlinear rotor model for prescribed helicopter maneuvers.

16:15-16:30 COFFEE BREAK

Session 4A: Air Mechanical Engineering
Time: 16:30pm-17:45pm; Room: Batlló
Session chair: Assoc. Professor Salma Barboura LSPM –University Paris 13, France

E010:
The Effect of Gust on Blended-Wing-Body Civil Aircraft
Ms. Cai Chenfang, Wu Jianghao and Liang Bin
China Aerospace Science and Technology Corporation, China

In this paper, aerodynamic properties of Blended Wing Body (BWB) civil aircraft are studied by two models: one calls complete model that is computed by numerical simulation coupling equations of motion with the Navier-Stokes equations, and the other doesn't consider the equations of motion (without dynamic response). The results show that the model without dynamic response can also correctly predict the trend of the dynamic properties compared with complete model. Nevertheless, there are some quantitative differences existing between the complete model and the model without dynamic response.

E015:
Numerical Experiment of a Symmetrical Airfoil with Attack Angle of 5 degrees in Fluctuating Relative Flow Velocity
Assoc. Prof. Yoshifumi Yokoi and Hiromi Fukuta
National Defense Academy of Japan, Japan

In this study, a numerical experiment was performed as what obtains relative velocity fluctuation by oscillating an object with comparatively large amplitude in the direction of flow. Follow pattern and instantaneous fluid force around an In-line forced oscillating symmetrical airfoil (NACA0012) with attack angle of 5 degrees caused

not separation in stationary situation were investigated using a vortex method at the Reynolds number Re=4.05×105, in ranges of the oscillation amplitude ratio 2a/c=0.5,1.0,1.5 and 2.0 and the oscillation frequency ratio f/fK=0.25,0.5,1.0 and 2.0 (here, a :half-amplitude of oscillation, c :chord-length, f :oscillation frequency, fK :natural Karman vortex shedding frequency from a stationary airfoil with the attack angle of 90 degrees). As a result of calculations, Separation was observed by oscillating condition even if it was the airfoil of attack angle not separating. It is found that the separation was dependent on the velocity ratio. The characteristics of fluid force are changed by oscillation.

E032:
Parametric Aircraft Design Optimisation Study Using Span and Mean Chord as Main Design Drivers
Mr. Pedro Albuquerque, Pedro Gamboa and Miguel Silvestre
University of Beira Interior, Portugal

The present work describes an aircraft design methodology that uses the wingspan and its mean aerodynamic chord as main design parameters. In the implemented tool, low fidelity models have been developed for the aerodynamics, stability, propulsion, weight, balance and flight performance. A Fortran® routine that calculates the aircraft performance for the user defined mission and vehicle's performance requirements has been developed. In order to demonstrate this methodology, the results for a case study using the design specifications of the Air Cargo Challenge 2013 are shown.

E039:
Wind Tunnel Study on a Missile with Forward-facing Cavity in Supersonic Flow
Mr. Jiang Zhang, Xiaojun Pan, Jingang Dong, Yongming Qin and **Mr. Handong Ma**
China Academy of Aerospace Aerodynamics, Beijing, China

A forward-facing cavity will be composed of the components of a scramjet from inlet to combustion chamber which has a uncovered inlet before the separation of the booster. Longitudinal oscillations are generated within the cavity under some certain flow conditions. Strong oscillations may damage the components of the scramjet, or induce bow-shock oscillations which may cause unsteady loads on the missile and affect the performance of the aerodynamical characteristics. An experimental study of missile model with a scramjet was conducted in a transonic wind tunnel. The characteristics of cavity flow were researched by both the dynamic force measurement and the fluctuation pressure measurement. In the experiments the oscillations within the cavity and the bow-shock in front of the inlet interacted. The oscillations of cavity flow and bow-shock affected the fluctuation pressure and the aerodynamical characteristics of missile remarkably. The amplitude of axial force was higher than the normal force's. The RMS of the fluctuation pressure of some measured place inside the scramjet reached a quarter of the total pressure, and the amplitude of the fluctuation reached half of the total pressure. Those might threaten the safety of the structure of the scramjet.

E049:
Estimation Mass of the Aircraft Wings with the Multidisciplinary Process
Mr. Fayssal Hadjez and Brahim Necib
laboratoire de ginie mécanique constantine, Algeria

The purpose of this project is to study and practice the techniques discussed in multidisciplinary courses aeronautical structure and load calculations to estimate the mass of an aircraft wing. The model studied is the Airbus A320. We first describe the characteristics of the wing of the aircraft. We will then study the aerodynamic forces, their distribution in the wings and aerodynamic load cases. In the next section, we will calculate the stresses induced by the bending of the wing and deduce the thickness of coatings that resist buckling. We also do a sensitivity analysis on the pitch of the ribs and stiffeners. Then, we will model the wing in SolidWorks and we will issue the card with Nastran constraints. Finally, we will provide our comments on the orders of magnitude obtained and the assumptions made the means to implement must be substantial to obtain an accurate result. The challenge of this project is to model the wing sufficiently wise to obtain an order of magnitude closer to reality. We consider an error of 15-20 % compared to the actual weight of the wing is suitable as part of a project like this [1].

E051:
Effect of Reduced Frequency on Longitudinal Oscillatory Derivatives of an Airfoil Based on Wind Tunnel Data
Asst. Prof.F. Rasi Marzabadi, and R. Kamali Moghaddam
Astronautics Research Institute, Iranian Space Research Center, Iran

Longitudinal dynamic derivatives of an airfoil oscillating in pitching and plunging motions were calculated using variation of pitching moment coefficients with angle of attack in various conditions, based on wind tunnel data. The effect of reduced frequency on variation of longitudinal oscillatory derivatives was investigated, in three different regions of oscillation: before, over and post stall conditions. The results showed that reduced frequency has significant effects on longitudinal oscillatory coefficients in different conditions for both types of oscillations.

17:45-18:00 BREAK

Session 4B: Air Mechanical Engineering
Time: 18:00pm-19:00pm; Room: Batlló
Session chair: Assoc. Professor Salma Barboura
LSPM –University Paris 13, France

E053:
Improvement Design of the Insulation Structure of High Temperature Pneumatic Duct System of the Aircraft
Dr. Shi Hong, Jiang Yanlong , Peng Yin and Cai Yufei
Jiangsu University of Science and Technology, China

Based on the study of the duct leak detection system of commercial aircraft in existence, the insulation structure of high temperature pneumatic duct system of the aircraft is improved with multilayer insulation method and its engineering calculation method is derived. Also, the insulation experiment platform of the high temperature pneumatic duct system is built to verify the applicability and feasibility of the engineering calculation method. The research result shows that the results from the engineering calculation method are not fit the experimental data perfectly, the margin of error is 17 percentage. The main reason is that the diversion tunnels have a little effect on the temperature distribution and in these cases parameter modification method should be adopted in the engineering calculation method. These works would be helpful for the design and optimization of the high temperature pneumatic duct system.

E074:
Aerodynamic and Performance Analysis of Representatives of One Century of Low-Speed Aircraft
Mr. Luciano Barbosa and Paulo Oliveira
UFMG, Brazil

This work presents a comparative study of aerodynamic and performance characteristics of relevant examples of low speed aircraft that have been built and flown between 1890 and 1990. As speed is related to aircraft mass and wing loading and power, the aircraft analyzed present low weight, low wing loading and low power. To generate this study a set of tools have been developed, which are specifically aimed to slow and light aircraft. One additional goal of the study is to obtain a consistent reference data basis - by using the developed tools to analyze existing aircraft - prior to use these tools in new designs with the features of low speed, low wing loading and low power.

E099:
Study on Flame Spread over Aviation Kerosene and Diesel
Dr. Manhou Li, Shouxiang Lu, Jin Guo and Kwok-Leung Tsui
University of Science and Technology of China, China

Flame spreading over liquid fuels is a common phenomenon involving in accidental fuel leakage in aircraft crash or oil tanker which may result in many casualties and economic losses. Comparative experiments are conducted concerning flame spread over aviation kerosene (RP5) and 0# diesel at a variety of initial fuel temperatures. The threshold value of initial fuel temperature for liquid-phase and gas-phase controlled flame spread is approximately 17 °C larger than liquid's flashpoint for both oils. For a given initial fuel temperature, due to low volatility and ignitability of 0# diesel, its flame spread rate is smaller than that of RP5, while the length of the horizontal subsurface convection flow is larger. Given the difference in flame speed, fire accidents for RP5 are potentially more hazardous than those of 0# diesel. Moreover, the variation trend of subsurface convection flow length falls nearly linearly with the initial fuel temperature for both fuels.

E0135:
Flight Loads Analysis of a Maneuvering Transport Aircraft
Dr. Hui Zhang, Jie Li, and Qiong Liu
Northwestern Polytechnical University, China

The paper provides a method applicable for the determination of flight loads for maneuvering aircraft, in which aerodynamic loads are calculated based on doublet lattice method, which contains three primary steps. Firstly, non-dimensional stability and control derivative coefficients are obtained through solving unsteady aerodynamics in subsonic flow based on a doublet lattice technical. These stability and control derivative coefficients are used in second step. Secondly, the simulation of aircraft dynamic maneuvers is completed utilizing fourth order Runge-Kutta method to solve motion equations in different maneuvers to gain response parameters of aircraft due to the motion of control surfaces. Finally, the response results calculated in the second step are introduced to the calculation of aerodynamic loads. Thus, total loads and loads distribution on different components of aircraft are obtained. According to the above method, abrupt pitching maneuvers, rolling maneuvers and yawing maneuvers are investigated respectively.

E1017:
Vacuum Degree Measuring Technique and its Development Tendency Inside a Satellite in the Thermal Vacuum Test
Prof. Zhongxu Xu, Yue Wu, and Chunlin Du
Beijing Institute of Spacecraft Environment Engineering (BISEE), China

In order to avoid vacuum discharge, it is necessary for the satellite to have real-time monitoring by the vacuum degree of the electrical components that are sensitive to vacuum degree in the process of the thermal vacuum test. This paper introduces two methods of measuring vacuum degree inside the satellite, makes an analysis of failure mechanism of ionization gauge method, and offers suggestions for improvement.

Oral Presentation Sessions

July 19th, 2014, Thursday 8:30 AM – 19:00PM/ Güell A

Session 5: Advanced Materials Engineering and Processing Technologies
Time: 8:30am-10:10am; Room: Güell A
Session chair: Prof. Anh Dung NGO
École de technologie supérieure, Canada

E046:
Prediction of long-term compression strength for quasi-isotropic CFRP laminates
Dr. Jun Kang, Zhun Liu, Xing Li, Junwu Mu, and Zhidong Guan
Beihang University, China

Long-term strength prediction method is developed based on three theories: accelerated testing methodology (ATM), strain invariant failure theory (SIFT) and progressive damage analysis (PDA). It can predict the strength and damage at a given failure time. Net resin 5228A was experimented by dynamic mechanical analysis and static tensile loading under various temperatures to determine the time-temperature shift factors and master curve of Young's modulus. Unidirectional laminates of CCF300/5228A were tested under different temperatures to calculate the SIFT/ATM critical parameters. Long-term strength of quasi-isotropic composite laminates (QIL) was predicted. Good agreement between numerical results and experiments is observed, which demonstrates the applicability of this method.

E078:
Numerical modeling to determine test conditions of shear blanking test for a hybrid material
Mr. Thaneshan Sapanathan, Raafat Ibrahim, Shahin Khoddam and Saden Zahiri
Monash University, Australia

A dedicated blanking test (DBT) was designed to measure the bonding shear strength of a metallic hybrid sample. To identify the required design parameters of the rig, a macro numerical model was developed using Abaqus Finite element (FE) package. Copper clad aluminum hybrid samples fabricated by an axi symmetric forward spiral composite extrusion (AFSCE) process were analyzed using the developed numerical model. The effect of the design parameters including sample thickness, blanking clearance and the die and punch fillet radii were determined to ensure a pure shear blanking along the interface. The numerical results showed that the sample thickness, clearance and fillet radii have a significant effect on the measured bond shear strength and the location of the failure. The required rig was designed and composite copper clad aluminum bonding shear strength was experimentally determined based on the numerical findings.

E0114:
Application of Peridynamic Theory to Nanocomposite Materials
Asst. Prof. Matteo Duzzi, Mirco Zaccariotto and Ugo Galvanetto
University of Padova, Italy

The purpose of this paper is to describe the computational procedure developed to apply the Bond-based Peridynamic Theory to nanocomposite materials. The goal is to predict the Young's modulus as a function of the filling fraction of different nanocomposite materials with an accuracy better than that of other methods (like Halpin-Tsai, Mori-Tanaka, FEA models). A displacement control method is adopted here in order to simulate the incremental application of an external load. The constitutive law considered is linear and thus the problem can be seen as a static-linear problem. A description of the model and of the "multiscale approach" is given, supported by a comparison between experimental data and simulation results for different nanocomposites.

E0119:
A Numerical Study of the Thermal Critical Component on FORMOSAT-7 with Phase Change Material
Dr. Chen-Hao Wang, Meng-Hao Chen, Jeng-Der Huang and Chia-Ray Chen
National Space Organization (NSPO), National Applied Research Laboratories, Taiwan

A numerical study of the effectiveness of phase change material (PCM) used on FORMOSAT-7 at the preliminary design phase is presented in this study. N-eicosane is used as the PCM for its melting temperature. To compare the performance of PCM, different messes of PCM are applied for high-power-dissipating component with short-duty-cycle. The results show that PCM can improve the thermal stability of component by not only moderating peak temperature for worst hot case but also preventing sudden temperature decrease when the power mode of component changed. However, mass addition of PCM reduces the duration of the maximum temperature and the minimum temperature due to the better thermal conductivity of solid phase. Therefore, an optimization of mass is suggested for the application of PCM.

E0144:
Effects of Number of Inserts and Insert Materials on

Surface Roughness of Cast-Iron Work Produced by Face Milling
Mr. Sutham Siwawut, Charnnarong Saikaew and Anurat Wisitsoraat
Department of Industrial Engineering, Khon Kaen University, Thailand

In this work, the effects of two key factors of face milling including the number of inserts and insert material on surface roughness of cast-iron turbine housing work were systematically studied using full factorial designed experiments. Three insert materials including uncoated cemented carbide (TH10), commercial TiAlN/TiN coated cemented carbide (AH120) and tungsten carbo-*nitride* (WCN) coated cemented carbide were selected while the number of inserts was varied from 1 to 3 in this study. The results showed that both factors were statistically significant and the optimal parameters that yielded minimum Ra-value of 0.495 μm were the commercial TiAlN/TiN coated cemented carbide material (AH120) and three inserts.

E4019:
Evaluation of Oven and Microwave Drying of Ceramic Material with and without Added Quartzito to Formation of Composite
Charbel Andrea Teixeira, **Birchal Viviane Santos**, Freitas Caio, Torres Daniel, Moreira Fernando, Santos Luis Carlos, and Carvalho Lucas Candido
Universidade Federal de Minas Gerais, Departamento de Engenharia Química, Brazil,

This study aims to assess the stage of drying ceramic composite through kinetic curves of drying , to evaluate the drying time and shrinkage of the material during the process carried out in an oven at 50 ºC and microwave at 10 % of maximum power 700 W. For this study, compositions with addition of “São Thomé” stone and clay in a 1:4 mass ratio were prepared and this composite was compared with the samples fabricated only with clay. To evaluate the structure resulting from the drying computed microtomography analysis was performed. The results indicated that the addition of stone “São Thomé” contributed to reducing the processing time by decreasing the conformation of water. The use of microwave drying process as favored gain strength of the product due to the lower fraction of pores, and also ensures a shorter processing time due to the increased rate of drying.

E0148:
A Study on the Tensile Strength and Thermal Property of CFRP Using Infrared Thermography Camera
Hee Jae Shin, In Pyo Cha, **Mr. Min Sang Lee**, Tae Ho Kim, Hyun Kyung Yun, Lee Ku Kwac, Hong Gun Kim
Graduate school Department of Mechanical Engineering Jeonju University, 1200 3-ga Hyoja-dong Wansan-gu Jeonju, Jeonbuk, Korea

The fiber is considered the most important element in fiber reinforced composite materials, as it generally occupies the largest volume in a composite material; further, delivers the heaviest loads. therefore, it is important to select types, quantity and proper stacking angles of the fiber. In this study, the fiber directions were arranged in different orientation angles, i.e. in symmetric (0°/0°, 15°/15°, 30°/ 30°, 45°/45°, 90°/90°) and asymmetric (0°/15°,0°/30°,0°/45°, 0°/90°), to analyze the tensile strengths depending on the fiber orientation angles through the tensile test. In addition, a thermal imaging camera was used to investigate the thermal characteristics of the test specimens generated during the tensile test. the tensile strength showed a tendency of decreasing while the orientation angle increased. the maximum temperature generated when the fracture occurred increased at the fiber orientation angle of 30°, and showed a tendency of decreasing as the orientation angle increased.

E0154:
Evaluation of the Fatigue Linear Damage Accumulation Rule for aeronautical CFRP using Artificial Neural Networks
Mr. Pablo Zuluaga-Ramírez, Malte Frövel, Álvaro Arconada, Tomás Belenguer and Félix Salazar
INTA, Spain

New optimized aerospace structures use composite materials for critical components and subsystems which make essential the knowledge of their fatigue properties. In the present work, the conventional methodology based on linear damage accumulation rules, applied to determine the fatigue life of structures subjected to spectral loads was evaluated for an aeronautical Carbon Fiber Reinforced Epoxy composite material. A test program has been performed to obtain the classical S-N curves at different stress ratios. Constant life diagrams, CLDs, where determined by means of Artificial Neural Networks due to the absence of consistent models for composites. A series of coupons have been tested until failure with a modified version of the standard FALSTAFF load sequence and were compared to the theoretical damage index calculated based on the conventional linear damage accumulation rule. The obtained results show non-conservative predictions.

E1022:
Vibration Analysis of Four-Edge Clamped Plain Weave Composite Plates with Different Impact Damage Patterns: An Experimental Study
Asst. Prof. Mehmet Yetmez, Hamza Erdogan, Levent Kocer and Ismail Demirci
Bulent Ecevit University, Turkey

In this study, dynamic analysis of carbon plain weave square plates with different damage patterns including pattern of post-low velocity impact and patterns of post-ballistic impact is considered. For this purpose, vibration tests are performed to present the vibration characteristics of the four-edge clamped square plates.

Effects of bullet-tip geometry, projectile velocity and impact damage location on the vibration characteristics are examined experimentally. Results are given in graphical form.

10:10-10:30 COFFEE BREAK

Session 6: Advanced Materials Engineering and Processing Technologies & Applied Mechanics
Time: 10:30am-12:30pm; Room: Güell A
Session chair: Dr. Ian McAndrew
Embry Riddle Aeronautical University, UK

E2012：
Measurements of Thermal Properties of Different Building Materials
Assoc. Prof. Dr. Akos Lakatos
University of Debrecen Faculty of Engineering, Hungary

In this paper we present measurements and measurement methods carried out on construction and building materials in our Building Physics laboratory in University of Debrecen, Faculty of Engineering, Hungary. The investigations with different methods are so significant from the point of view of thermal sizing and designing of the buildings. The laboratory measurements of the thermal properties of materials and in-built structures are very important either for the manufacturers or the designers. In this communication the measurement result are presented. Thermal conductivities will be calculated after steady state thermal resistance measurements both from Calibration hot box (CC) and Heat Flux measurements carried out by Hukseflux (HF) apparatus. Calorific values of some insulating materials will be presented after combusting them in a CAL2K ECO type bomb calorimeter.

E4022:
Effect of Powder Flow Rate and Gas Flow Rate on the Evolving Properties of Deposited Ti6al4v/Cu Composites
Mr. Mutiu F. Erinosho, Esther T. Akinlabi,and Sisa Pityana
University of Johannesburg, South Africa

Pure copper was deposited with Ti6Al4V alloy via laser metal deposition (LMD) process to produce Ti6Al4V/Cu composites. This paper reports the effect of powder flow rate (PFR) and gas flow rate (GFR) of laser metal deposited Ti6Al4V/Cu composites. The deposited samples were characterised through the evolving microstructure and microhardness. It was observed that the PFR and GFR have an influence on the percentage of porosity present in the samples. The higher the flow rates of the powder and the gas, the higher the degree of porosity and vice versa. The widmanstettan structures were observed to be finer as the flow rate reduces which in turn causes a decrease in the hardness values of the deposited composites. The hardness values varied between HV381.3 ± 60 and HV447.3 ± 49.

E003:
Comparison of Analytical Models of Force Prediction during Dynamic Bending Stage for 3-Roller Conical Bending Process
Asst. Prof. Mahesh Chudasama, and HaritRaval
S. & S. S. Ghandhy Government Engineering College, Surat (Gujarat) India

Conical bending process using three rollers with different configurations is a widely used process for manufacturing conical sections and shells in the industries. The process involves static as well dynamic stages. For optimum design of the machine, accurate analytical model of the force prediction is required for static as well dynamic bending stages. In this paper the analytical models considering three different stress conditions have been compared with the experimental results. The observations of the comparison have been reported. It is concluded that for higher bottom roller inclination, the shear stress has to be considered for evaluation of bending force whereas for lower bottom roller inclination it can be neglected.

E012:
Mechanical Performance Analysis of Composite Scarf Joints with Debond Flaw
Dr. Xia Guo, Zengshan Li, Wenchao Zhang, Riming Tan and Zhidong Guan
School of Aeronautic Science and Engineering, Beihang University, Beijing 100191, PR China

The adhesive structural mechanical performance is influenced by debond flaw. This paper presents a research on the effect of flaws on the mechanical performance of composite scarf joints. The experimental results show that the load-carrying capacity of composite scarf joints changed along with the location of the debond flaw. The location of the flaw in the bondline influences the failure mode. Additionally, the finite element method was employed to obtain the failure mode of the composite scarf joint. The adhesively bonded joints were modeled using ABAQUS software. The computational results show that flaws located at the edge of the bond region result in more pronounced load reduction than which located at the middle of bond region.

E023：
Compressive and Shearing Mechanical Anisotropy of Aluminum after ECAP
Cleber Granato de Faria, Tércio Assunção Pedrosa, Roberto Braga Figueiredo, **Prof.Maria Teresa Paulino** Aguilar and Paulo Roberto Cetlin
Federal University of Minas Gerais, Brazil
Severe plastic deformation (SPD), where metals are deformed up to very high strain values, leads to a very small grain size and a high strength of the material. ECAP (Equal Channel Angular Pressing) is one of the SPD methods, and involves the extrusion of a metal billet through two intersecting channels with identical

cross-section and forming an angle between them. The material undergoes shearing as it crosses from one channel to the other, but its external dimensions are not altered. Shearing occurs along a single plane, which may lead to anisotropy in the mechanical properties of the material after ECAP. Compression, tension and shearing tests along various directions in the as-processed specimens indicated the presence of mechanical anisotropy in ECAP processed aluminum.

E033:
Simplified Finite Element Riveted Lap Joint Model in Structural Dynamic Analysis
Mr. Marco Dourado and José Meireles
Minho University,Portugal

This paper proposes a simplified finite element model to represent a riveted lap joint in structural dynamic analysis field. The rivet is modeled by spring-damper elements. Several numerical models are studied with different quantities of rivets (1, 3 and 5) and spring-damper elements (4, 6, 8, 12, 16 and 20) per rivet. In parallel, samples of two aluminum material plates connected by different quantities of rivets (1, 3 and 5) are built and tested in order to be known its modal characteristics – natural frequencies and mode shapes. The purpose of the different settings is to get the best numerical riveted lap joint representation relatively to the experimental one. For this purpose a finite element model updating methodology is used. An evaluation of the best numerical riveted lap joint is carried out based on comparisons between the numerical model after updating and the experimental one. It is shown that the riveted lap joints composed by eight and twelve spring-damper elements per rivet have the best representation. A stiffness constant value k is obtained for the riveted lap joints in study.

E066:
The Specification of Unknown Force within Dynamic Analysis of Slider Crank Mechanism by Three Various Accesses
Assoc. Prof. Katarina Monkova, Andrea Cizikova, Peter Monka
TU Kosice, Faculty of Manufacturing Technology with seat in Presov, Slovakia
The article deals with the specification of unknown force within dynamic analysis of slider crank mechanism by three various access. The method of virtual work was used at the analytical solution; the principle of superposition was used at the graphical solution and the software PTC Creo was used at the solution with computer aid. All three types of the solution have their selves advantages and disadvantages. The final decision, which of methods should be selected for the solution, depends on required result precision and on the abilities of investigator. In all cases, however, it is necessary to know the basic principles of mechanics.

E079:
Numerical model for prediction of cutting forces in a vibratory drilling process
Nawel Glaa, **Assoc. Prof.Kamel Mehdi** and Moez Ben Jaber
Preparatory Institute for Engineering Studies El Manar (IPEIMa), University of Tunis EL Manar,Tunisia

The drilling operation is considered by manufacturers as complex and difficult process (rapid wear of the cutting edge as well as problems of chip evacuation). Faced with these failures, manufacturers have shifted in recent years towards the drilling process assisted by forced vibrations. This method consist to add an axial oscillation with a low frequency to the classical feed movement of the drill so as to ensure good fragmentation and better chip evacuation.
This paper presents a model for prediction of cutting forces during a drilling operation assisted by forced low-frequency vibration. The model allows understanding the interaction between the tool and the workpiece and identifying numerically the three-dimensional evolution of the cutting force components generated by the vibratory drilling operation. The effects of cutting parameters, tool parameters and those of forced vibrations on the cutting forces distributions will be discussed.

E072:
Analysis of the Torsional Load Capacity of V-section Band Clamps
Dr. Simon M Barrans, Adelle Waterworth and Salahaddin Sahboun
Turbocharger Research Institute, University of Huddersfield, UK
This paper investigates the torsional load capacity of three sizes of V-section band clamps when assembled onto rigid flanges by comparing experimental data with a developed theoretical model. This mode of failure is of particular interest for turbocharger applications where, in use, they are subjected to torsional loading via thermal and vibrational effects. The theoretical model developed allows the impact on torsional load capacity of a number of joint parameters to be investigated and good correlation of the results, incorporating variations in coefficients of friction and dimensions, has been shown for the two larger band sizes. For smaller diameter bands, the experimental data suggests that as the band is tightened, contact with the flange is localised rather than being over the full circumference of the band. The coefficients of friction, in particular that between the flanges, and the position of the contact point between band and flange have been shown to have a significant impact on the theoretical torsional load capacity of V-section band clamps.

E0136:
Kinematic Analysis for Hybrid 2-(6-UPU) Manipulator using Wavelet Neural Network
Dr.Arash Rahmani, Aahmad Ghanbari,and Siamak

Pedrammehr
Faculty of Mechanical Engineering, University of Tabriz, Tabriz, Iran

This paper addresses forward and inverse kinematics of a specific class of serial-parallel manipulators, known as 2(6-UPU) manipulators. This manipulator composed of two modules which consist of elementary manipulators with the parallel structure of Stewart Platform. At first, the Kinematics Model of the hybrid manipulator is obtained. As there is a highly nonlinear relations between joint variables, and position and orientation of the end effectors, the inverse kinematic problem of these manipulators is quite complicated to solve. In this study, wavelet based neural network (WNN) with its inherent learning ability, is used to solve the inverse kinematic problem. Also, proposed wavelet neural network is applied to approximate the paths of mid and upper plates in circle and spiral trajectories. Finally, the results of simulation show high accurate performance of proposed method.

12:30-13:30 BUFFET LUNCH

Session 7A: General Mechanical Engineering
Time: 13:30pm-14:45pm; Room: Güell A
Session chair: Assoc. Prof. Yoshifumi Yokoi
National Defense Academy of Japan, Japan

E045:
Buckling and Post-buckling of Composite Shells with Asymmetric Meshing in form of Axial Band in Numerical Model
Mr. Zia ul Rehman Tahir, and Parthasarathi Mandal
University of Manchester, Pariser Building, Sackville Street, M13 9PL, UK

Asymmetric meshing is a perturbation introduced in the numerical model without changing geometry, loading or boundary conditions. Asymmetric meshing is employed in the form of a band along axial direction of the shell model, the elements size in the axial band is reduced as compared with the rest of shell to produce asymmetry in the meshing and four amplitudes of asymmetry are used in a particular band. Asymmetric meshing affects predicted buckling load, buckling mode shape and post-buckling behaviour. The reduction in the buckling load using asymmetric meshing was observed to be about 18%, which depends mainly on area of asymmetric meshing and less on different magnitudes of asymmetry in the same area. The load-displacement curve behaviour using asymmetric meshing technique is quite siGaudir to the curve obtained by introducing geometric imperfection in the shell model.

E060:
Application of Shainin Design of Experiment Method on Metal Turning Operation
Assoc. Prof. Charnnarong Saikaew, Chollatit Chanapal and Theerawet Phrachai
Khon Kaen University, Thailand
Surface roughness on machined part is a key performance index of surface quality for metal machining industry. Machining condition is a way to reduce surface roughness of the machined part. This study aimed to determine the significant factors affecting surface roughness and to obtain the optimal machining operation in turning process. The Shainin design of experiment method was used to investigate the effect of five machining factors on surface roughness in turning process of carbon steel. Furthermore, analysis of variance and multiple comparisons were used to determine the optimal machining condition of the significant factors. The results showed that set of the cutting tool angle was the only significant factor affecting the average surface roughness with the optimal operating condition of 120 degree used for reducing surface roughness of the machined part.

E0120:
Study on Improving the Degree of Size Precision of Rack Tube
Hao-Yu, Dong-Hong Kim, and **Prof. Dong-Won Jung**
Jeju National University, Korea

The tube is a significant machine part in a car. It provides the important contact and fixed functions during the steering of a car. An inaccurate tube size cannot provide steering stability. For example, if the difference in diameter between the front and back of a tube is very large, the car moving at high speeds will be to swing, although steering would still be possible. A car can be made safer at high speeds by controlling the difference between the front and back diameters of the tube. High temperature welding of various parts to the tube, heats the tube almost 2,000℃, so the consequent deformation of the tube must be controlled.

E0121:
Study on Spring-back Effect with Various Temperature of Magnesium Alloy in Roll Forming Process
Mr. Dong-Hong Kim, Dae-Hwan Yoon, Hao-Yu and Dong-Won Jung
Jeju National University, Korea

AZ31 magnesium alloy sheets are usually performed at high temperatures of 200 to 250°C due to their unusual hexagonal close-packed structure and low ductility at room temperature. In this study, to predict the spring-back of AZ31 magnesium alloy sheets in a roll forming process subjected to high temperatures, so the spring-back phenomenon consider in various temperature using an explicit finite element code. Finally, the roll forming process for a magnesium alloy sheet at high temperatures was performed to verify the spring-back angle, which was then compared with the spring-back angle predictions of the FE simulation.

E0123:
Influence of MoN Sputtering Coating on Wear Resistance of a Fishing Net-Weaving Machine Component

Mr. Parinya Srisattayakul, Charnnarong Saikaew, Anurat Wisitsoraat and Naphatara Intanon
Department of Industrial Engineering, Khon Kaen University, Khon Kaen 40002, Thailand

Wear resistance of an upper hook, an important fishing net-weaving machine component manufactured from stainless steel, was improved by systematically investigating the influence of molybdenum nitride (MoN) sputtering coating using experimental design. Three factors of MoN coating on upper hooks including DC current, operating pressure, and Ar/N2 ratio were studied and optimized for minimum wear of the machine component. After conducting wear testing on the fishing net-weaving machine in a participating company, it was found that the three coating factors influenced the wear of the machine component. In addition, the optimal operating condition for MoN sputtering coating that produced the minimum wear was obtained at DC current of 0.45 A, operating pressure of 0.01 mbar, and Ar/N2 ratio of 0.5.

E0124:
The Role of Vanadium in Reduction of Helium Diffusion in Tungsten Based Alloys
Bhatti Imran Shaban, and **Mr. Kameel Arshad**
Beihang University, China

Helium diffusion is a very critical factor for designing a plasma facing components of fusion reactor. Because it not only reduce the thermal conductivity but also degrade the surface morphology of tungsten based materials. In this numerical study the specimens of tungsten, vanadium and tungsten vanadium alloys have been simulated under thermo-diffusion conditions. The finite element commercial software Abaqus was used for simulation to obtain helium diffusion profile at temperature of 800 K for concentration of1024number of atoms in tungsten and vanadium metals. Due to its relatively low helium diffusion coefficient, vanadium has shown better resistance against helium penetration as compared to tungsten. Subsequently the analytical effect of helium diffusion in tungsten, vanadium and different grades of tungsten vanadium alloys has been investigated. To study the distribution of vanadium in tungsten, tungsten vanadium alloys were fabricated by spark plasma sintering technique and its morphology has been analyzed by scanning electron microscopy.

14:40-15:00 BREAK

Session 7B: General Mechanical Engineering
Time: 15:00pm-16:15pm; Room: Güell A
Session chair: Assoc. Prof. Yoshifumi Yokoi
National Defense Academy of Japan, Japan

E0146:
A Comparative Study on the Hardness of CrN, CrC and CrCN Coatings

Ms. Supakanya Khanchaiyaphum, Charnnarong Saikaew, Parinya Srisattayakul and Naphatara Intanon
Department of Industrial Engineering, Khon Kaen University, Thailand

Improving the surface quality of various machine components can extend their lifespans by several orders of magnitude. Thin film coating is one approach that can be used to enhance machine part surface quality. In this work, three different thin film coatings (i.e, CrN, CrC and Cr-C-N) were statistically compared for surface quality improvement of fishing-net weaving machine component, namely an upper hook. All coatings were deposited utilizing DC sputtering technique. The effects of coating types on hardness for both hardchrome and non hardchrome coated upper hooks were systematically investigated using one-way analysis of variance (ANOVA). Scanning electron microscope (SEM) and energy dispersive X-ray (EDX) were used to examine the surface quality of the machine component. This study found that CrN gave very high hardness values of 13.042 GPa for hardchrome coated upper hooks and 12.583 GPa for non-hardchrome coated upper hooks. However, the averages hardness of the hardchrome coated and non-hardchrome coated upper hooks were not significantly different at the 95% confidence level.

E027:
Investigation and Simulation of Supersonic Gas Jet for Martian Dust Removal
Mr. Zhenlin Wang, Heng Xu, Ruiqiang Yang, Wenjin Guo
Lanzhou Institute of Physics, China
The Martian dust is a serious threat to the spacecraft and rover. It would hinder the functioning of equipment and limit mission duration. The paper introduces a system, which uses supersonic gas jet formed by a Laval nozzle to blow off the accumulated dust. The related parameters have been investigated and the flow fluid field has been simulated.

E030:
Preliminary Model Analysis of Acoustic Noise Levels For Space Station
Prof. Yaoqi Feng, Jiang Yang, Guosong Feng and Yao Wu
Beijing Institute of Spacecraft Environment Engineering (BISEE), China

This paper presents the modeling and analysis method of acoustic noise levels of whole audible frequency range for Chinese Space Station (CSS) module. Using Boundary Element Modeling (BEM), the acoustic analysis model of low frequency range for CSS module was established. The analysis model of high frequency range was created by using Statistical Energy Analysis (SEA) method. Based on the established models, the acoustic noise levels in all areas of CSS module were analyzed and the results for some typical areas are provided. Finally, the acoustic contribution of noise sources according to their spectral characteristics is analyzed and the implementation of noise control methods to reduce acoustic levels in CSS

module is discussed.

E043:
Comparative Evaluation of Activated Carbons Prepared by Thermo-Chemical Activation of Lignocellulosic Residues Aiming at Phenol Removal
Cibele C.O. Alves, **Prof. Adriana S. Franca**, Leandro S. Oliveira
Universidade Federal de Minas Gerais, Brazil

This paper presents a comparative evaluation of three lignocellulosic residues (coffee husks, spent coffee grounds and pequi husks) as precursor materials in the production of activated carbons (ACs). Results indicate that the precursor material has a significant effect in both physical and chemical aspects of the adsorbent, with the AC based on spent coffee grounds being the most effective for phenol removal, with maximum adsorption capacity comparable to commercial ACs.

E052:
Assessment of Real Gas Effects on Approximate and Boundary Layer Equations for Hypersonic Laminar Flow over Axisymmetric Bodies
Dr. Ramin Kamali Moghadam and Seyed Amir Hosseini
ARI, Islamic Republic of Iran

Two efficient computational procedures based on the boundary layer equations and approximate relations are assessed in prediction of the laminar hypersonic flowfield for both the perfect gas and equilibrium air around the axisymmetric blunt body configurations. For the boundary layer procedure, the boundary layer equations utilize the integral matrix solution algorithm for the blunt nose and afterbody region by using a space marching technique. The integral matrix procedure able us to create accurate and smooth results using the minimum grid in the boundary layer and minimize the computational costs. Applying the approximate method creates a robust and efficient code for heating calculations over the blunt bodies which flies in hypersonic regimes. These algorithms are highly appropriate to design of hypersonic reentry vehicles. The effects of real gas on the flowfield characteristics are also studied in two procedures.

E056:
Investigation of Effects of Inlet Boundary Conditions on the Flow Behaviour in a Diesel Injector
Mr. Gökhan Tuccar, Tayfun Ozgur, Erdi Tosun, Ceyla Ozgur and Kadir Aydin
Çukurova University, Turkey

Diesel engines become popular from this point of view because of their high thermal efficiency. However, new and developing technologies are expected to lower their emission levels. Atomization of the fuel has a vital importance in order to control heat release rate and exhaust emission during combustion. With the known injection devices, atomization of the fuel is realized with high pressure systems such as common rail direct injectors (CRD) which operate at pressures exceeding 1300 bar. However, atomization of the fuel by simply increasing injection pressure can create cavitation erosion which may lead to mechanical failure of the nozzle. Utilization of air in diesel engine injectors will increase fuel atomization, provides more complete combustion of any diesel fuel consumed, enhance fuel economy and results in lower engine emissions. Therefore the aim of this study is to design a special injection device for use in a diesel engine which improves combustion by mixing air and fuel inside itself at optimum ratio. Proper air inlet pressure was determined for favorable diesel air mixing by investigation of the flow behavior in a newly designed injection device with the help of computational fluid dynamics based software. Three different air inlet pressures (20, 30 and 40 bar) are simulated and the contours of turbulence intensity, velocity and volume fraction of diesel fuel are discussed, and compared with each other.

16:15-16:30 COFFEE BREAK

Session 8A: General Mechanical Engineering
Time: 16:30pm-17:45pm; Room: Güell A
Session chair: Prof. Adriana S. Franca
Universidade Federal de Minas Gerais, Brazil

E0158:
A SMA based Morphing Leading Edge Architecture
Dr. Salvatore Ameduri
Centro Italiano Ricerche Aerospaziali, Italy

This paper analyses a morphing leading edge device, activated by a Shape Memory Alloy (SMA) actuator. The objective is to achieve the Droop Nose effect for particular phases of the flight (e.g. take-off, landing), both obtaining an increased lift and preserving the laminar flow. The device is constituted of: a kinematic chain at the level of the wing section, transmitting motion to the skin, this way fitting the Droop Nose target shape; a span-wise architecture integrated with a SMA actuator, ensuring both a reduction of the actuation forces and the balancing of the aerodynamic external load. A dedicated logical framework was adopted for the design, taking into account the SMA material features and the device intrinsic non-linearity. The framework was integrated within an optimization genetic algorithm, to fit the target shape with an appropriate architecture topology. The optimized system proved to produce the desired morphing, also under the most severe aerodynamic loads.

E3015:
Taguchi Optimization of Process Parameters in Friction Stir Spot Welding of AA5754 and AA2024 Alloys
Assoc. Prof. Yahya Bozkurt and Mustafa Kemal Bilici
Marmara University, Turkey

The feasibility of friction stir spot welding was studied on

AA5754-H22 and AA2024-T3 aluminum alloys which have widespread applications in aircraft and automotive industries. The quality of the joint was evaluated by examining the characteristics of the joint as a result of lap-shear fracture load. Taguchi approach of the parameter design was used as a statistical design of experiment technique to set the optimal welding parameters. The experiments were arranged by using Taguchi's L9 orthogonal array. The signal-to-noise ratio and the analysis of variance were utilized to obtain the influence of the friction stir spot welding parameters on the lap-shear fracture load. Finally, the results were confirmed by further experiments.

E067:
On the Unsteady Flow of Two Incompressible Immiscible Second Grade Fluids between Parallel Plates
Abdul Siddiqui, **Asst. Prof. Maya Mitkova**, and Ali Ansari
Gulf University for Science and Technology, Kuwait

Unsteady, pressure driven in the gap between two parallel plates flow of two non-Newtonian incompressible second grade fluids is considered. The governing equations are established for the particular two-layer flow and analytical solutions of the equations that satisfy the imposed boundary conditions are obtained. The velocity of each fluid is expressed as function of the material constants, time dependent pressure gradient and other characteristics of the fluids. As part of the solution, an expression for the interface velocity is derived. We analyze the shift of the velocity maximum from one to another fluid as a function of variety of values of fluids' parameters.

E0100:
Three-dimensional Numerical Simulation of Mixed Convective Heat Transfer in a Horizontal Rectangular Duct Utilizing Nanofluids
Ms. Nur Irmawati Om and Hussein A. Mohammed
Universiti Tenaga Nasional, Malaysia

Predictions are reported for three-dimensional laminar mixed convective heat transfer using nanofluids in a horizontal rectangular duct. Five different types of nanoparticle, Ag, Al_2O_3, Au, Cu and SiO_2 with nanoparticles volume fractions range of 2% to 10% are investigated. In this study, the effects of nanofluids type, nanoparticles volume fraction of nanofluids and the effect of aspect ratio on the thermal fields were examined. Results reveal that the addition of nanoparticles to the base fluid and their volume fraction tend to increase the Nusselt number along the horizontal rectangular duct (i.e., increases the rate of heat transfer). It was also found that the Nusselt number increases as the aspect ratio decreases.

E0101:
Investigation of Syngas Combustion at Variable Methane Composition in Can Combustor Using CFD
Norhaslina Mat Zian, Hasril Hasini and **Ms. Nur Irmawati Om**
Universiti Tenaga Nasional, Malaysia

This paper describes the analysis of the fundamental effect of synthetic gas combustion in a can-type combustor using Computational Fluid Dynamic (CFD). Emphasis is given towards the effect of variation of methane to the flame profile, temperature distribution and heat flux in the combustor. In this study, the composition of hydrogen in the syngas was fixed at 30% while methane and carbon monoxide were varied. Results show that the flame temperature and NO_x emissions are highly dependent on the composition of methane in the syngas fuel. Nevertheless, the overall NO_x emission for all cases is relatively lower than the conventional pure natural gas combustion.

E0103:
Heat Transfer Enhancement in Turbine Blade Cooling Dutcs
Mehmet Kahraman, Guven Komurgoz, and Ibrahim Ozkol
Istanbul Technical University, Turkey

Gas turbine is a type of rotary engine that consists of compressor, combustion chamber, and turbine sections. This type of engine works in the Brayton Cycle principle that is compression of atmospheric flow, combustion of air-fuel mixture and expanding high temperature combustion flow to generate power output from turbine. The aim of this study is to determine the duct geometry and flow conditions of the gas turbine blades having the internal cooling ducts that acquire highest heat transfer on turbine blades. For different design of internal duct geometries and flow conditions, Fluent solver is used and solutions are validated with Han's experimental results.

17:45-18:00 BREAK

Session 8B: General Mechanical Engineering
Time: 18:00pm-19:00pm; Room: Güell A
Session chair: Prof. Adriana S. Franca
Universidade Federal de Minas Gerais, Brazil

E0118:
Calculation of Heat Transfer in Heterogeneous Structures Such as Honeycomb by using Numerical Solution of Stochastic Differential Equations
Dr. Sergey A. Gusev, and Vladimir N. Nikolaev
Institute of Computational Mathematics and Mathematical Geophysics Siberian Branch of Russian Academy of Sciences, Novosibirsk, Russia

A computing method of heat transfer in heterogeneous structures is proposed in the paper. The problem is mathematically described as the parabolic boundary value problem with discontinuous coefficients. The generalized solution of this parabolic problem can be approached by the solution of the parabolic boundary problem with smoothed coefficients. To obtain estimates of the solution of the problem with smoothed coefficients

the method of numerical solution of stochastic differential equations (SDE) is applied. Some numerical results for honeycomb structures are presented.

E1015:
Research on the Water-based Hydraulic Vibration Test-bed
Mr. Qian Liu, Yuanxun Liu, Cong Yang, Xiaolin Li
Institute of System engineering, China Academy of Engineering Physics, China
In this paper, the application background and function of vibration test is introduced. Besides, the composition and working principle of vibration test system is also introduced simply. Furthermore, the characteristic of water and oil is compared with each other in the paper. It is discussed if the water hydraulic is able to be used in the hydraulic vibration test-bed or not. The capability of hydraulic vibration test-bed based on water is simulated by Matlab software. The feasibility of this project is also analyzed.

E4004:
Tribocorrosion Behavior of [TiCN/TiNbCN]n Coating on Austenitic Steels Substrate in Hanks' Balanced Salt Solution
Willian Aperador, **Prof. Jaime Duque**, and Erika Ruiz
Universidad Militar Nueva Granada, Colombia

Multilayer coatings [TiCN / TiNbCN] n were fabricated with periods of bilayers 1, 50 and 200 deposited on substrates of austenitic steels type fermanal, using R.F. reactive magnetron sputtering with a radio frequency source (13.56 MHz) and two TiC and Nb targets. The multilayers were characterized using X-ray diffraction and scanning electron microscopy. The tribo – electrochemical behavior simulating hostile body environment was evaluated by testing tribocorrosion (combination of wear and corrosion in aqueous environment) which were carried out with a Gamry PCI 4 equipment to which adapted a pin on disk tribometer, the tests were made immersed in Hanks solution (Hanks balanced salt solution). A cell comprising a platinum counter-electrode, an Ag/AgCl reference electrode and the and a working electrode (austenitic steels) at a temperature of 37 ± 0.2 ° C. the evaluation tests were performed using electrochemical techniques of Tafel polarization curves. Regarding the results, the hard coating [TiCN / TiNbCN] n improved polarization resistance and lower coefficient of friction than that reported for the substrate is provided , which indicates a good resistance to corrosion and wear.

E4015:
Analysis of the Temperature Evolution during Lined Pipe Welding
Mr. Obeid Obeid, Giulio Alfano, and Hamid Bahai
Brunel University, UK
A numerical analysis of thermal phenomena occurring during lined-pipe welding is presented in this paper. Numerical models of surfaces and volumetric heat sources were used to predict the time evolution of the temperature field both in a corrosion-resistance-alloy (CRA) liner, made of SUS304 stainless steel (SS), and for the single-pass girth welding of a carbon-manganese (C-Mn) steel pipe. Using the finite-element code ABAQUS, three-dimensional non-liner heat-transfer analyses was carried out to simulate the gas-tungsten-arc (GTA) welding process used in liner welding and the metal-inert-gas (MIG) welding process consumed in C-Mn steel backing welding. FORTRAN user subroutines were coded to implement the movable welding heat source and heat transfer coefficient models. The thermal history was numerically computed at locations where circumferential angles from the welding start/atop position are 90°, 180° and 270° with respect to axial distances from the weld centerline (WC).

E084:
Natural Convection with Viscous Dissipation and Radiation Effects in an Inclined Square Porous Enclosure Using a Thermodynamic Non-Equilibrium Model
Salam Hussain and Ahmed Hussein
Mechanical Engineering Department - Babylon University-Babylon City, Hilla, Iraq

Thermal non-equilibrium model between the fluid and the porous media is applied to deal with natural convection in an inclined square porous enclosure when both viscous dissipation and radiation are taken into account. The upper and lower walls are assumed insulated, while the left and right sidewalls are considered differentially heated. This problem is not considered in the open literature and as a result this work presents an original contribution in this field.

Oral Presentation Sessions

July 19th, 2014, Thursday 8:30 AM – 19:00PM/ Capricho

Session 9: Functions and Differential Equations
Time: 8:30am-10:10am; Room: Capricho
Session chair: Prof. Dr. Necdet BİLDİK
Celal Bayar University, Turkey

M014:
Comparison of Adomian Decomposition Method and Taylor Matrix Method in Solving Different Kinds of Partial Differential Equations
Prof. Necdet Bildik and **Sinan Deniz**
Celal Bayar University, Turkey

In this paper, we will present a comparison between the Adomian Decomposition Method (ADM) and Taylor Matrix Method by solving some well-known partial differential equations (PDEs). In order to illustrate the analysis we examined the Telegraph equation, which is considered one of the most significant partial differential equations, describe wave propagation of electric signals in a cable transmission line and Klein-Gordon equation which is encountered in several applied physics fields such as, quantum field theory , fluid dynamics , optoelectronic devices design and numerical analysis. Our study shows that the decomposition method is faster and easy to use from a computational viewpoint.

M002:
On Solvents of Matrix Polynomials
Ms. Malika Yaici, and Kamel Hariche
University of Bejaia, Algeria

This paper is concerned with the construction of right and left solvents (also called block roots) of a matrix polynomial from latent roots and vectors. It addresses also the important case of the existence of a complete set of block roots. Solvents do not always exist, so conditions for the existence of such solvents are discussed. The inverse of a matrix polynomial is obtained as a particular case of the block partial fraction expansion of a related rational matrix. It involves the knowledge of a complete set of solvents and the computation of the inverse of a block Vandermonde matrix. Numerical examples are given to illustrate the two results.

M009:
Relations between Lambda-Statistical Limit İnferior and Limit Superior for Sequences of Fuzzy Numbers
Asst. Prof. F. Berna Benli
Erciyes University, Turkey

In recent years the concept of statistical convergence of fuzzy numbers has been studied by many mathematicians. The main work consists Lambda-statistically convergence, which is a kind of convergence between ordinary convergence and statistical convergence. F. B. Benli has been studied lambda-statistical limit inferior and limit superior for lambda-statistically bounded sequences of fuzzy numbers. This work has been extended in this paper, where some relations have been considered such that when lambda-statistical limit inferior and lambda-statistical limit superior for lambda-statistically convergent sequences of fuzzy numbers are equal. Furthermore, lambda-statistical boundedness condition for different sequences of fuzzy numbers has been studied.

M012:
Exact Solutions of Time-Fractional KdV Equations by Using Generalized Kudryashov Method
Assoc. Prof. Hasan Bulut
Firat University, Turkey

In this paper, we investigate exact solutions of time-fractional KdV equations by using generalized Kudryashov method (GKM). The time-fractional KdV equations can be reduced to nonlinear ordinary differential equation by transformation. Subsequently, GKM has been performed to obtain exact solutions of time-fractional KdV equations and we attain some new solutions such as soliton solutions and hyperbolic function solutions. Furthermore, we note that this method is a generalized form of classical Kudryashov Method.

M013:
The Numerical Solution of Nonlinear Time-Fractional Generalized Burgers Equation by Homotopy Analysis Method and Modified Trial Equation Method
Asst. Prof. Yusuf Pandir
Bozok University, Turkey

In this paper, we have executed the Homotopy Analysis Method and Modified Trial Equation Method which has newly been submitted to the literature for obtaining analytical solution of the nonlinear time-fractional generalized Burgers equation occuring in various areas of physics, chemistry, applied sciences, applied mathematics such as modeling of gas dynamics and traffic flow. Then, we have formed a table which includes numerical conclusions for time-fractional generalized Burgers equation. Finally, we have obtained the 2D and 3D surfaces by means of programming language Mathematica 9 in order to interpret in the sense of physical phenomena for analytical solution and approximate solution which have been obtained.

M1001:
A New General Approach to Vector Valued Stochastic Integration
Dr. Mangatiana A. Robdera
University of Botswana, Botswana

We use an extended theory of integral that generalizes the integration of vector valued functions with respect to non-negative, monotonic, countably subadditive set functions, in order to introduce a new approach to stochastic integral. With such an approach, we will explore the possible extension of the theory of stochastic integration to the more general setting of integrable processes taking values in normed vector spaces. We show that our approach makes applications possible to stochastic processes that are not necessarily square integrable, nor even measurable. Such an extension generally consolidates the typical and classical results obtained for the standard scalar case.

M2005:
A Note on Two Point Taylor Expansion III
Prof. Kazuaki Kitahara and Taka-Aki Okuno
School of Science and Technology, Kwansei Gakuin University, Japan

If a function is analytic on an interval, then the function is expressed as the Taylor expansion about a point in the interval. Furthermore, possibility of Taylor expansions of functions about two or three points has also been studying as useful expressions in several fields of mathematical sciences. In this paper, we show the following main result by estimating values of divided differences: Let $\boldsymbol{f}$ be a piecewise polynomial continuous function such that $\boldsymbol{f}$ is a polynomial $\boldsymbol{p}$ on the interval $[\mathbf{1/3}, \infty)$ and $\boldsymbol{f}$ is a polynomial $\boldsymbol{q}$ on the interval $(-\infty, \mathbf{1/3}]$. Then, we show that $\boldsymbol{f}$ is expressed as the two point Taylor expansion about $-\mathbf{1}, \mathbf{1}$ with the multiplicity weight $(\mathbf{2}, \mathbf{1})$ on the interval $(\boldsymbol{\alpha}, \boldsymbol{\beta})$, where $\boldsymbol{\alpha}$ is the solution of $(\boldsymbol{x}+\mathbf{1})^{\mathbf{2}}(\boldsymbol{x}-\mathbf{1}) = -\mathbf{32/27}$ with $\boldsymbol{\alpha} < -1$ and $\boldsymbol{\beta}$ is the solution of $(\boldsymbol{x}+\mathbf{1})^{\mathbf{2}}(\boldsymbol{x}-\mathbf{1}) = \mathbf{32/27}$ with $\boldsymbol{\beta} > 1$.

10:10-10:30 COFFEE BREAK

Session 10: Physics and Applied Mathematics
Time: 10:30am-12:10pm; Room: Capricho
Session chair:

M004:
The Claim that Neumann's Induction Law Is Consistent with Ampère's Law Rejected
Mr. Jan Olof Jonson
Alumn of Stockholm University and KTH Technical University, Sweden

There have been made several efforts to link Ampère´s law to different parts of electromagnetic field theory In this paper Neumann's effort to make his induction law to appear to be consistent with Ampère's law will be studied thoroughly., Since there exists a concept, named "Ampere-Neumann electrodynamics", it has been regarded as necessary to analyze how Neumann derives the connection between induction and Ampère's force law. One conspicuous thing is that he by the electromotive force of the secondary loop is meaning a physical, mechanical force, contrary to what has usually has been understood as an induced voltage. This makes it possible for him to claim his ideas to be consistent with Ampère's law. On the contrary, recent papers have convincingly shown that the Continuity Equation of Electricity is able to explain, how a current is being induced in a secondary circuit, due to an alternate current in the primary circuit. Earlier discoveries that Coulomb's law is able to account for electromagnetic forces, without involving magnetic fields, provides the conceptual background, which makes the use of magnetic fields unnecessary also in connection with induction.

M4003:
MHD Boundary Layers Due to a Point Sink with Temperature-Dependent Viscosity/Prandtl Number
Prof. A. T. Eswara
Visveswaraya Technological University, India

The influence of temperature-dependent viscosity and Prandtl number on the steady, incompressible MHD boundary layer forced flow (of water) due to a point sink is investigated. The coupled non-linear partial differential equations governing the axisymmetric flow are non-dimensionalized into a system of non-linear ordinary differential equations by siGaudirity transformations, and, later solved numerically using an implicit finite difference scheme along with quasilinearization technique. Computations are carried out to examine the effect of various parameters such as transverse magnetic field, temperature-dependent viscosity /Prandtl number on the flow field and heat transfer. From the results of the present study, it has been observed that the effect of magnetic and the variable thermo-physical parameters are considerable and they should to be taken into consideration in the flow and heat transfer problems, arising in engineering and technological applications.

M010:
Mathematical Modeling and Stability Analysis of the Brain Tumor Glioblastoma Multiforme (GBM)
Asst. Prof. Fatma Bozkurt
Erciyes University, Turkey

In this paper, a brain tumor growth that is known as Glioblastoma Multiforme (GBM) is modeled, which has two sub-population; the sensitive tumor cell and the resistant tumor cell. Within a single tumor of monoclonal origin, the sensitive cell produces another population, the resistant cell population, that has more resistance to the drug than the sensitive tumor population. In this work, the local and global stability of the positive equilibrium point of the constructed system was investigated based on specific conditions. The boundedness nature and the

damped oscillation behavior of the solutions were also analyzed. The obtained stability relations depend to the growth rates of the tumor population and the drug treatment, that was considered in the discussion part of this work.

M018:
Texture Analysis Using Multifractal Spectrum
Dr. Khaled Harrar
Département maintenance Industrielle, Faculté des sciences de l'ingénieur, Université M'Hamed Bougara Boumerdes, Algeria

Multifractal analysis has been recognized as a powerful tool in characterizing textures. Several studies have shown the possibilities offered by multifractal analysis in image processing, in particular in classification of complex textures. Indeed, in most cases, the mode of multifractal spectrum is used for classification; in this study, we propose two different methods to estimate this spectrum. This paper focuses on the classification of Brodatz textures using multifractal analysis. Two methods are considered: The first method is based on the multifractal formalism of Frish and Parisi through the Legendre transform, the second one is a direct method based on the box-counting algorithm. For both approaches, we used the multiresolution coefficients of the wavelet transform, with the Gaussian first order derivative to find singularity exponents in the direct method, and the leaders coefficients for the multifractal formalism. The Legendre transform was used to estimate the multifractal spectrum, while the box-counting method was used to compute the Hausdorff dimension of sets of the same degree of singularity. Results demonstrate that it is more interesting in some cases to use the box-counting method than the Legendre transform to obtain a more accurate spectrum, as in the bimodal spectrum case.

M3001:
On the exact ordering operators and their applications
Prof. Ali M. Awin
Department of Mathematics, University of Tripoli, Libya.

Exact and general exact ordering methods are reviewed. Firstly, the exact ordering method is introduced, and few theorems were given to assign the conditions needed to locate the position of a required object among a group of objects to be ordered in a certain manner in three classes .Secondly, the exact ordering method is generalized to any odd number of classes (m). In both cases and if the required object class is put in the middle of other classes then the required object is located exactly as the object in the middle of all objects provided that we arrange the objects orderly in three groups in the first case and in m groups in the second generalized one and where certain defined steps are to be followed; in general m steps are required to determine the required object exactly and where m is the odd number of classes. The possibility of making the subject more interesting, deeper and handled in a sophisticated manner, through the introduction of exact ordering operators, is then discussed; this is by no means complete and this matter will constitute the subject of a future work .Finally few different applications are suggested in physics ,in operational research, in sorting files and in postal mailing. Its use as a practical demonstration with playing cards is also mentioned.

M3003:
Octonion Formulation of Electromagnetism for the Different Media
Dr. Mustafa Emre Kansu
Dumlupinar University, Turkey

Maxwell equations are derived from the electric and magnetic fields. They are the fundamental elements for electromagnetism and generally studied for isotropic media with electric and magnetic induction vectors. According to the different media or unit systems, Maxwell equations have various notations in electromagnetism. Physical meanings of these equations are different for vacuum or material media. Here, in addition to the electric and magnetic fields, the polarization and magnetization vectors gain much importance. In this study, it is investigated that whether Maxwell equations could be represented or not in a basic and short manner by using higher dimensional algebra. Octonion algebra is one of the member of hypernumber system. They are both non-commutative and non-associative algebraic structures with eight components. In this study, by means of the constitutive equations with polarization and magnetization effects, the field term is firstly defined by using hyperbolic octonion form. By defining the hyperbolic octonionic differential operator and applying it on the field term, the hyperbolic octonionic source equation is obtained in compact and elegant way. As a result, the relations of the octonionic source equation between vacuum and material media are presented. Additionally, the components of these relations are also given seperately.

M4004:
Average Weakly Hyperedge Domination Number for a Hypergraph and Actor-Network Application
Mr. Ömer Akgüller
Mugla Sitki Kocman Universitesi, Turkey

Communication through lines is supposed to be continuous in a network design. It is important for a network to be invulnerable that is communication is not interrupted in the case of any damage. In this paper, we introduce the concept of the average weakly hyperedge domination number (AWHEDN) of a hypergraph as a new vulnerability measure. The polynomial runtime of the presented algorithm and the boundary of this measure are also studied. Since information systems are operating in a social context, we need to represent acts of humans in security systems to obtain more consistent models. To achieve this goal, hypergraphs are more useful than simple graphs. In this study we consider the hypergraph

model of an actor-network of a workplace, and then studied what kind of urgent changes shall be done in wi-fi connection in the case of the outer attack. The model with lesser AWHEDN number has the least communication possibility, hence it's appropriate to choose that model as an urgent response.

12:30-13:30 BUFFET LUNCH

Session 11A: Electrical Engineering and Electric Machines
Time: 13:30pm-14:45pm; Room: Capricho
Session chair: Assoc. Prof. V.V. Shurenkov National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), Russian Federation

E016:
Modelling and Comparison of Compressor Performance Parameters by Using ANFIS
Ms.Isil Yazar, Emre Kiyak and Hasan Serhan Yavuz
Anadolu University, Turkey

Developing a robust control algorithm for an aircraft engine requires an accurate nonlinear mathematical model. In formation of a nonlinear mathematical model, some components like compressor and turbine are modeled by using component maps. These maps show the connection between the compressor performance parameters. To show this connection, map data is digitized by using some techniques. In this study, we digitized a compressor map data by using ANFIS (Adaptive Neuro Fuzzy Inference System). RMSE (Root Mean Square Error) were calculated for different types of FIS (Fuzzy Inference System) structures constructed with different number of membership functions. The model was formed by using all valid data which is collected from a small turboprop engine compressor. Results demonstrate that the designed ANFIS structure can serve as an alternative model to estimate both online and offline compressor performance parameters.

E054:
Numerical Studies of Engine Performance, Emission and Combustion Characteristics of a Diesel Engine Fuelled with Hydrogen Blends
Tayfun Ozgur, **Mr. Erdi Tosun**, Ceyla Ozgur, Gökhan Tuccar and Kadir Aydin
Çukurova University, Turkey

In this study the performance, exhaust emission characteristics and combustion process of the engine fueled with hydrogen-diesel blends were compared to diesel fuel. Hydrogen was blended with diesel fuel at the volumetric ratios of 5%, 10% and 20%. AVL BOOST software was dedicated to simulate the performance and emission values for various blends of hydrogen with diesel fuel. The simulation results showed that hydrogen addition to diesel fuel improve both engine performance and exhaust emmisions.

E055:
Investigation of Engine Performance and Emission Characteristics of SI
Engine Fuelled with Ethanol Blends by Numerical Simulation
Ceyla Ozgur, Erdi Tosun, **Mr. Tayfun Ozgur**, Gökhan Tuccar and Kadir Aydin
Çukurova University, Turkey

In this study the influences of ethanol addition to gasoline on an spark ignition engine performance and emissions were explored. AVL BOOST software was used to simulate the performance and emission characteristics of different ethanol-gasoline blends. The blended fuels contain 5%, 10% and 15% of ethanol by volume, and indicated as B95E5, B90E10, and B85E15, respectively. The results showed that ethanol addition to gasoline fuel improve combustion process, decrease CO emissions and reduce BSFC of the SI engine.

E070:
Description of Sequences of Rhythmic Motor Primitives
Ms. Anna Gorbenko, and Vladimir Popov
Ural Federal University, Russia

Various problems of the task-level robot learning from demonstration has received substantial attention recently. Among other, we can mention investigation of motor primitives. In particular, different rhythmic motor tasks are very important. Recently, the approximate period problem was considered as a model for the investigation of sequences of motor primitives. In this paper, we consider the approximate period problem and some modifications of the problem for the investigation of sequences of rhythmic motor primitives.

E076:
Numerical Analysis of The Flow Field In The Nozzle of Hot Water Rocket Motor
Mr.Weiwei Sun, and Zhijun Wei
Beijing Institute of Technology, China

Flashing is an important factor in the working process of hot water rocket motor. In order to deeply understand the performance characteristic of hot water rocket motor, a numerical simulation model of the flow field in the nozzle was established in this paper. According to the study of flow field in the nozzle of the motor,it is found that the phase change occurs at the position of the throat,and the flow reaches to supersonic after the throat because of the changing sound speed.The flow in the nozzle can be divided into three processes in this paper: single-phase flow process, flash process and expand-accelerating process.

E0132:
Improving the Mechanical Properties of a Machine Component of A Fishing-net Weaving Machine by Duplex Coating
Mr. Naphatara Intanon, Charnnarong Saikaew, Anurat

Wisitsoraat and Parinya Srisattayakul
Khon Kaen University, Thailand
In this study, the mechanical properties of a weaving machine component made of cast stainless steel are improved by the duplex coatings of electroplated hard-chrome and sputtered metal nitride layers. The effects of the first and second coat layers of three metallic nitrides, including TiN, TiN-Ni and NiN, were comparatively studied. The structural characteristics of the coating materials were studied by scanning electron microscopy, energy dispersive X-ray spectroscopy and X-ray diffraction. Vicker hardness was then measured by nanoindenter. It was found that the duplex coating surfaces gives better surface quality than those of single-layer coated ones. In addition, the hardness of single-layer coating either with hard-chrome or metal nitride was only 2-3 times higher than uncoated ones whereas duplex coating with both layers synergistically increases the hardness by a factor of 7-8. Moreover, duplex coating with TiN exhibits relatively high hardness compared with other metal nitrides.

14:45-15:00 BREAK

Session 11B: Electrical Engineering and Electric Machines
Time: 15:00pm-16:15pm; Room: Capricho
Session chair: Assoc. Prof. V.V. Shurenkov National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), Russian Federation

E0134:
CFD Modeling and Design of Wind Boosters for Low Speed Vertical Axis Wind Turbines
Mr. Natapol Korprasertsaka, Nataporn Korprasertsak, and Thananchai Leephakpreeda
Sirindhorn international institute of Technology, Thammasat University, Thailand

In Thailand, the average wind speed is generally quite low (≈ 3 - 4 m/s). Although Vertical Axis Wind Turbines (VAWTs) are designed for low speed wind, standalone VAWTs are still unable to generate power satisfactorily under that practical condition. This study introduces a new design of a wind flow controlling device, called a “wind booster”, by utilizing Computational Fluid Dynamics (CFD). A wind booster is developed for incorporating with a VAWT in order to increase the performance of the VAWT and to overcome the limitation of harvesting energy with low availability at low speed wind. The guiding and throttling effects of the optimal design of the wind booster are able to increase the angular velocity of VAWTs which leads to an increase in power generated from VAWTs.

E0151:
Sensitivity Analysis of the Air Flow Inside a Single Cylinder Engine for Different Turbulence Models Using CFD
Mr. Felipe Grossi Lamas Amorim, Jean Helder Marques Ribeiro, Marília Gabriela Justino Vaz and Ramon Molina Valle
Federal University of Minas Gerais, Brazil

The increase of greenhouse gases emissions makes necessary to improve the comprehension of the Internal Combustion Engines operation. One of the factors that affect the combustion in these engines is the turbulence, since it can raise the quality of the fuel-air mixture inside the combustion chamber. However, when modeling internal combustion engines using CFD, the turbulence model choice is always a relevant problem. The present paper analyzes the results for three different turbulence models (k-ε Realizable, RNG k-ε and Menter k-ω SST) in a single-cylinder engine geometry, comparing numerical and experimental pressure data. For this experiment, the k-ε models obtained more trustable results than the k-ω SST, using less computational resources. The models achieved good results for eddy recirculation inside de cylinder and in regions of free shear flow at the valve openings, which makes possible to observe the correlation between parameters such as tumble and turbulent kinetic energy.

E2015:
The Simulation Calculation of Temperatures on Valve Seats of Combustion Engine and Its Verification
Brabec Pavel and **Mr. Aleš Dittrich**
Technical University of Liberec, Czech Republic

The paper deals with the load of the head of the engine. Head of SI engine, which has molded seat of intake and exhaust valve, is one of the most complex parts of the engine. It contains intake and exhaust ports, spark plugs, timing of the mechanism and channels for cooling and lubrication. Much of the final form of this component also contributes its load, which is both heat and mechanical. The biggest influence on the deformation of embedded saddles exhaust valve has a temperature distribution in the cylinder head. These temperatures are influenced by many factors, especially temperature and coolant flow, load and engine speed, which affect the combustion process and exhaust gas temperature (the engine mode is constantly changing, therefore the thermal load on the valve seats is different). In our paper we will only deal with the heat load of the cylinder head of the engine. Currently, the most common use of appropriate software tools for determining the distribution as voltage or temperature. The simulation results may not always be identical to the actual situation, so it is necessary to perform by verification. The paper described measurements of temperature on the inserted valve seats cylinder head of the engine.

E2016:
Design of System Hydrogen Engine Supercharging
Mr. Popelka Josef
Technical University of Liberec, Czech Republic

In this paper I am dealing with a general analysis of

problems burning of lean hydrogen mixtures in combustion engines. During burning of very lean mixtures burning procedure is over lasted with characteristic features. They need to be removed or reduced. One of these features is low power of engines operating by lean mixtures, which can be partially removed with the help of supercharging such engines. In the second part of the paper I am dealing with a design of supercharging system for a three- cylinder engine with volume 1,2 dm3.

E4003:
Rigid-flexible coupling dynamics analysis for a Twin-rotor Piston Engine
Dr. Tengan Zou, Cunyun Pan, Xiang Zhang and Lei Zhang
National University of Defense Technology, China

Twin-rotor piston engine (TRPE) is a new differential rotary engine, which is still under developing. In this paper, a rigid-flexible coupling dynamics model was established for the prototype TRPE-350. By combining the multi-body dynamics simulating software RecurDyn and the finite analysis software ANSYS, the TRPE's performances were studied. Vibration analysis for rigid-flexible coupling model was analyzed. The simulation results can be found that the simulated overall changing trends match with the actual movement of the TRPE very well. So it provides a theoretical tool for further optimization and improvement of this engine.

E0153:
Numerical Analysis of Tumble, Cross Tumble and Swirl Ratios in a Single Cylinder Research Engine
Mr. Leonardo Fonseca, Raniro Coelho, Raphael Braga, Bruno Pena e Ramon Molina Valle
UFMG University, Brazil

In-cylinder flow such as tumble and swirl has an important role on the engine combustion efficiencies and emission formations. In particular, the tumble flow which is dominant in current high performance gasoline engines has an important effect on the fuel consumption and exhaust emissions under part load conditions. In this research a numerical analysis on a single cylinder engine using computational fluid dynamics (CFD) is presented. From the results of the commercial code, the tumble, cross-tumble and swirl ratios are calculated for evaluating the flow development through intake and compression strokes. The reliability of the results is accessed through a validation process, which consists of comparing numerical and experimental results for in-cylinder pressure, along with a grid independence study. The results for the in-cylinder pressure show good agreement between numerical and experimental results, and the grid independence is rapidly achieved. The results for rotational ratios around X and Z axis show lower and unstable values, and indicate that the vortex on those plane change its rotation direction. On the other hand, the ratio around Y axis has the greater values, and also keeps its rotation direction.

16:15-16:30 COFFEE BREAK

Session 12A: Control and Automation of Manufacturing
Time: 16:30pm-17:45pm; Room: Capricho
Session chair:

E005:
Low Speed Aerodynamics of Drogue System Refueling of Unmanned Aerial Vehicles
Assoc. Prof. Ian McAndrew, Elena Navarro and Orin Godsey
Embry Riddle Aeronautical University, United Kingdom
Refueling aircraft has become a significant aspect of military strategy for air forces to work at further distances from safe shores. This paper will address the aerodynamics of the drogue refueling system and in particular its characteristics at low speeds, including head and tail winds. Data from wind tunnel experiments are used to show how the docking when refueling is affected by the lower speeds, position behind the supply aircraft and weather conditions. Possibilities of design improvements and implications are related to the task of refueling Unmanned Aerial Vehicles in-flight

E013:
On-machine Measurement System Implemented Based on Fanuc CNC System Using a Touch Trigger Probe
Ms. Zhang Rong, and Wang Yaping
Beihang University, China

This paper aims to implement an OMM (on-machine measurement) system using a touch trigger probe installed on the spindle of the milling machine with Fanuc 0i-mc CNC system. The CNC used in the milling machine is Fanuc 0i-mc system. The hardware system configuration for OMM and its software were both presented. The software is composed of several modules, and the most significant one is for generating measurement program based on CAD model of workpiece. This paper mainly presents the specific construction of the measurement macro for Fanuc system.

E061:
A Novel Approach to Model and Implement Planar Trajectory-Tracking Controllers for AUVs/ASVs
Mr. Nguyen Dong, Nguyen Hoai Nam, Khuong Minh Tuan and Ngo Van Hien
Hanoi University of Science and Technology, Viet Nam

Following the Model-Driven Architecture (MDA) approach, we have modeled and implemented a planar trajectory planning and tracking controller designed for Autonomous Underwater Vehicles or Autonomous Surface Vessels (AUVs/ASVs). Our approach covers steps such as the requirement, analysis, design and implementation to model and realize a controller for most standard AUV/ASV platforms. It also allows the designed elements to be customizable and re-usable in the development of new applications of AUV/ASV

controllers. The paper describes step-by-step the development lifecycle of planar trajectory-tracking controller for AUVs/ASVs. Based on this approach, a horizontal trajectory-tracking controller of a miniature autonomous submerged vehicle is completely developed and successfully taken on trial trip.

E098:
A Hybrid Control Model to Develop the Trajectory-Tracking Controller for a Quadrotor UAV
Mr. Pham Gia Diem, Pham Hoang Anh, Nguyen Phu Khanh, Nguyen Phu Hung and Ngo Van Hien
Hanoi University of Science and Technology, VietNam

A new hybrid model of control implementation is developed to realize trajectory-tracking controllers for quadrotor Unmanned Aerial Vehicles (UAV). This model is based on the Computational Fluid Dynamics (CFD) model and hybrid automata in order to accurately implement control parts of these vehicles, and can be applied to most standard quadrotor UAV platforms. The paper brings out step-by-step the controller development lifecycle for a quadrotor UAV, including the configuration and aerodynamic calculation model for the gathering preliminary inputs of the control application, the control analysis of dynamic model and general architecture, as well as the control design performed by specializing hybrid automata. The detailed design model is then converted into the implementation model by using open-source platforms in order to quickly simulate and realize the trajectory-tracking controller for this quadrotor UAV. Finally, this application was completely deployed and successfully taken on trial flights.

E0113:
Design and Non-Linear Simulations of a Fault-Tolerant Flight Control
Mr. Saif H. Almutairi and Nabil Aouf
Cranfield University, United Kingdom

In this paper, a Fault-Tolerant Control strategy (FTC) was applied using a linear dynamical model of a business jet aircraft subjected to actuation faults. As a baseline controller, an optimal linear quadratic tracker was designed to control some selected aircraft motion variables. Faults due to the loss of effectiveness were assumed. Then, the FTC was built upon a compensation of faults into the dynamical equations. The complete system was tested using nonlinear simulations of the aircraft dynamics. The results demonstrate the ability of the FTC strategy to maintain the stability of the system and to improve the tracking performance for a large scope of faults.

E0145:
Multi-Objective Optimization of CNC Turning Machining Parameters
Assoc. Prof. Sharad K. Pradhan and Surendra K. Saini
National Institute Of Technical Teachers' Training & Research, Bhopal, Mp-462002, India

An experimental investigation into CNC turning operation on Brass C36000 alloy as work piece material which is widely used for various industrial applications is performed. Multi objective optimization is carried out to find out the influencing machining parameters among spindle speed (rpm), feed (mm per revolution) and depth of cut (mm) for CNC turning of Brass C36000 alloy with surface finish and Material Removal Rate as performance parameters using Taguchi method. Taguchi orthogonal array [L_{27} (3^3)] is used for the experimental design. All experiments are conducted using EMCO Concept Turn 250 machine tool with carbide insert cutting tool. The optimization result shows that feed is the most significant turning machining parameter for surface roughness while depth of cut has high influence on material removal rate followed by spindle speed during CNC turning of Brass C36000 alloy. Above results is further validated using ANOVA approach.

17:45-18:00 BREAK

Session 12B: Control and Automation of Manufacturing
Time: 18:00pm-19:00pm; Room: Capricho
Session chair:

E1013:
Simulation of Sinusoidal Vibration Control Algorithm Based on Hydraulic Vibration Table
Ms. Li Xiaolin and Yan Xia
China Academy of Engineering Physics, China

In this paper, the model of hydraulic vibration system is established and sinusoidal vibration control algorithm is discussed and studied. A sinusoidal control hydraulic vibration system is designed. By simulation, this system has good frequency response characteristic and sine sweep control function.

E1016:
The Simulation of Rotor Field Oriented Control of PMSM
Mr. Ou Feng, Chen Hong, Chen Ying
China Academy of Engineering Physics, China

Permanent magnet synchronous motor（PMSM）has been widely in production and everyday life, and its control system has been a difficult point needing more researches. Therefore, it is important to investigate the control system of PMSM. In order to ensure the dynamic and static performance of PMSM, this paper presents a new vector control method based on the rotor field oriented control (RFOC) technology. The paper introduces the fundamental principal of RFOC, and designs three loop servo control simulation system and analyses the result of the simulation. The results shows that the RFOC system has high dynamic and static performance by adopting the three loop control. And the analysis can also provide a reference for siGaudir servo control system design personnel.

E2010:
CNC Processing of Nurbs Curve based on AutoCAD
Mr. Di Fei
China Academy of Engineering Physics, China

In this paper, firstly the characteristics and discrete mathematics method of Nurbs curve were studied in-depth, and a NC processing method based on De Boor-Cox algorithm was presented. Then, dedicated data-processing software for NC system was developed with VC++ 6.0. This software has been well applied in practice production, and the production efficiency is improved as well.

E4018:
Gait of a Biped Robot Implemented on a FPGA
Mr. Crhistian Segura and Jairo Cortes
Universidad Militar Nueva Granada, Colombia

A biped robot based its mobility imitating human movements; this development is focused on the movement of the lower limbs. The mobility of the robot is made by servomotors; because they work in a very siGaudir way as the joints of the human's lower limbs but with some restrictions. The logic of this system was coded on VHDL language to be implemented in a FPGA. The reason for using this hardware; is because it had fast reaction speed, its implementation is friendly and versatile also is able to handle multiple processes in parallel. This paper describes the servo characteristics and how it was used to through an FPGA make possible move a robot who imitates the human movements in the sagittal plane, also show the mechanical design. Shows that the FPGA is better suited in this case than a micro controller to follow multiple paths at the same time.

E3013
Combined Effects of Radiation and Viscous Dissipation on MHD Free Convection in a Square Porous Cavity with Localized Isoflux Heating
Ahmed Kadhim Hussein and Salam Hadi Hussain
Mechanical Engineering Department- Babylon University, Babylon Province, Iraq

Radiation and viscous dissipation effects on the free convection in a square cavity filled with a porous media and subjected to a horizontal magnetic field (Bo) is investigated numerically. Both left and right sidewalls are maintained at a constant cold temperature (Tc).The upper wall is adiabatic and the bottom one is subjected to a localized isoflux heating while the other regions of it are considered adiabatic also.

Oral Presentation Sessions

July 19th, 2014, Thursday 8:30 AM – 19:00PM/ Gaudi

Session 13: Energy & Modeling
Time: 8:30am-10:10am; Room: Gaudi
Session chair:

R3006:
RES Efficiency Indicators for Portugal, Spain and Germany
Prof. F. Martins and C. Felgueiras
REQUIMTE/ISEP, Portugal

Nowadays one of the most important strategies in the European Union and in the World to solve energy problems is RES energy production. Many investments and financial supports are being done and implemented in many countries. However it is very relevant to have parameters and merit figures that help to evaluate the investments done and solutions implemented and that can be useful in the definition of future pathways and energy systems. In this work are calculated efficiency indicators to RES technologies for three EU's Member States, namely Portugal, Spain and Germany that are internationally recognized to have a significant role in RES implementation and integration.

R046:
Adoption of energy efficient new technologies from the point of view of Malaysian experts and consumers: A qualitative analysis
Ms. Hasti Khorasanizadeh, Jussi Parkinnen, and Rajendran Parthiban
Monash University Malaysia, Malaysia

This paper presents the result from interviews about consumers' reasons for adopting or not adopting energy-efficient technologies, specifically LED lamps, in Malaysia. Data were gathered via 18 in-depth semi-structured interviews. The interviewees were chosen from two groups: energy and environment professionals and normal electricity consumers. The respondents were mainly environmentally concerned. They believed that typical reasons, which could encourage consumers to adopt new technologies, are energy efficiency, money savings or environmental conciousness. It was also concluded by this study that consumers might not favor adopting new technologies due to price barriers, lack of knowledge and not effective policies.

R3005:
Embedded Electricity Quality Analyser
Prof. Dr. C. Felgueiras, S. Freitas, R. Martins, and F. Martins
CIETI/ISEP, Portugal

Electric installations are traditionally designed for supplying an electric service. The only one associated instrument is the energy meter that is introduced only for measure the total amount of energy that will be charged to the user. However, the exploration of parameters associated with electricity can provide several advantages such the household performance devices, legal issues and later one a more sustainable way to use the electricity energy. This work presents the principle of a low cost energy analyzer that will be part of a electric home installation. Electric parameters are measured and then transmitted via Wi-Fi to a domestic server where all data are stored. This data exploitation can be later one used for several purposes, since electric efficiency to electric charges prediction.

R019:
Multi-Criteria Decision Support Methods for Renewable Energy Systems on Islands
Mr. Christian Wimmler, Golnar Hejazi, Eduardo de Oliveira Fernandes, Carlos Moreira and Stephen Connors
University of Porto, Portugal

Islands often are confronted with severe energy challenges especially those far from the main land which operate as isolated energy systems. In those cases electricity, the queen of the energy vectors, shall be obtained from diversified sources to alleviate the burden of the dependence on fossil fuels. Thereby, the generation of electricity from renewable energy sources in combination with electricity storage becomes an irrecusably challenge in the nearby future. Often a variety of criteria can be applied to identify the suitability of technologies, whereas no ideal family of criteria has been defined in the literature. Hence, decision support for energy planning and management is required. This paper reviews the state-of-the-art of multi-criteria decision support methods applied to renewable energy and storage technologies. It will be analyzed where the current focus is placed on. The gaps of those analyzed studies will be evaluated and key aspects for future energy planning considerations for islands will be proposed. Finally, an outlook for a newly developed concept for island energy planning will be presented. Indeed, for most isolated islands renewable energy technologies in combination with storage devices are a desirable and valued solution for sustainable development.

R2015:
Hydrogen and methane production from palm oil mill effluent in the two-stage thermophilic-mesophilic anaerobic reactor

Asst. Prof. Lakhveer Singh and Zularisam A. Wahid
Faculty of Technology, Universiti Malaysia Pahang (UMP), Lebuhraya Tun Razak, 26300 Gambang, Kuantan, Pahang, Malaysia

The aim of the present study was to investigate the potential of hydrogen and subsequent methane production by a novel two-stage combine reactor using a palm oil mill effluent. Thermophilic hydrogen fermentation was conducted in a up flow anaerobic recator at 60 °C and pH hydraulic retention time (HRT; 32 h) by inoculating with seed sludge. Following the hydrogenogenic process, methanogenesis in the second bioreactor was conducted at 35 °C using a continuous-type stirred tank (CSTR). At a HRT of 32 h, the hydrogen production rate was 8.13 L of H2/day, while the yield of hydrogen produced was 4.35 L H2/L-POME. The effluent from hydrogenogenic first stage with a high concentration of organic acids was further digested into methane by the mesophilic methane production CSTR reactor at a HRTs of 12, 8, and 4 days. The highest methane production rates was 75.6 L of CH4/day with COD reduction 94%, was obtained at a HRT of 4 days. This work demonstrated that anaerobic co-digestion of POME for hydrogen-methane production was a stable, reliable and effective way for exploiting the gaseous biofuel potential of this wastewater type.

R042:
The Relation between the Budget Deficit and Energy Demand in the selected European Countries and Turkey:Panel Cointegration Analysis
Ms. Zerife Yildirim and **Ms. Ayse Atilgan Yasa**
Dokuz Eylül University, Turkey

Within a country in the current globalized world, there is being an immense increase in energy demand due to a rapidly growing economy, changing living standards, population growth and rapid urbanization. Although the subject of some noteworthy studies has been on the energy policies, there are not so many of them focused on the correlation between energy demand and the budget deficit. Considering the researches ever made, mostly for developing countries, it is derived that the level of energy demand exceeds the level of energy supply.
In the countries where there exists limited energy production capacity as well as, adversely, a huge growth of energy demand, that has resulted in dependency on high-cost energy resources or energy imports. However, these countries are diversified from each other with varying degrees of budget balances, supply-demand relations, or underground energy base. In this study, we aim to focus on the relationship between budget deficit and energy demand in some European countries and Turkey within the years of 1960-2013. In order to determine that relationship, vector error correction model, causality test, panel unit root tests, and panel cointegration analysis are used in terms of methodological framework.

R069:
CAN Based Conformance Testing using TTCN-3
Prof. Intaek Kim, Tayyab Wahab Awan, Ahmed Mahdi Abed, and Hyuk Soo Jang
Myongji University, South Korea

Conformance testing is a way to determine if a developed system satisfies the requirements of a specification. As recently a CAN based standard for communication interface for DC fast charging is developed, it requires conformance testing to ensure the safety and proper operation. This paper exploits the use of TTCN-3 for this CAN based conformance testing and attention is focused on the implementation of TTCN-3. Two computers are used for communication via CAN. One computer is working as a tester and the other is working as a system under test.

R074:
Sensitivity Tests of Direct Insertion Data AssiGaudition with Pseudo Measurement
Mr. Lei Ren, Michael Hartnett and Stephen Nash
National University of Ireland, Galway

Data AssiGaudition (DA) was a technique to improve the modelling forecasting ability. The measured data was blended with model background states in the DA process. Whether the model was robust to synthesize the measured data needs to be studied. In our research, Direct Insertion (DI) data assiGaudition was applied to update the model background states. In order to test the sensitivity of Direct Insertion data assiGaudition, five kinds of data assiGaudition model with different time interval were utilized. The influence of Direct Insertion data assiGaudition on surface layer was also studied. A small test area was chosen for data assiGaudition. Constant pseudo measurements were used to update the surface velocity components in data assiGaudition domain.

10:10-10:30 COFFEE BREAK

Session 14: Clean Energy
Time: 10:30am-12:10pm; Room: Gaudi
Session chair:

R009:
Enhancement in enzymatic saccharification by planetary milling for environmentally friendly bioenergy production
Dr. Jin Hyung Lee
Korea Institute of Ceramic Engineering and Technology, Rep. Korea

Pretreatment of lignocellulosic biomass is one of the key steps required in biofuel production. Pretreatment processes usually aim to increase the biomass's internal surface area by decreasing the degree of polymerization and crystallinity, separating the structureal linkages between lignin and carbohydrates and disrupting the lignin strucutre. Here, we propose planetary mill based

pretreatment process for environmentally friendly biomass pretreatment. Planetary milling reduced the crystallinity of rice straw and production of soluble phenolic compounds. We optimized the conditions of pretreatment and saccharification using Response Surface Methodology (RSM). Finally one-spot biobutanol production by simultaneous saccharification and fermentation of planatery milled biomass will be presented as a model process of green biofuel production process.

R2001:
Numerical modelling of regular waves propagation and breaking using waves2Foam
Mr. Behrang Chenari, Seyedeh Shiva Saadatian and Almerindo Domingues Ferreira
University of Coimbra, Portugal

Nowadays, ocean energy has attracted more attention among the researchers due to its massive energy potential. As designing, constructing and testing prototypes are both expensive and time consuming, recently, many researchers have developed numerical wave tanks to simulate the behaviour of the waves as well as the interaction of waves with wave energy converters. This paper aims to model numerical wave tanks, using waves2Foam - a solver within OpenFOAM, to show the propagation of waves, as well as different wave breaking types. Firstly, a flat-bottom wave tank is modelled in order to simulate both generation and absorption of the waves. Such results are benchmarked against laboratory experiments data and the comparison between simulation and experiment results showed a good agreement. Furthermore, some additional cases are modelled to assess the capability of waves2Foam in absorption of waves' reflection from the outlet boundary. Secondly, different sloped wave tanks are modelled to investigate the capability of waves2Foam in properly simulating wave breakings. Results demonstrated that waves2Foam is not only able to well simulate wave generation and absorption but it is also able to simulate all types of wave breaking. This work presents waves2Foam as powerful toolbox which can properly model waves based on different wave theories. However, some limitations of the solver were identified.

R015:
Optimal Placing of Wind Turbines: Modeling the Uncertainty
Mr. Frank Phillipson and Timo Leenman
The Netherlands Organisation for Applied Scientific Research, Netherlands

When looking at the optimal place to locate a wind turbine, trade-offs have to be made between local placement and spreading: transmission loss favours local placements and the correlation between the stochastic productions of wind turbines favours spreading. In this paper steps are described to determine the locations of new wind mills that minimize energy loss on the High Voltage power grid. A vindication of the used power grid model is provided, the simulation procedure for stochastic wind power is described and the required mathematical optimization models are described as well as implemented. Results are shown and their relation to real life problems is discussed. The analysis leads to the observation that in reality the entire Dutch coast is popular to locate wind turbines but the only region where this leads to actual reduction of the losses is the North (Groningen and Friesland). Next to this, at the current share of wind energy in the total network load, a spreading strategy to reduce variance of total wind power production does not seem advisable. At higher penetration (30% or more) spreading will become important.

R029:
Estimating the Evolution of Residential Demand for Natural Gas: The Case of Istanbul
Assoc. Prof. A. Talha Yalta and Galip Altinay
TOBB University of Economics and Technology, Turkey

Much of the existing literature on demand for natural gas assumes constant and single value elasticities, overlooking the possibility of dynamic responses to the changing economic and environmental conditions. We aim to fill this gap by providing individual time series of short-run elasticity estimates based on maximum entropy resampling in a fixed-width rolling window framework. This computational approach does not only enable to take into account the variability of the elasticities, but also helps obtain more efficient and robust results in small samples in comparison to conventional inferences based on the asymptotic distribution theory. To illustrate the methodology, we employ monthly time series data between 2004-2012 and analyze the dynamics of residential natural gas demand in Istanbul, the largest metropolitan area in Turkey. Our findings reveal that the parameters of the demand model do not remain constant and they are sensitive to the economic conjuncture as well as environmental fluctuations.

R035:
Drying Nerium Oleander in an indirect solar dryer using phase change material as an energy storage medium
Dr. Saleh Shalaby and Mohmed Bek
Tanta University, Egypt

In this work, the Nerium Oleander was dried at its prescribed drying temperature (50±2.5 ºC) in indirect solar dryer (ISD) using phase change material (PCM) as energy storage medium. 12 kg of paraffin wax were used as a latent heat thermal storage. From the experimental obtained results it is found that the ISD implementing PCM as thermal storage medium successfully maintains the temperature of drying air around 50 ºC for seven consecutive hours. It is also found that the temperature of drying air is higher than ambient temperature by 2.5-5 ºC after sunset for 5 hrs at least. This profile of the temperature of drying air helps reaching the final

moisture content of Nerium Oleander after 14 hrs. Nine thin layer drying mathematical models were tested to specify the suitable model for describing the drying behavior of the Nerium Oleander. It was found that Midilli and Kucuk model is convenient to describe the thin layer solar drying of Nerium Oleander.

R040:
Polyaniline modified stainless steel fiber felt for high-performance microbial fuel cell anodes
Dr. Junxian Hou, Zhongliang Liu,and **Dr. Yanxia Li**
Beijing University of Technology, China

The three-dimensional (3D) macroporous anodes are constructed by coating polyaniline(PANI) on stainless steel fiber felts (SSFFs) that have an open, solid and macroporous structure. In the present study, nano-polyaniline is synthesized in two different methods by using chemical and electrochemical oxidative polymerization. These modified electrodes provide large surface area for reaction, interfacial transport and biocompatible interface available for bacterial colonization and substrate transport. The polarization curves together with electrochemical impedance spectroscopy (EIS) measurements demonstrate that polyaniline modified anodes could greatly improve MFCs' power output and decrease MFCs' internal resistance. Our experimental results also prove that embedding polyaniline into 3D macroporous metallic scaffold is a promising method for MFC anode fabrication.

R050:
Analytical study of a heat recovery/desiccant cooling system under Tunisian conditions
Mr. Seifennasr Sabek, Kaouther Bennasr, Ridha Chouikh, and Amenallah Guizani
Research and Technology Center of Energy, Tunisia
The solar potential energy in Tunisia can be used like a principal factor for the operation of new technologies of air conditioning. Studies could be carried out like approaches of simulation, analyzes experimental or both unit. In this paper, we present an analytical solution of heat and mass transfer processes in regenerator and air conditioning system (ACS) cores of a heat recovery /desiccant cooling system (HRDCS) under Tunisia weather conditions. Simulations programs were carried out to test the principal components of the HRDC system. The results show that the coefficient of performance of system improves when we use the renewable energy for heating and cooling. This study is significant and effective to prove the efficiency of such HRDC systems in this country.

R1009:
The Evaluation of Aerodynamic Interaction of Wind Blade Using Fluid Structure Interaction Method
Kyoungsoo Lee, **Prof. Ziaul Huque**, Raghava Kommalapati, and Sang-Eul Han
Prairie View A&M University, USA

This paper presents the evaluation process of aerodynamic load on wind turbine blade using Fluid Structure Interaction (FSI) method. The aerodynamic loads are determined using 3D Computational Fluid Dynamics (CFD) and are applied to the wind blade structure with the help of an interface which relates the FSI interaction. The interface shares the identical surface topology. The steady and transient CFD analyses with k-SST turbulence model are performed for 1-way and 2-way interaction, which are defined by using the interface between fluid and structure domains. A parameterized 3D CAD models for National Renewable Energy Laboratory (NREL) Phase VI wind blade are used for the analyses. The verification of CFD results are performed by comparing with experimental data, which were obtained from NREL. The calculated and verified aerodynamic loads are applied to the wind blade structural model. The effective structural stiffness was derived from the frequency based eigen-value analysis. The static and time dependent transient structural analyses were performed. From the mesh-sensitivity parametric studies, the wind power coefficient or torque value is found to be strongly affected by the fluid mesh characteristics. The structural mesh characteristic was important in the mapping process of CFD aerodynamic load to the structure.

12:10-13:30 BUFFET LUNCH

Session 15A: Environmental Engineering
Time: 13:30pm-14:55pm; Room: Gaudi
Session chair:

R031:
Integrating sustainability into management of project
Mr. Hosein Daneshpour
Lappeenranta university of technology,Finland

Sustainability is one of the most significant challenges that societies face today. Over recent years environmental considerations have become an important part of all projects and companies are integrating sustainability in their strategy. The need for sustainability is the crucial factor for projects success and project management as a key skill need to develop to execute and guide the project in a sustainable way. The purpose of this work is to discuss the concept of sustainability, highlighting it application in project management and introducing the potential area of integration of sustainability idea in project management. Consequently aiming at providing the insight and increasing the awareness of project oriented organizations concerning sustainability issue.

R026:
Solubility of Organics in Triethylene Glycol: Phase Equilibrium Modelling Using the Dortmund and LYNGBY Modified UNIFAC Models
Ms. Corina-Maria Mateescu, Edison Muzenda and Mohamed Belaid
University of South Africa, South Africa

This work is an attempt to predict the solubility of 60

volatile organic compounds (VOCs) in triethylene glycol aimed at thermodynamically testing the suitability of this solvent as an absorbent for the selected organics. The VOC main groups studied were alkanes, alkenes, alkynes, aldehydes, carboxylic acids and alcohols. The Modified UNIFAC Dortmund and Lyngby models were to study the required phase equilibrium as a function of temperature and composition. Triethylene glycol was found to be suitable for the absorption of low molecular weight aldehydes, alcohols and carboxylic acids. Generally, the infinite dilution activity coefficients computed in this study were low (below 100) indicating that the polymeric solvent studied in this work gave favourable phase equilibrium compared to water, the common industrial solvent. The solubility of VOCs was also found to decrease with increase in solute molecular weight. Compared with literature findings, the Dortmund performed better than the Lyngby procedure. However both models failed to accurately predict phase equilibrium behaviour. The authors therefore agree with literature findings that a specialised group interaction needs to be created for this solvent in the UNIFAC models in order to satisfactorily predict activity coefficients for the studied binary interactions.

R034:
Visualization of Multiple Flame Interactions: Appearance Structure and Combustion of LPG-Air Premixed Laminar Flames
Dr. Usa Makmool, Sumrerng Jugjai and Suvit Tia
King Mongkut's University of technology Thonburi (KMUTT), Thailand

Interaction of multiple premixed laminar flames was studied by visualizations of the modified flame structures. Typical line-of-sight flame chemiluminescence image and spatial resolved OH distribution by means of planar laser-induced fluorescence (OH-PLIF) technique were applied for these observations. The premixed flames of liquefied petroleum gas (LPG)/air mixture with three inline nozzles were established to simulate the practical flame characteristics produced by the practical cooking burners. The obtained results are compared as a function of primary equivalence ratio ( ) and inter-distance (S/D_o) between nozzles. Effect of S/D_o and on the multiple premixed flame structures is well understood via the clarifying reaction zone distribution, which is in-situ visualized by OH PLIF technique. S/D_o has a strong effect on interactions between flames, resulting in either flame enhancement or flame inhibition, depending on . CO and NO_x emissions were measured in order to confirm the combustion performance of the multiple flames. It is recommended that the in-situ visualization is the focus for a study of the flame. This will help to avoid misunderstanding of the real combustion as it can be occurred by using the line-of-sight observation technique.

R036:
Effectiveness of Greenhouse Gases Reduction Strategies and Policies in Mexico
Prof. Dr. Violeta Mugica-Alvarez, Leticia Ramos-Guizar, José De Jesús Figueroa-Lara andMiguel Torres-Rodríguez
Universidad Autonoma Metropolitana-Azcapotzalco, México

Mexico as one of the No Annex I countries signatories of Kyoto protocol has conducted several activities to face climate change. This paper presents the assessment and discussion of the actions comprising the three programs in the country during the period 2009-2012: The federal program named Climate Change Special Program (PECC from its Spanish initials), the Clean Development Projects (CDP) registered in the IPCC, and the State Government Actions (SGA). Only 36 of the quantitative 53 PECC´s goals achieved some progress, although the global goal of reducing 129.03 Mt CO_2eq/year by the end of 2012 was fulfilled and exceeded, but several important goals were not met. Some actions were performed in order to generate clean energy, such as the construction of an Eolic Park and a hydroelectric, but the government has continued benefiting the extraction of fossil fuels. The estimated effectiveness for PECC actions was 13.4 million of euros/ Mt CO_2eq.

R037:
Carbon Capture Analysis in Two Forage Systems as a Tool for Mitigating Global Warming. Study Case: Sumaco Biosphere Reserve - Ecuador.
Mr. Santiago Jimenez, Alejandra Jimenez, and Cristhy Jimenez
Escuela Superior Politecnica De Chimborazo, Ecuador

Global warming is the phenomenon in which the accumulation of greenhouse gases in the atmosphere produces the increase of the global average temperature. Carbon dioxide is one of the main responsible for the "extended" greenhouse effect. The release of this gas mostly obeys to anthropogenic activities effect. Plants contribute to store the atmospheric CO_2 through the photosynthesis and biomass production. The forests capability to store carbon is well known around the world, however in Ecuador there is insufficient information about this topic. This paper presents the research conducted in order to quantify the carbon stored in two soil use systems. Pastures with and without shade were analyzed during the study. Both soil use systems are located in the Sumaco Biosphere Reserve. Temporary sample plots of 500m^2 were installed in three towns of Napo Province. The sample plots were divided in several smaller plots and trial pits. All storage components of woody and herbaceous strata were analyzed. The obtained data were expressed in tons per hectare of estimated CO2. The results of the study showed on one hand, that the main storage component in both soil use systems was the soil; whereas, forage production was higher in system without shade.

R2011:
Waste Tyre Management in Gauteng, South Africa:

Government, Industry and Community Perceptions
Prof. Edison Muzenda and Christina Popa
University of Johannesburg, South Africa

Waste tyres have accumulated at landfills in South Africa, some are illegally dumped in open spaces or sold. This work discusses the waste tyre problem in South Africa as well as the environmental and economic benefits of waste tyre utilization for green fuels. The perceptions of government, industry and community on waste tyre management were investigated. To achieve the objectives a triangulation procedure was followed. This included personnel interviews, questionnaires and literature analysis. The research has shown that lack of knowledge particularly in the informal sector contributed to the waste tyre management problem. The lack of clear and focused legislation guiding the disposal and recycling of waste tyres remains a challenge. Pyrolysis was found to have the potential to address the waste tyre problem with the potential to reduce environmental impact and also contribute towards a green economy.

R063:
Bio-enrichment of waste crude oil polluted soil: amended with Bacillus 139SI and organic waste
Dr. Arezoo Dadrasnia and Salmah Ismail
University of Malaya (UM), Malaysia

Biodegradation of waste crude oil contaminated soil amended by *Bacillus 139SI* and used tea leaf amendments was investigated to determine the rate of hydrocarbon remediation. Previously, *Bacillus 139SI* was isolated from an agricultural soil in the Serdang agricultural center, Malaysia. Within 60 days, 14% oil loss was recorded in unamended polluted autoclaved soil, while waste crude oil disappeared more rapidly in the soil amendment with both strain and organic waste, recorded above 89%. Utilizing bacteria counts were significantly higher in all amended treatments comparing to control soil. Dehydrogenase activity in soil was markedly enhanced by the application of amendments. Waste crude oil composition monitored by GC/FID indicated complete degradation of n-C_9–C_{25}. First-order kinetic model revealed that organic waste and strain were the best of treatments, with biodegradation rate constant of 0.17day^{-1}and half-life of 4 days. The results showed there is potential for tea leaf and *Bacillus 139SI* to enhance biodegradation of waste crude oil contaminated soil.

14:55-15:05 BREAK

Session 15B: Environmental Engineering
Time: 15:05pm-16:30pm; Room: Gaudi
Session chair:

R047:
Application and optimization of using recycled pulp for Methylene Blue Removal from Wastewater: a Response Surface Methodology Approach
Mr. Babak Salamatinia, Andreas Aditya Hermawan, and Tan Kok Bing
Monash University Malaysia, Malaysia

One of the main challenges in the industrial world is presence of dyes in water bodies, which can create lots of problems. Researchers have recently focused a lot on removing dyes by use of low cost techniques or waste material. A huge amount of waste paper is daily produced in many places. This study has been conducted to investigate the possibility of using waste paper as an adsorbent to remove methylene blue (MB) dye from water. With total of six variables observed, the experiment was divided into two parts using central composite design, and employing Response Surface Methodology (RSM) by using Design-Expert 6.0.7 Software. After certain optimization following the criteria from software prediction, the highest removal of MB was found to be 95%. Pulped waste paper shows good sorption ability and the optimum conditions were found.

R068:
Phytoremediation of mine tailings using Lolium multiflorum
Prof. Dr. Violeta Mugica-Alvarez, Verónica Cortés-Jiménez, Mabel Vaca-Mier and Victor Domínguez-Sori
Universidad Autonoma Metropolitana-Azcapotzalco,México

In this research we studied the feasibility of applying phytoremediation in the mine tailings at La Concha site. The extraction efficiency of heavy metals was studied, as well as the tolerance to high pollution and biomass generation of Lolium multiflorum, known as Italian ryegrass, in the aggressive soils composed almost entirely by mine wastes. Ryegrass seeds were grown in mine tailings containing Cu, Mn, Zn, and Pb concentrations of around 800, 4600, 3200, and 5400 ppm respectively. Triplicate analyses of soils without treatment and with treatments consisting in organic matter (OM) additions were carried out during 90 days. Italian ryegrass has a high tolerance to polluted mine tailings, although the addition of small quantities of organic matter improves the extraction of metals. The highest metals uptake from tailings was achieved through treatment with 20 % OM additions, with varying efficiencies of around 50% for Zn and Pb in 90 days, although for Cu and Mn these were smaller, namely of 28 and 14% respectively. These results show that phytoremediation of mine tailings is possible through grass planting that was able to remove the heavy metals.

R076:
Combustion process analysis in a DISI engine fuelled with n-butanol through UV-VIS emission spectroscop
Dr. Cinzia Tornatore, Adrian Irimescu, Luca Marchitto, Simona Silvia Merola and Gerardo Valentino
Istituto Motori - CNR., Italy

In this paper, the study on the effects of n-butanol on the combustion process in a DISI engine has been conducted.

Experiments were performed on a direct injection SI engine operated on gasoline and butanol, with combined analysis of in-cylinder pressure traces, exhaust emissions and optical data. The optically accessible power unit was fitted with a commercial head and a high pressure wall guided injection system working at 100 bar. The engine speed was set at 2000 rev/min as a representative value for mid-road load automotive use. Different spark timings were tested. All trials were performed at close to stoichiometric air-fuel ratio. UV-visible natural emission spectroscopy was applied to investigate the formation and the evolution of the main compounds characterizing the spark ignition and combustion process. Pollutant measurements (HC, CO and NOx) at undiluted exhaust, for gasoline and butanol, were correlated with pressure related data and optical results.

R1005:
Study on the Scale Inhibition Performance and Mechanism of Polyepoxysuccinic Acid for Calcium Phosphate
Dr. Wu Lei, Wenyan Shi, and Gang Chen
Nanjing University of Science and Technology, China

The static scale-inhibiting method was employed to investigate the scale inhibition performance of polyepoxysucci-nic acid (PESA) on calcium phosphate, and molecular dynamics (MD) method was used to simulate the interactions between PESA and (001), (010) surfaces of hydroxyapatite (HAP, the most thermodynamically stable phase of calcium phosphate) in aqueous solution. The results show that the scale inhibition efficiency of PESA increases as the increase in the concentration and PESA possesses better scale inhibition performance compared with PAA while poor performance compared with POCA. Moreover, PESA molecules adsorb on the surfaces rather than remain in the bulk water in MD simulations and the binding energy of PESA with (010) is significantly stronger (1.8 times) than that with (001) surface, which is mainly provided by hydrogen bonds and coulomb interaction verified by the analysis of radial distribution functions. The adsorption of PESA changes the growth rate of crystal surfaces and leads to changes in the crystal morphology of HAP, according well with the scanning electron microscopy (SEM) results. These suggestions may be useful for the synthesis of new, highly effective scale inhibitors.

R1006:
A Theoretical Investigation on the Molecular Structure and Spectral Characteristics of Heavy Metal Chelating Agent of H3TMT and Its Complex (HgMe)3TMT with CH3HgCl
Prof. Feng-yun WANG, Feng-he WANG, and Xue-dong GONG
Nanjing University of Science and Technology, China

In order to explore the molecular structure and spectral characteristics of 2, 4, 6-trimercaptotriazine (H_3TMT) and its heavy metal chelating complex $(HgCH_3)_3TMT$, quantum chemical calculations were performed using the density functional theory, B3LYP method. With the optimized geometries of H_3TMT and $(HgCH_3)_3TMT$, ^{13}C NMR chemical shifts and IR spectroscopic characteristics were calculated. In order to describe the molecular characteristics more accurately, descriptors such as the frontier molecular orbital energy, Fukui indices, the natural population analysis and global reactivity were obtained. In combination with the compositions of the highest orbital molecular orbital (HOMO), and the local reactivity descriptors, S and N atoms in H_3TMT are the reactive sites, as was seen in the formation of metal complex of $(HgCH_3)_3TMT$ with CH_3HgCl. The calculated molecular geometries, ^{13}C NMR chemical shifts and IR spectroscopic characteristics of $(HgCH_3)_3TMT$ are in good agreement with the experimental results, which indicates the simulation is reasonable. Theoretical investigation upon the heavy metal chelating agent of H_3TMT is undoubtedly helpful for the design and synthesis of new materials, as well as the assessment of material performance.

R2012:
Glycerol – a Viable Solvent for Absorption of Highly Polar Solutes I: Behaviour of Molecular Interactions
Prof. Edison Muzenda and Jacques J. Scheepers
University of Johannesburg, South Africa

This work focused on the potential of glycerol as a scrubbing solvent for stripping of highly polar volatile organic compounds (VOCs) from industrial waste gas streams. Results for glycerol interactions were compared to those of its water. Solubility predictions in the form of infinite dilution activity coefficients were made using the Modified UNIFAC Dortmund group contribution model, which was set up on a Microsoft Excel spreadsheet specifically designed for this purpose. Activity coefficients for VOCs in waster and glycerol (highly polar solvents) increased with an increase in the length of the VOC solute nonpolar tail. Furthermore, activity coefficients decreased with an increase in the degree of branching of the VOC solute. The results show that low chain length highly polar alcohol, ketone, organic acid and aldehyde solutes are very soluble in glycerol. Diols, dicarbonyl aldehydes, some ketone derivatives and the ethanolamines also show good solubility. Highly polar diesters and ester derivatives are insoluble in glycerol and water. This study has found glycerol to be a better scrubbing solvent than water in treating highly polar VOCs. However it is possible that the standard method of building up the glycerol molecule in the UNIFAC may result in under-predictions of activity coefficients and thus special group interaction parameters for glycerol are required.

R1007:
Cellular and Molecular Damage by Ganaxolide on Phanerochaete chrysosporium
Dr. Wei Huang, Hongxia Xiong, Changbing Liu, **Mr. Aijing Li**, and Yu Lin
Tianjin Research Institute of Water Transport Engineering,

China

Galaxolide (1, 3, 4, 6, 7, 8-hexahydro-4, 6, 6, 7, 8, 8-hexamethyl-cyclopenta-γ-2-benzopyran, HHCB) is recognized as a novel contaminant in water and has potential adverse impacts on aquatic organisms. The toxic effect of HHCB on *Phanerochaete chrysosporium* was investigated by exposure of the fungus in nitrogen-limited culture medium to various concentrations of HHCB. The cultivation results showed that both the size and the quantity of the mycelial pellets of *P. chrysosporium* could be reduced when the concentration of HHCB was higher than 300 mg/L. DNA damage of *P. chrysosporium* by HHCB was also detected. Comparing with that in the control, the percent polymorphism under different concentrations of HHCB increased, from 21.4% to 42.9%. In addition, the result of UPGMA (un-weighted pair group method of arithmetic means) dendrogram showed that the Simple Matching Coefficient (SM) was decreased with an increase in the concentrations of HHCB. Thus, as an environmental pollutant, HHCB has the toxic effect on *P. chrysosporium* at both cellular and molecular level.

16:30-16:45 COFFEE BREAK

Session 16A: Electric Energy & Refrigeration Technology
Time: 16:45pm-17:45pm; Room: Gaudi
Session chair:

R032:
Performance Evaluation of Photovoltaic String with Compound Parabolic Concentrator
Mr. Haider Ali and Palanichamy Gandhidasan
King Fahd University of Petroleum and Minerals, Saudi Arabia

Photovoltaic (PV) system is used to directly converting the solar energy into the electrical energy. Compound Parabolic Concentrator (CPC) is a non-imaging concentrator which is considered in this study for reducing the cost of electrical energy. Two configurations are numerically studied namely one with simple typical flat PV string and the other PV string with CPC. The truncated CPC with concentration ratio of 2.3 and an acceptance angle of 41.75° is considered in the analysis of PV string with CPC (PV-CPC). Transient System Simulation Software (TRNSYS) is used for the evaluation of PV cell performance with and without CPC. The mathematical model for PV and PV-CPC is developed for the performance estimation of thermal and electrical characteristic of the system. Engineering Equation Solver (EES) code is written to solve the mathematical model and is linked with TRNSYS for simulation. The simulation is carried out for the average day of the months of June and December for Riyadh city. Results indicated that the use of the CPC increases the absorbed energy and electrical power output of PV system. The electrical power of PV string increases almost 35% when CPC is used with PV compared to simple typical flat PV string.

R1010:
A Systematic Planning Method for the Electric Vehicles Charging Service Network
Assoc. Prof. Junhai Wang, Leijin Shan, Yongxia Dai, Lingling Ming, and Dayang Yu
Hangzhou Electric Vehicle Services CO. LTD., China

Electric vehicle (EV) is an important solution for the traffic and environment problems in cities. However, to plan and build the energy supply and service network is always a challenging work all over the world. This paper is based on the planning of a real charge-swap service network for the electric vehicle in Hangzhou city, China. First, the planning factors are analyzed; second, the charging demand forecasting method is proposed based on the future number of EVs; then the service capacity of the single charging station is defined and the planning model of charge-swap service network is proposed which can work for networks including two to three hierarchies.

R1008:
Probing the inhibitory mechanism of calcite precipitation by organic phosphonates in industrial water cooling system
Dr. Mingzhu Xia and Chunyu Chen
Nanjing University of Science and Technology, China

The effect of three phosphonic acids (ethylene diamine tetra (methylene phosphonic acid), EDTMP; hexamethylene diamine tetra (methylene phosphonic acid), HDTMP; and diethylene triamine penta(methylene phosphonic acid), DTPMP on the growth of $CaCO_3$ has been investigated by pH curve method(pHCM). The result shows the inhibitor effectiveness: DTPMP > EDTMP > HDTMP. Meanwhile, the interaction of three phosphonic acids with the calcite (104) surface has been also studied by means of molecular dynamic simulation under the periodic boundary condition in industrial water environment. The results indicate that strong electrostatic interactions between the oxygen atom in phosphonate functional groups and the Ca^{2+} of the calcite (104) face play a dominant role in their adsorption. For the calcite (104) surface, the binding energy has a sequence in agreement with the pHCM experiment. The weakest inhibition of $CaCO_3$ is HDTMP because of the only one phosphonate group in contact well with the surface.

R052:
Environmental Impact and Performance Comparison of Refrigerants (R744 and R134a) In a Mobile Air Conditioning System Used for Cooling Buses
Mr. Huseyin Gunhan Ozcan, Huseyin Gunerhan, Arif Hepbasli, and Hakan Yaldirak
Yasar University, Turkey

Environmental awareness and energy efficiency are important concepts in terms of sustainability. Regarding the negative impact on the ozone layer, the largest portion is due to the refrigerants used with a share of 31% caused by mobile air conditioning (MAC) systems. In this

study, refrigerants used in MAC systems were discussed in the terms of environmental aspects. First, the cooling capacity of the bus was calculated by using ASHRAE andbook and EN 14750 -1 standard for the city of Istanbul in Turkey. Next, a conventional MAC system (with R134a) used for a bus was considered and the performance tests of this system were performed at SAFKAR Inc., located in the city of Izmir, Turkey while the calculations for R744 were made using experimental values of R134a at the same capacity. Finally, various aspects were presented.

R053:
Experimental Exergetic Performance Evaluation of an Elevator Air Conditioner Using R-1234yf
Mr. Mustafa Araz, Ali GÜngÖr, and Arif Hepbasli
Yasar University, Turkey

In this study, an elevator air conditioning (EAC) prototype, designed and manufactured at a factory located in Izmir, Turkey, is considered to assess its performance using exergy analysis method. The analyses performed include two various refrigerants, namely R-134a and R-1234yf. The maximum improvement potential is found to be in the condenser for R-134a, while it is in the compressor for R-1234yf. The COP values are determined to be 2.550 and 2.33, while the product/fuel based exergy efficiencies are determined to be 58.72% and 57.39% for R-134a and R-1234yf, respectively. The biggest irreversibility occurred in the compressor for both refrigerants. The exergy loss and flow diagram (the so-called Grassmann diagram) is also presented for the EAC studied to give quantitative information regarding the proportion of the exergy input that is dissipated in the various system components.

17:45-18:00 BREAK

Session 16B: Electric Energy
Time: 18:00pm-19:00pm; Room: Gaudi
Session chair:

R039:
Project codename - “Sensor data remote acquisition”
Asst. Prof. Peteris Apse-Apsitis
Riga Technical University, Latvia

Remote sensor’s installation and data acquisition are rapidly growing technical field. Data sensing in a variety of ways, transmission, collection, storage, analysis and resulting control, alarms, statistics etc. require knowledge in different fields to achieve the best and effective result. Different specialities professionals are involved in all stages from design till installation and over. “Meaning and importance of sensor data“, “energy efficiency”, “the most effective way for data transmission” etc. are common questions during system development and article share some practical experience about common questions.

R033:
Multi-Criteria Decision Making-Based Comparison of Power Source Technologies for Utilization in Automobiles
Asst. Prof. Dr. Fehmi Gorkem Uctug, **Ms. Naz Eylul Kabakci**, **Ms. Betul Akyurek**, and **Ms. Olcay Bugu Bekdikhan**

Four automobiles with different power sources were compared and ranked according to five different criteria by using a multi-criteria decision making approach named TOPSIS. An internal combustion engine vehicle, an electric vehicle, a hybrid electric vehicle and a hydrogen fuel cell vehicle, all with siGaudir sizes and characteristics, were compared in terms of their initial costs, operating costs, environmental effects, on-board safety and performance. The scores for each of these criteria were obtained from the literature. Criteria weights were determined via a survey which was conducted to a total of 151 people, who were then divided into three groups according to their monthly income, considering that with variant incomes preferences and priorities differ. For all cases, the ideal technology emerged to be internal combustion engine vehicles, due to their low initial costs, external costs and high performance. Hybrid electric vehicles appeared almost as favorable as internal combustion engine automobiles. Hydrogen fuel cell vehicles gathered the least scores, given the premature state of the technology and consequent high prices. The results of our study show that while internal combustion engine vehicles continue to dominate the automotive market for the time being, hybrid electric vehicles have the potential to become competitive alternatives.

R1011:
Technical and Economic Evaluation of the Electric Vehicle Charging Network Planning Scheme
Assoc. Prof. Junhai Wang, Lingling Ming, and Dayang Yu
Hangzhou Electric Vehicle Services CO. LTD., China

Electric vehicle (EV) is an important solution for the traffic and environment problems in cities. However, to plan and build the energy supply and service network is always a challenging work all over the world. This paper is based on the planning of a real charge-swap service network for the electric vehicle in Hangzhou city, China. First, this paper defined the service radius for a network and developed the technical evaluation model; second, the economic evaluation model is proposed based mainly on the investment analysis considering the operating cost and earnings of the network. A case study is presented to show the application of the proposed evaluation method for a real charge-swap service network with a three-hierarchy structure.

R3008:
A Markov Decision Model for Cooperative Virtual Power Plants Market Participation
Mr. Credo Paniah, Cédric Herpson, and Javier Gil-Quijano
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The advent of renewable energy induces new problematic electrical network configurations. Indeed, the renewable

energy characteristics (intermittency, production uncertainty) combined with their inherent spatial distribution implies to aggregate them and to design specific control tools to connect them to the grid and allow them to participate to the market. Based on an industrial case study, we propose in this work to gather and coordinate numerous independent producers through a Cooperative Virtual Power Plant (CVPP). To perform an efficient market participation of such coalition of producers, we model its behavior as a Markov Decision Process. Our model takes into account renewable generation prior uncertainty, market constraints and optimizes sequentially the utilization of available resources. Experiments realized using realistic datasets show the efficacy of the proposed model and speak in favor of renewable and controllable producers' coalition in CVPP.

Poster Presentation

E073:
Contact Pressure Distribution in Joints Formed by V-band Clamps
Simon M Barrans**,** Goodarz Khodabakhshi, and Qiang Xu
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V-band clamps offer an efficient clamping solution in diverse applications including process equipment, exhaust systems and air handling. This paper studies the distribution of interface contact pressure between the V-band and flange when the coupling is established. The determination of the contact area and pressure distribution in a joint is essential information, as it determines the integrity of the coupling. A three dimensional finite element model has been developed for this purpose. Contrary to the previous assumption in developing axisymmetric models, the 3D results showed that the contact pressure is non-uniform around the circumference of V-band with maximum contact pressure near the T-bolt area. This is in agreement with the theory in the literature. The presence and magnitude of friction has a noticeable influence on the form of the interface pressure distribution curve. It is also shown that the diameter of the band interacts with the effect of friction.

E077:
Determining a Robust, Pareto Optimal Geometry for a Welded Joint
Simon M Barrans, and Hazim. E. Radhi
Turbocharger Research Institute, University of Huddersfield, UK

Multi-criteria optimization problems are known to give rise to a set of Pareto optimal solutions where one solution cannot be regarded as being superior to another. It is often stated that the selection of a particular solution from this set should be based on additional criteria. In this paper a methodology has been proposed that allows a robust design to be selected from the Pareto optimal set. This methodology has been used to determine a robust geometry for a welded joint. It has been shown that the robust geometry is dependent on the variability of the geometric parameters.

E092:
Effect of radiation induced charge neutralization on ELDRS
V.S. Pershenkov, A.S. Bakerenkov, A.T. Yastrebov, A.V. Solomatin, V.V. Belyakov, and V.V. Shurenkov
National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), Russian Federation

The physical model, procedure of fitting parameter extraction and experimental study of the contribution of radiation induced charge neutralization (RICN) effect on enhanced low dose rate sensitivity (ELDRS) of bipolar devices are presented.

E093:
Using Low Temperature Irradiation for ELDRS Estimation
V.S. Pershenkov, A.S. Bakerenkov, A.T. Yastrebov, A.V. Solomatin, V.V. Belyakov, and V.V. Shurenkov
National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), Russian Federation

The technique for low dose rate response prediction, based on the combination of low, room and elevated temperature irradiation was described. The possibility of using Test Method 1019.8 for space applications was considered.

E1021:
Early Diagnosis of Spalling in the Gear Teeth
Merzoug Mustapha, Ait Sghir Khalid, Miloudi abdelhamid, and Dron Jean
Universite Des Sciences Et De La Technologie Houari Boumedienne Alger, Algerie

The monitoring and vibratory analysis of gear transmission allow the prediction of a possible malfunction and breakdowns. As the gear transmission product non-stationary signals its treatment is too difficult with the usual tools of signal processing witch can product errors in its interpretation. As the characteristics of gear frequencies are predetermined, it is proposed to monitor (fault identification) using wavelet analysis. To simulate the signal to be analyzed, we intentionally introduced a spalling defect. We chose the Daubechies wavelet type which are the most used in diagnostic. The aim of this work is to try to control the various parameters related to the wavelet analysis for reliable and inexpensive detection, i.e., the order of the wavelet and level decomposition. The approach witch was previously used for bearings, consists on observing the kurtosis for several orders wavelet based on the default severity.

E0150:
Mechanical Characteristic Changes of Carbon Fiber Reinforced Plastics (CFRP) Depending on the Lamination Methods
In Pyo Cha, Hee Jae Shin, Min Sang Lee, Sung Woo Hong, Jin Young Kwon, Sun Ho Ko, Hong Gun Kim and Lee Ku
Jeonju University, Korea

The prepreg process among the CFRP (Carbon Fiber Reinforced Plastic) forming methods is the short term of ‘Pre-impregnation’, which is widely used for aerospace composites that require a high quality property such as a fiber-reinforced woven fabric, in which an epoxy

hardening resin is impregnated. The reality is, however, that this process requires continuous researches and developments for its commercialization because the delamination characteristically develops between the layers when a great weight is loaded from outside. to supplement such demerit, three lamination methods among the prepreg lamination methods of CFRP were designed to minimize the delamination between the layers due to external impacts. Further, the newly designed methods and the existing lamination methods were analyzed through a mechanical characteristic test, tensile test and infrared thermal device during the tensile tests, to obtain a better property than the existing lamination methods. the tensile test result showed that the newly designed three lamination methods, i.e. Roll, Half and Zigzag lamination methods, appeared superior to the Play lamination method in the aspects of the strength and strain. The strength of the Zigzag lamination method, which was the highest, was confirmed as being improved by about 20% than that of the Ply method.

R064:

The Preservation of Groundwater Quality through Aerobic Treatment of Wastewater

Nawel Nedjah, Oualid Hamdaoui and Nabila Laskri
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Adrar, a city located at the extreme western south of Algeria, uses underground water as the unique source of drinking water, unfortunately, this ground water is subject to contamination by the ceaseless urban water discharged by the city. The objective of this work is to examine the efficency of the biological treatment of this raw waste water through natural lagoon; prior to their release into the receiving environmlent; by the removal of elements characteristics of pollution mainly DCO, MES, P and N, we have found a removal efficiency in DCO of 63%, in MES 66%, nitrites and nitrates70% and 40% of phosphorus. These findings are considered satisfactory and hence prevent the contamination of drinking water and preserve the quality of Adrar's ground water.

R065:

Anaerobic Digestion of Waste Organic Matter and Biogas Production

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We are interested in carrying out the process called anaerobic digestion of two different substrates: the biodegradable waste from landfill and sludge from the wastewater treatment plant by natural lagoon. The experiment is performed in a digester with a capacity one liter, sealed. To optimize the degradation of organic matter, we followed the evolution of the degradation of organic matter by measuring the CDO, the volume of biogas formed during the digestion, the temperature and the pH of the process. We found that the sludge off the wastewater treatment plant by natural lagoon is very rich in fermentable and biodegradable organic material than the proportion of fermentable material of the landfill. The biogas formed is flammable, so very rich in methane.
The volume of biogas produced during the digestion of sludge is greater than 10 times compared with the digestion of organic matter in the landfill. Knowing beforehand that the volume of biogas produced is always a function of the residence time of digestion and the concentration of organic matter.

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