

## **2014 BOSI EDU CONFERENCE SCHEDULE**

**2014 3rd International Conference on Machine Design  
and Manufacturing Engineering  
(3rd ICMDME 2014)**



**Jeju Island, South Korea**

**May.24-25, 2014**

<http://www.icmdme.org/>

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## Venue

**Conference venue:** The Hyatt Regency Jeju

大会会场：济州岛凯悦酒店

Add: 3039-1 Saekdal-dong, Seogwipo-si, Jeju-do, Korea



Transportation:

Airport transfers by hotel are available and price is listed below. Please advise if you would like us to arrange this service. (Distance from Jeju Airport to hotel: 50min)

Grand Bus (45 pax) – KW 200,000 (included TAX, one way)

Coach (15 pax) – KW 150,000 (included TAX, one way)

VIP Car (4 Pax) – KW 90,000 (included TAX, one way)

If you need Taxi, It costs will be KW 30,000 per one way.

If you need Airline limousine, It costs will be KW 3,900 per one way.

## Conference Schedule

<b>May.24, 2014(Saturday)</b>	
<b>13:30-17:00</b>	<b>Registration at the Hotel Lobby</b>

Note: You can also register at any time during the conference.

<b>May.25, 2014 (Sunday) A.M.</b>		
<b>In Regency A</b>		
<b>09:00—09:45</b>	<b>Plenary Speech 1</b> Professor Peng-Sheng Wei, title: Analysis and Control of Defects Encountered during Melting and Welding Processes	
<b>09:45—10:15</b>	<b>Plenary Speech 2</b> Professor Maenghyo Cho, title: Multiscale Platform for Design and Analysis of Photo Responsive Polymer	
<b>10:15—10:30</b>	<b>Photos&amp;Coffee Break</b>	
<b>10:30—11:00</b>	<b>Plenary Speech 3</b> Professor NAVDEEP MALHOTRA	
<b>11:00—12:00</b>	<b>Session 1</b>	
<b>12:00—13:00</b>	<b>Lunch</b> on Terrace Café or Omi Rest	
<b>May.25, 2014 (Sunday) P.M.</b>		
<b>Time</b>	<b>In Regency A</b>	<b>In Regency C</b>

<b>13:00—15:00</b>	<b>Session 2</b>	<b>Session 3</b>
<b>15:00—15:15</b>	<b>Coffee Break</b>	
<b>15:15—17:00</b>	<b>Session 4</b>	<b>Session 5</b>
<b>17:00—18:00</b>	<b>Session 6</b>	<b>Session 7</b>

### Note:

1. All the participants are strongly advised to arrive before 8:20.
2. Certificate of Participation can be collected at the registration counter.
3. Please copy PPT files of your presentation to the secretary when registration.
4. The organizer doesn't provide accommodation, and we suggest you make an early reservation.
5. If you want to deliver oral presentation but your paper is not in the session list, please contact us by Email: [cfp@icmdme.org](mailto:cfp@icmdme.org) (for ICMDME2014)

## Instruction about Oral Presentation

### Devices Provided by the Conference Organizer:

- Laptops
- Projectors & Screen
- Laser Sticks

### Materials Provided by the Presenters:

- PowerPoint or PDF files
- Duration of each Presentation:  
 Regular Oral Session: about 10 Minutes of Presentation and 5 Minutes of Q&A

## Session List

### Session 1

**May 25, 2014(11:00-12:00)**

**Paper ID: J385**

**Title:** Analysis of micro-crack inducing mechanism by graphite in bond area in laser repairing grey cast iron

**Authors:** YI Peng, FAN Changfeng, XU Pengyun, LI Chuanxiu

**Abstract:** Experimental researches are developed on grey cast iron surface to clarify the micro-crack formation mechanism and influence law of graphite phase in bond area. The results show that unreasonable morphology of flake graphite phase in bond area is an important cause of micro-crack initiation and propagation. Their cusps almost cross toward the molten layer and through the bond area. Then the micro-crack grows along the grain boundary. Additionally, under condition of certain specific energy input, an appropriate increase in laser power and scanning speed can enhance molten mass convection. It can be also helpful for the distribution rationalization of graphite phase and reduce crack sources.

**Paper ID: 44**

**Title:** Analysis of the dynamic characteristics of theaerostatic journal bearings

**Authors:** Chundong Xu, Huihui Feng, Fengfeng Wang

**Abstract:** This paper investigates the dynamic characteristics of theaerostaticjournal bearing, the rotation center of which is not the center of the journal length.The Finite Difference Method (FDM) and the perturbation method are employed to calculate the stiffness and damping coefficients.Results show that the cross-coupledstiffness and damping coefficients cannot be neglected due to the rotation center beingnotthe center of the journal length.

**Paper ID: 68**

**Title:** Application of New Design method by High-strength Composite Material

**Authors:** Haruhiko IIDA, Toshiaki FUJISHIMA, Yoshifumi OHBUCHI, Hidetoshi SAKAMOTO

**Abstract:** The purpose of this study is to apply a new design method, which integrates both optimum strength and product design. Here, the collaboration of design and strength by using composite materials is administered. Many products, which are made from high strength composite materials, require new product design technology. Existing product developments tend to separate product design from product planning. The process begins from planning the shape of the product, then calculating the strength, and lastly designing the product. In our new design method, we create from an engineering point of view. By using a design method of high-strength materials, we designed a new ZIGZAG CHAIR made of carbon fiber reinforced plastic of excellent strength and light-weight.

**Paper ID: J380**

**Title:** Design and Implementation of New Smart Battery Management System

**Authors:** Gao Qiang, Song Jianghua, Shen Silei

**Abstract:** The purpose of the battery management system is to improve the efficiency and prolong cycling life of the battery pack which is connected in series, SH79F329 is used as the main control IC of the hardware. The system can detect the voltage, current, temperature of the battery by AD sampling, and can calculate the SOC by the value of current and the way of SOC algorithm, as well as communicating with the host computer. and it has been implemented in the process of charging equalization, overcharge protection, overdischarge protection and a series of other processes. It proves that this design has high reliability and real-time performance in the test.

**Paper ID: 16**

**Title:** A Study on Contact Angle and Surface Tension on Copper-ABS for FDM Feedstock

**Authors:** N. Sa'ude, N.M.A. Isa, M. Ibrahim, M. H. I. Ibrahim

**Abstract:** This paper presents the development of a new Copper-ABS feedstock material by the injection molding machine. The material consists of copper powder filled in an acrylonitrile butadiene styrene (ABS) binder and surfactant material. In this study, the effect of metal filled ABS and binder content on the contact angle and surface tension was investigated experimentally. The detailed formulations of compounding ratio with various combinations of a new Copper-ABS feedstock was done by volume percentage (vol. %). Based on the result obtained, an increment by vol. % of copper filler in ABS effected on contact angle and surface tension results. With highly filled copper content in ABS composites increase the surface tension value. It can be observed that, the tendency of the liquid surface that allow to resist an external force in PMC material through an injection molding process.

**Paper ID: 18**

**Title:** Sustainable Natural Bio Composite for FDM Feedstocks

**Authors:** M. Ibrahim, N. S. Badrishah, N. Sa'ude, M. H. I. Ibrahim

**Abstract:** This paper presents the development of a new Wood Plastic Composite (WPC) material for Fused Deposition Modeling (FDM) feedstocks. In this study, a biodegradable polymer matrix (POLYLACTIDE, PLA) was mixed with natural wood flour (WF) by Brabender mixer, and the samples produced by injection molding machine. The effect of wood was investigated as a filler material in composite FDM feedstock and the detailed formulations of compounding ratio by weight percentage. Based on results obtained, it was found that, compounding ratio of PLA80%:WF20% has a goods result on the tensile strength and PLA60% : WF40% gave a higher value of flexural strength. An increment of 20% to 40% WF filler affected the flexural strength, and hardness results. The highly filled WF content in PLA composites increases the mechanical properties of PMC material through the injection molding process. The potential of development of a sustainable composite material will be explored as the FDM feedstocks in the rapid prototyping process.

12:00-13:00

Lunch

## Session 2

**May 25, 2014(13:00-15:00)**

**Paper ID: 61**

**Title:** Characteristics of swirl effervescent atomizer spray angle

**Authors:** Zulkifli Abdul Ghaffar, Salmiah Kasolang, Ahmad Hussein Abdul Hamid

**Abstract:** In the application of sprays produced by an atomizer, spray angle is one of key performance parameters. A larger spray angle is often required in providing a better spray

dispersion. Swirl effervescent atomizer is one of the existing atomizers with the capability to produce a large spray angle. The formation of spray angle from this atomizer however is hardly understood. A newly-designed swirl effervescent atomizer was developed and tested with different swirl-generating vane angle in order to understand the swirl intensity effect on the spray angle. Experiments were carried out based on a cold flow test approach using water as the working fluid and nitrogen gas as the atomizing agent. High-speed shadowgraph technique was deployed to record the resultant sprays produced. Video recordings, acquired using a high-speed video camera, were converted to a sequence of images for further analysis using an image processing software. It was found that the spray angle increases with the swirl-generating vane angle. Specifically, the spray angle shows an abrupt increase for the case of swirl-generating vane angle changing from 30° to 45° but visualizes only a gradual increase in the case of swirl-generating vane angle changing from 45° to 60°.

**Paper ID: 42**

**Title:** Combined influence of Misalignment and orifice diameter on the static performances of hydrostatic, water-lubricated journal bearings

**Authors:** Huihui Feng, Chundong Xu, Fengfeng Wang

**Abstract:** The water-lubricated bearings have gained an increasing focus to overcome the disadvantages of the oil film bearings and gas bearings. In this paper, the influences of orifice diameter in aligned and misaligned conditions on the static performance of two hydrostatic, four-recess, water-lubricated journal bearings used to support a rigid rotor, are investigated. The steady Reynolds equation for the journal bearing for the turbulent bulk flow and the film thickness expression considering tilting angles are used and numerically solved by finite difference method. Results demonstrate that the static performances, such as the quality, power loss and temperature rise are affected by the tilting angles, orifice diameter to some degree.

**Paper ID: 63**

**Title:** Comparison between Normal Waveform and Modified Wavefront Path Planning Algorithm for Mobile Robot

**Authors:** Swee Ho Tang, Che Fai Yeong, Eileen Lee Ming Su

**Abstract:** Mobile robot path planning is about finding a movement from one position to another without collision. The wavefront is typically used for path planning jobs and appreciated for its efficiency, but it needs full wave expansion which takes significant amount of time and process in large scale environment. This study compared wavefront algorithm and modified wavefront algorithm for mobile robots to move efficiently in a collision free grid based static environment. The algorithms are compared in regards to parameters such as execution time of the algorithm and planned path length which is carried out using Player/Stage simulation software. Results revealed that modified wavefront algorithm is a much better path planning algorithm compared to normal wavefront algorithm in static environment.

**Paper ID: 62**

**Title:** Comparison between Waveform and Bug Path Planning Algorithm for Mobile Robot

**Authors:** Swee Ho Tang, Che Fai Yeong, Eileen Lee Ming Su

**Abstract:** Mobile robots frequently find themselves in a circumstance where they need to find a trajectory to another position in their environment, subject to constraints postured by obstacles and the capabilities of the robot itself. This study compared path planning algorithms for mobile robots to move efficiently in a collision free grid based static environment. Two algorithms have been selected to do the comparison namely wavefront algorithm and bug algorithm. The wavefront algorithm involves a breadth-first search of the graph beginning at the goal position until it reaches the start position. The bug algorithm uses obstacles borders as guidance toward a goal with restricted details about the environment. The algorithms are compared in terms of parameters such as execution time of the algorithm and planned path length by using Player/Stage simulation software. Results shown that wavefront algorithm is a better path planning algorithm compared to bug algorithm in static environment.

**Paper ID: J421**

**Title:** Comparison of Theoretical and Numerical Analysis of Shell and Tube Heat Exchanger

**Authors:** Rock-Won Jeon, Bong-Su Sin, Praveen Kumar S P, Si-Pom Kim, Kwon-Hee Lee

**Abstract:** In this paper, the simplified approach using commercial computer software code was adopted to predict the performance of a kettle typed shell and tube heat exchanger. Similarly the numerical analysis using ANSYS/CFX is conducted for the same design and the result data are collected to analyze its performance numerically. In general, the heat exchanger performances are evaluated by predicting the temperature difference and pressure drop. The result data of both the analysis are compared to find the differences between the data. From the comparison, we came to know that the error percentage between the two analysis results is very low which is acceptable proving our design is convincible. Thereby we fabricated a prototype model of shell and tube heat exchanger (kettle type) with the same parameters used for these analyses.

**Paper ID: 25**

**Title:** Conversion of Strontium Hydroxyapatite Nanopowders to Porous Scaffolds For Bone Implant Application

**Authors:** C.M. Mardziah, I. Sopyan, K.M. Hyie, N.R. Nik Roselina

**Abstract:** The fabrication of Sr hydroxyapatite (HA) porous scaffolds was done by using polymeric sponge method. To prepare the porous samples, the synthesized SrHA nanopowders were mixed with distilled water and appropriate amount of dispersing agent followed by drying in the ambient air and sintering at 1300°C. The compressive strength of the materials was strongly influenced by the porosity, while there was almost no dependence on the crystallinity of the powders since XRD patterns showed high crystallinity of HA phase for all porous samples. Morphological evaluation by FESEM revealed that the SrHA scaffolds were characterized by

macro-micro interconnected porosity, which replicates the morphology of the cancellous bone. Compression test on the porous scaffolds demonstrated that doping 10 mol% of strontium in HA has increased the compressive strength by a factor of two compared to the undoped HA with  $1.81 \pm 0.26$  MPa at 41% porosity.

**Paper ID:** **47**

**Title:** Corrosion Behavior of Electrodeposited CoNiFe Nanoparticles Immersed in Different Environments

**Authors:** Nor Azrina Resali, Koay Mei Hyie, M.N. Berhan, N.R. Nik Roselina, C.M. Mardziah

**Abstract:** Replacement or repair of corrosion damaged equipment is the largest maintenance requirement for the industry. One technique for reducing the corrosion of metals is to coat them with thin layers of less reactive metals or alloys. Unfortunately, most metallic coatings are inherently porous and historically have been of little value as barriers against corrosion. Recently, with the development of new alternative material such as electrodeposited CoNiFe, these problems have largely been overcome. This paper investigated the effects of different aggressive environments on the corrosion behavior of electrodeposited CoNiFe. Interestingly, the mixed morphologies with spherical and dendritic structure were found in the neutral and alkaline environment. This morphology exhibited the smallest particle size with less percentage of oxygen elements. Besides, alkaline environment experienced the slowest corrosion rate due to the mixed morphology. It was found that spherical and dendritic refinement provides higher corrosion resistance. The corrosion rate of the sample prepared in alkaline environment was the lowest compared to the others due to the reduction of particle size.

**Paper ID:** **J424**

**Title:** Dynamic Clustering Heuristic Method for Smart Grid Computing

**Authors:** Jeong-Sig Kim, Jin-Hong Kim

**Abstract:** Efficient scheduling has appeared as a fundamental problem in smart grid computing systems. Since finding an optimal scheduling on the system to minimize the program completion time is a well-known NP-complete problem in general, researchers have resorted to devising efficient heuristics. In this paper, we present a dynamic scheduling heuristic which is appropriate for the system. The goal is realized with four general metrics and two additional restricted metrics, which not only take the communication cost, priority, mutex between jobs into account, but also consider the characteristic of the resource, such as the storage capability and the dynamic characteristic in smart grid computing..

## Session 3

**May 25, 2014(13:00-15:00)**

**Paper ID: 60**

**Title:** Effect of Biodiesel from Waste Cooking Oil on Mixture Formation and Emission of Burner Combustion

**Authors:** Amir Khalid, Latip Lambosi, M.M.Lokman, B. Manshoor, Izzuddin Zaman, Azwan Sapit, Shahrin Hisham Aminordin

**Abstract:** Stringent emissions regulations and increasing concern on greenhouse emissions are challenging the researcher to find the alternative fuels like biomass and biodiesel. However, the main issue biodiesel fuel (BDF) from waste cooking oil (WCO) is high toxic emission of Nitrogen Oxides (NO<sub>x</sub>) and particulate matter (PM) in burning process of burner combustion. Thus, the emulsification concept of BDF and water mixing were studied with focusing in controlling of combustion process especially during early stage combustion in order to minimize the harmful emission. This main purpose of this research is to investigate the effects of biodiesel fuel from waste cooking oil on mixture formation and emission in burner system. The mixture formation behavior of BDF-water-air premixing was investigated due to this spray characteristics will contribute in combustion process that predominantly influence to the NO<sub>x</sub> and PM emission production. Blending of biodiesel ratio was varied from 5vol%(WCO5)-15vol%(WCO15). Water content under emulsified biodiesel was varied up to 15 percent, and equivalence ratio from 0.6 to 2.0. The real spray image of emulsified WCO fuel and different equivalence ratio were captured by optical visualization system together with color digital camera. The images of the spatial distribution of WCO fuel-water-air mixing will be further analyzed compared with the exhaust emission production in order to understand the influences of mixture formation on combustion process and burning process. Increased of water content, promoted fuel-air premixing and spray tip penetration thus predominantly influences to the reduction the exhaust emissions.

**Paper ID: J367**

**Title:** Effects of TiC/TiN Contents and Sintering Temperatures on Microstructure and Mechanical Properties of Al<sub>2</sub>O<sub>3</sub>/Ti(C,N) Ceramic Materials

**Authors:** Wang min, Zhao jun, Wang lili

**Abstract:** The Ti (C, N) solid solution is as one particle in most study of Al<sub>2</sub>O<sub>3</sub>/Ti (C, N) ceramic materials. In this paper the contents of TiC and TiN will be considered separately, the mechanical properties and microstructures of Al<sub>2</sub>O<sub>3</sub>/Ti (C,N) ceramic materials are study in different contents of TiC/TiN and sintering temperatures. It is indicated that the TiC/TiN contents and sintering temperatures have important effect on microstructures and mechanical properties of Al<sub>2</sub>O<sub>3</sub>/Ti (C,N) ceramic materials.

**Paper ID: J346**

**Title:** ENGINE PERFORMANCE AND EMISSION OF EMULSIFIED BIODIESEL

**Authors:** Amir Aziz, Ahmad Fitri Yusof, Rizalman Mamat, W. N. Azeem W. G.

**Abstract:** An emulsion of biodiesel and water is one of the possible approaches that have been used to overcome diesel engine pollution. In this work, the performance and emission characteristics of a 4-cylinder diesel engine using pure diesel, biodiesel B20 and emulsified biodiesel were investigated. Emulsified biodiesel containing 5 % and 10 % water were utilize for the engine tests. During the experimental work, the engine was set-up at 2500 rpm and 20 % to 60 % loads. The result shows the reduction in NO<sub>x</sub> formation when the water content in emulsified biodiesel increased from 5 % to 10%. For the performance, there were no significant differences between the engine break powers measured for emulsified biodiesel containing 5% water and diesel fuel.

**Paper ID: 4**

**Title:** Experimental study of injection conditions for a thin-walled wax pattern using response surface methodology

**Authors:** Changhui Liu, Sun Jin, Xinmin Lai, Donghong Wang, Yulian Wang

**Abstract:** In this paper, the relationship between the shrinkage of the thin-walled wax part in the investment casting process (ICP) and the process parameters including mold temperature, melt temperature, packing pressure and holding time are investigated through a series of experiments. The relationship is successfully described by a mathematical regression model which is based on the response surface methodology (RSM). The rationality and adequacy of the mathematical model are checked via analysis of variation (ANOVA) and a sensitivity analysis for process parameters on the dimensional shrinkage variation are conducted which shows that the contribution percentages of mold temperature, melt temperature, packing pressure and holding time are 23.77%, 43.67%, 11.85% and 16.99%, respectively. Additionally, the optimal setting of the process parameters is also obtained by calculating the desirability function. The optimal combination of the mold temperature, melt temperature, packing pressure, and holding time is 74 °C, 30 °C 25bar, and 5 sec, respectively.

**Paper ID: J358**

**Title:** Fault Diagnosis for CNC Machine Tool based on Mapping Model

**Authors:** Sheng Bo, Deng Chao, Xiong Yao, Luo Zhijun, Wang Yuanhang

**Abstract:** Since numerous parts and various faults of CNC machine tool, the mapping model is proposed to represent the complex relationship between faults. Then some matrices are used to process the mappings model. Finally, the priority of the fault sources is sorted by the fault localization algorithm based on the matrix above. Besides, the case of ram feed system of CNC boring machine tools FB260 illustrates the performance of mapping model based on fault diagnosis.

**Paper ID:** J377

**Title:** Gear Meshing Noise of the Closed Gearbox

**Authors:** Chen Fuzhong, Shi Yongjun, Yu Leiyan

**Abstract:** The dynamic excitation and the noise of meshing gears were analyzed quantitatively using the three-dimensional finite element contact analysis and the boundary element method. The distribution and variation roles of the gear mesh noise were obtained. The simulation result was verified by sound power measurement. The main excitation was determined additionally. It provides the theory basis for the control of the gearbox noise.

**Paper ID:** J406

**Title:** Implementation of Magnetic Damping to Reduce Chatter Amplitude and Tool Wear During Turning of Stainless Steel AISI 304

**Authors:** A.K.M. Nurul Amin, Ummu Atiqah Khairiyah bt. Mohamad, Muammer D. Arif

**Abstract:** Machine tool chatter is a type of intensive self-excited vibration of the individual components in a machine-tool-fixture-work system. Chatter affects the cutting process and may lead to negative effects concerning surface quality, cutting tool life, and machining precision. However, modern manufacturing industries and their end users demand fine surface finish, high dimensional accuracy as well as low operation costs which include the cost of tooling. Therefore, any effective damping technique, which reduces or eliminates chatter, will significantly improve tool life and will be a profitable technique to implement in the industry. This paper presents a novel chatter control method in turning of (AISI 304) stainless steel by using permanent magnets. The study compared tool wear under two different cutting conditions: normal turning and turning with magnetic damping. A special fixture made of mild steel was designed and fabricated in order to attach a powerful neodymium permanent magnet (4500 Gauss) to the carriage of a Harrison M390 engine lathe. The arrangement ensured that the magnet was placed exactly below the tool shank. The main idea was that the magnet will provide effective damping by attracting the steel tool shank and restricting its vertical vibratory motion during cutting operations. A Kistler 50g accelerometer, placed at the bottom front end of the tool shank was used to sense vibration. The data was then collected using a Dewetron DAQ module and analyzed using Dewesoft (version 7) software in a powerful Dell workstation. Response surface methodology (RSM) in Design Expert software (version 6) was used to design the sequence of experiments needed based on three primary cutting parameters: cutting speed, feed, and depth of cut. The tool overhang was kept constant at 120 mm in order to facilitate the attachment of the magnet fixture. Analysis of the recorded vibration signals in the frequency domain indicated that significant reduction in the vibration amplitude, as much as 86%, was obtained with magnetic damping. Next tool wear was analysed and measured using a scanning electron microscope (SEM). It is found that tool wear is reduced considerably by a maximum of 87.8% with the magnetic damping method. Therefore, this new magnetic damping method can be very cost effective, in terms of vibration reduction and tool life extension, if applied to industrial turning operations of metals.

**Paper ID: 33**

**Title:** Improving engine oil properties by dispersion of hBN/Al<sub>2</sub>O<sub>3</sub> nanoparticles

**Authors:** Muhammad Ilman Hakimi Chua Abdullah, Mohd Fadzli Bin Abdollah, Hilmi Amiruddin, Noreffendy Tamaldin, Nur Rashid Mat Nuri, Masjuki Hassan, S.A. Rafeq

**Abstract:** This paper provides oil properties study of conventional diesel engine oil enriched with hBN/Al<sub>2</sub>O<sub>3</sub> nanoparticles. In this study, an optimal composition (0.5 vol.%) of hBN and Al<sub>2</sub>O<sub>3</sub> nanoparticles separately dispersed in SAE 15W40 diesel engine oil by sonication technique. The oil properties were studied by measuring the Viscosity Index (VI), Total Acid Number (TAN), Total Base Number (TBN) and flash point temperature. The results reveal that the nano-oil with hBN nanoparticles could improves or at least maintain the key lubrication properties, though the TAN value is slightly increased. The results presented here may facilitate improvements in the conventional diesel engine oil performance.

15:00-15:15	Coffer Break
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### Session 4

**May 25, 2014(15:15-17:00)**

**Paper ID:** J366

**Title:** Improving Rate of Penetration for PDC Drill Bit using Reverse Engineering

**Authors:** A.M. Abdul-Rani, M.Zamri Ismail, M.Ariff Zaky, M.Hariz M.Noor, Y.Y. Zhun, K. Ganesan, T.V.V.L.N. Rao, Subhash Kamal, T.L. Ginta

**Abstract:** In petroleum industry, drilling is one of the most important aspects due to its economics. Reduction in drilling time is desired to minimize operations cost. This work focus on Polycrystalline Diamond Compact (PDC) drill bit which is categorized as a fixed cutter drilling bit. Problem such as wear and tear of PDC cutter are some of the main factors in drilling process failure affecting the rate of penetration (RoP). Thus, an intensive study in drill bit design could potentially save costs if the drill bit efficiency can be improved. The objective of this research is to improve the PDC cutter design and analyse design improvement in relation to the rate of penetration using reverse engineering (RE) approach. RE method is capable of resolving unavailable drill bit blueprint from the manufacturer due to propriety and confidential. RE non-contact data acquisition device, 3D laser scanner will be used to obtain cloud data of the existing worn drill bit. Computer Aided Design (CAD) software is used to convert cloud data of the PDC drill bit into 3D CAD model. Optimization of PDC Drill bit is focused on feature design such as back rake angle, side rake angle and number of cutters. CAE software is used to analyse the effect of the design feature modification to rate of penetration. Results show rate of penetration increases as the angle of both rake angle and number of cutter decreases.

**Paper ID:** J369

**Title:** Inhibition mechanism of benzotriazole in copper chemical mechanical planarization

**Authors:** Jing Li1, Xinchun Lu, Zongbo Zhang

**Abstract:** During the process of chemical mechanical planarization (CMP) of copper, benzotriazole (BTA) is the most commonly used inhibitor in the slurry. Though the corrosion inhibition mechanism has been studied widely, the mechanism of BTA layer on copper surface in CMP slurries should be further investigated. In this paper, the adsorption mechanisms of BTA were studied by static corrosion tests. Besides, the surface composition was measured by XPS. Combining with CMP experiments, the material removal mechanism of copper CMP depending on pH values was investigated. It was found that the formation of passive film, consisting of Cu-BTA complex, adsorption of BTA and copper oxides, played a dominant role under acidic conditions. While the surface film composed of adsorption layer of BTA and copper oxides under alkaline conditions. The inhibition mechanism of BTA varied with pH values, resulted in corresponding changes of material removal rate and coefficients of friction.

**Paper ID:** J416

**Title:** Inlet Passage's Development and Optimization of New Tidal Unit-Shaft Tubular Turbine

**Authors:** Chunxia Yang, Mengtian Lu, Yuan Zheng, Xiaoqing Tian, Yuquan Zhang

**Abstract:** A new type of tidal unit-vertical shaft tubular turbine is designed with high efficiency, large flow rate and low water head, which has large power under the 2~3 meters water head. According to the data of the being installed tidal units and principles of tubular turbine's design, the high efficiency vertical shaft tubular turbine was designed under large discharge and low head, which was suitable for the tidal power station. The design also considered the requirements of turbine's size and the details of flow through the whole flow passage were attained. The turbine's property was predicted by the 3-d numerical simulation software on the whole flow passage. Moreover, the influences of vertical shaft's sizes were analyzed. And the terminal of vertical shaft with or without transverse brace and longitudinal brace were analyzed to get the influence. Considering the hydraulic performance of various methods, the best guide vane opening was chosen. The results show that, the turbine unit has the best performance on efficiency, hydraulic loss, etc. with the guide vane opening 62°, meeting the power station's design requirements. The results show that the optimal designed flow passage's efficiency reaches up to 88.4%, the flow rate becomes much larger and the power reaches 174.63kW. Without partial vortex, the flow pattern is smooth through the whole passage also with lower hydraulic loss.

**Paper ID:** J460

**Title:** Investigation of Redox-Transmetalation Process for Coating of Gold(Au)-shell on Nickel (Ni)-core Nanoparticles

**Authors:** N.R. Nik Roselina, A. Azizan, Koay Mei Hyie, C.M. Mardziah, Z. Salleh

**Abstract:** Core-shell nanoparticle has created great interest among researchers due to their various unique properties. The new properties created are combination of both the core and the shell. In this work, pre-prepared Nickel (Ni) nanoparticles were coated with Gold (Au) to produce core-shell structure. Formation mechanism of the core-shell structure is investigated via UV-Vis spectrum of the as-synthesized particles and its supernatants. Ni nanoparticles were synthesized using polyol method with hydrazine as the reducing agent. Coating of Au was conducted using sodium citrate as the reducing agent and acid citric to control the pH of the mixture. UV-Vis absorption spectra analysis of as-synthesized nanoparticles and the supernatant results revealed that the coating happened via redox-transmetalation process with a very broad peak at about 540 nm and size range of 26 - 40 nm.

**Paper ID:** 79

**Title:** Mixing and characterisation of stainless steel 316L feedstock for waste polystyrene binder system in metal injection molding (MIM)

**Authors:** R. Asmawi, M.H.I. Ibrahim, A. M. Amin

**Abstract:** This paper describes the mixing process and homogeneity analysis of a newly developed binder system based on waste polystyrene (PS) and palm kernel oil (PKO) to produce feedstock for metal injection molding (MIM). Since mixing is a critical step in MIM process,

hence the mixture of powder and binder should be homogeneous and injectable. In this study, water atomised Stainless Steel powder was mixed with a new binder system consisting of waste polystyrene and palm kernel oil in a Brabender Plastograph EC rotary mixer. Several tests were performed to assess the homogeneity of the feedstock that was produced at 60 vol.% powder loadings. The 60 vol.% was chosen because the Critical Powder Volume Concentration (CPVC) of the SS316L powder was found to be 64.8 vol.%. The tests conducted were density, binder burn-out and SEM morphology observation. It was found that the feedstock shows good homogeneity and suitable for further processing in MIM.

**Paper ID:** **21**

**Title:** MIXING HOMOGENEITY AND RHEOLOGICAL CHARACTERIZATION FOR OPTIMAL BINDER FORMULATION FOR METAL INJECTION MOULDING

**Authors:** Azriszul Mohd Amin, Mohd Halim Irwan Ibrahim, Rosli Asmawi

**Abstract:** Mixing homogeneity and the feedstock rheological characteristic for optimal binder formulation in metal injection moulding is evaluated between Polypropylene (PP) and Sewage fat (SF) or Fat Oil Grease (FOG). Difference powder loading of SS316L also being used here to determine the possibility of the best binder formulation selected could be optimised for optimal powder loading base on rheological characteristic analysis. Two binder formulations of PP to SF being selected here are 60/40 and 70/30 accordingly with the powder loading of 60% and 55% for each binder formulation. The analysis will be base on viscosity, shear rate, temperature, activation energy, flow behaviour index and moldability index. It is found that rheological result shows all the two binder formulations with both powder loading exhibit pseudoplastic behaviour or shear thinning where the viscosity decrease with increasing shear rate. Feedstock viscosity also decreases with increasing temperature indication of suitability for moulding. Results from all the analysis conducted shows that the volumetric powder loading of 60% with binder volumetric of 24% for PP and 16% for SF contributes significant stability and suitability for optimum powder loading.

**Paper ID:** **J363**

**Title:** Non-melt ultrasonic bonding method for polymer MEMS devices

**Authors:** Zongbo Zhang, Qingqiang He, CaoQing Yan

**Abstract:** Based on the theoretical study in our previous work, a novel thermal assisted ultrasonic bonding method for polymer Micro/Nano-Electro-Mechanical Systems (M/NEMS) has been demonstrated. Bonding experiments of PMMA microfluidic chips with micro-channel of 80  $\mu\text{m}$  in depth and width were conducted. The result shows numerous superiorities of this method including high bonding strength (0.95 MPa), low dimension loss (0.8% in depth and 0.3% in width, respectively) and short bonding duration.

**Session 5****May 25, 2014(15:15-17:00)****Paper ID: 53****Title:** Numerical Simulation of Supersonic Subsea Compact Wet Gas Separator for Gas Transmission Pipeline**Authors:** Mohd Hashim F.M, Ahmad M.F.A

**Abstract:** Conventional wet gas separators are used as a means to remove free water using the gravitational settling and momentum principle. However, these separators possess setback in terms of its efficiency. Alternatively, supersonic compact wet gas separators have been designed in Universiti Teknologi PETRONAS Gas Separation Research Center (UTPGSRC) which uses supersonic flow to separate natural gas and free water. In its preliminary design, determination of the flow behavior according to the design of the separators is important. The result provides information whether the design can be accepted or improvement should be taken into consideration. It is therefore an objective of this paper to numerically simulate and analyze the flow characteristic such as velocity, pressure and temperature distribution correlating with the separator design. From the flow performance results obtained, it shows that the separator design has fulfilled the requirement.

**Paper ID: J405****Title:** Optimization of Surface Roughness in Micro-High Speed End Milling of Soda Lime Glass Using Uncoated Tungsten Carbide Tool with Compressed Air Blowing**Authors:** A.K.M. Nurul Amin, Mahmoud M.A. Nassar, Muammer D. Arif

**Abstract:** Soda lime glass is a very important material in diverse manufacturing industries, including automotive, electronics, and aerospace. In these applications, the glass surface needs to be defect free and without impurities. However, the machining of glass is difficult due to its inherent brittleness which leads to brittle fracture and easy crack propagation. This research investigates the high speed micro-end milling of soda lime glass in order to attain ductile regime machining. It has been found by other researchers that ductile mode machining can avoid brittle fracture and sub-surface cracks. Also, in this study, a special air delivery nozzle is used to blow away the resultant chips and keep the machined surface clean. To accomplish this, Design Expert software and a commercial NC end mill were used to design and perform the machining runs, respectively. The surface roughness of the resultant surfaces was later analyzed with a surface profilometer. Microphotographs of the machined surfaces were also taken in order to see how effective the air blowing method is. The results of surface roughness measurements were then used to develop a quadratic empirical model for surface finish prediction. Finally, desirability function and genetic algorithms were used to predict the best combination of cutting parameters needed to obtain the lowest surface roughness. The predictions were later

tested by experiments. The results demonstrate that this type of machining is viable and the roughness obtained is very low at 0.049  $\mu\text{m}$ .

**Paper ID:** 28

**Title:** Oxidation of Inconel 690 Alloys at 800-1000oC in Air

**Authors:** Soon Yong Park, Dong Bok Lee

**Abstract:** The Ni-based superalloy, Inconel 690, was oxidized between 800 and 1000oC for up to 300 h in air. It displayed good oxidation resistance, because the formed scales consisted primarily of  $\text{Cr}_2\text{O}_3$ . As the oxidation progressed,  $\text{CrMn}_{1.5}\text{O}_4$  also formed on the surface through the ensuing outward diffusion of Mn from the alloy. Internal oxidation occurred below the scale-alloy interface along grain boundaries of the matrix.

**Paper ID:** J394

**Title:** Position and the Size of Drawbeads for Sheet Metal Forming with the Finite Element Method

**Authors:** Khemajit Sena, Surasith Piyasin

**Abstract:** This study aims to find a solution to improve the formability in a deep drawing process. For this purpose drawbeads were used to avoid wrinkles and ruptures. The finite element method was applied to simulate the 3D metal forming process using a die and drawbead. The drawbead amount, position, size and form were studied for their affects on the formability. 3 drawbead patterns with 3 different heights were examined. The simulation was performed for each drawbead pattern and each drawbead geometrical parameter and the failure elements were counted. The best pattern chosen was the pattern that resulted in the least failure elements.

**Paper ID:** 34

**Title:** Research on coupled thermo-hydro-mechanical mechanism for heavy oil thermal recovery

**Authors:** Feng SUN, Wendong YANG

**Abstract:** Thermal production is an important heavy oil recovery method , which bothers with the complex problems of Thermo-Hydro-Mechanical coupling effects and reservoir failure processes due to thermal recovery. Based on the coupling theory of T-H-M, the fully coupling equations of heat transfer, fluid seepage, geomechanics, and reservoir damage are constructed. The Galerkin FEM with fully implicit and sequential iterative algorithm is adopted to solve the coupling equations. Numerical results demonstrate that Thermo-hydro-mechanical coupling effect takes as important roles in thermal process. The response of the rocks surrounding the reservoir has a significant stress transfer, pore pressure increase or thermal cracking. This paper presents an analytical method to predictions coupled geomechanical effects and change of reservoir parameters, which are all important phenomena affecting heavy oil exploitation.

**Paper ID:** J427

**Title:** Research on the Fault Characteristic Extraction of Hydropower Units Based on Hilbert-Huang Transform

**Authors:** Yuquan Zhang, Yantao Zhu, Yuan Zheng, Yuan Feng, Xinfeng Ge, Xiaoqing Tian

**Abstract:** In order to effectively extract nonstationary and nonlinear fault signature of hydropower units' signals, a new method, based on Hilbert–Huang transform (HHT), is proposed. This method is used to carry out EMD (Empirical Mode Decomposition) analysis and Hilbert transform of signals firstly and then extract Hilbert spectrum to provide a basis for signal feature extraction. The vibration signal of upper brackets in hydropower units has been put forward with experimental analysis. The results suggest that the EMD can decompose vibration components in different frequency domain, which has intuitive physical meaning. Moreover, Hilbert spectrum also has a good resolution in time domain and frequency domain. Thus, HHT can be used to depict the fault signals effectively and lay the foundation of the fault pattern recognition.

**Paper ID:** J314

**Title:** Residual Life Prediction for In-service Pressure Vessels Containing Crack Defects

**Authors:** Sijian Lin, Wei Long, Daqing Tian

**Abstract:** Residual life is tightly related to the period of examine and repair of pressure vessels. The accuracy of residual life prediction may have a great influence on the reliability and the cost of examine and repair of the in-service pressure vessels containing crack defects. Aimed at the problem of residual life prediction of pressure vessels containing crack defects, we put forward a new method on the basis of crack failure path and rate, which is based on the fracture mechanics and failure assessment diagram (FAD). Though there may be a lot of researches to do, this algorithm is higher in efficiency and easy to calculate, compared to the other methods. This method is original and creative. It provides a new research approach to study the residual life prediction.

**Session 6**

**May 25, 2014(17:00-18:00)**

**Paper ID: 22**

**Title:** Screw Fixing Fracture and Fatigue Failure on Particleboard Surface using Different Style of Screw Insertion Technique

**Authors:** Falah Abu, Mansur Ahmad

**Abstract:** Particleboard jointing during screw fixing activities weakens the furniture, kitchen and household joinery. Screw jointing on the particleboard surface contribute to the particleboard fracture. Fracture on the particleboard surface will promote failure in jointing. This study was done to determine the effect of application different style of screw insertion technique on fracture and fatigue failure. Three different style of screw insertion technique applied was self-drilling, pilot-hole and pilot-hole with countersunk (P+CSK) insertion technique. From the study, applications of P+CSK screw insertion technique causing highest number of damages. 57% samples of common chipboard screw size damages when used P+CSK screw insertion technique. Most fracture failure in type 6 mode. There is no significance difference in number of damages for self-drilling insertion technique and pilot-hole insertion technique. Therefore, self-drilling insertion technique, which is preferable insertion technique used by kitchen cabinet installer was much reliable because of ease to be handling during screw insertion.

**Paper ID: J448**

**Title:** Seismic Response Analysis of Large-Scale Site with Circular Diaphragm Wall

**Authors:** Zhang Rulin, Yang Wendong, Sun Feng

**Abstract:** The seismic response analysis of project soil site is important to obtain the ground motion parameters for seismic design of upper structures. First, a simplified solving method is introduced, in which, the horizontal seismic loadings are expanded into Fourier series in the circumferential direction, using the orthogonality between the normal and tangential direction on the circumference, the three-dimensional problem is reduced to a series of two-dimensional problems. Then, the simplified method is used for seismic response analysis of a practical large-scale soil site with large diameter circular diaphragm wall. The influence of wall to the site is obtained through two field conditions, which are wall field and free field (without wall). Compare with the results of the site without wall, the peak acceleration of the pit bottom is increased owing to the confinement effect of wall, and the influence to ground surface far from the wall is very little.

**Paper ID:** 52

**Title:** Simulation on the Life Expectancy of Fine Blanking Tool Punch for High-strength Automobile Start Motor Flange

**Authors:** Jong-Deok Kim, Young-Bae Ko, Hyun-Jun Ko

**Abstract:** Fine blanking is a press-working process that permits the production of precise, finished components which are cleanly sheared through the whole cutting surface. The manufacturing cost can be reduced because the secondary operations such as milling and broaching can be eliminated and the multistage combined stamping process can be added. The product cost can increase, however, while the precise fine blanking tool and high cost fine blanking press are required. Therefore it is important to design the fine blanking tool in view of the life expectancy of the punch. In this paper the fatigue simulation of fine blanking tool punch for automobile start motor flange was conducted using the commercial FEA software ANSYS. Initially, the material properties were tested and the fine blanking tool was designed for production experiments. The modelling of tool elements and the fatigue simulation according to repeated loads were conducted. As a result of fatigue simulation, the fine blanking tool punch for start motor flange had been fractured with 3,981 strokes. In the fine blanking production experiments, the fine blanking tool punch had to be regrinded after it was used with 3,425 strokes. It was also found that the fatigue simulation of fine blanking tool punch was conducted with an error of 14%.

**Paper ID:** 64

**Title:** Workshop Product Manufacturing Process Information Integration Based on USBOM

**Authors:** XU Ai-ming, GAO Jian-min, CHEN Kun, CHEN Fu-min, WANG Zhao

**Abstract:** Workshop is gathered place and exchange centre of product manufacturing process information (PMPI), which is divided by enterprise heterogeneous systems. This led to the integration and sharing difficulty of PMPI and constrains the information system application in workshop, like MES. To solve this problem an information integration method based on semantic BOM was proposed. Firstly, a global ontology model USBOM of PMPI was constructed which given the unified semantic description of PMPI. Based on USBOM a PMPI integration framework was proposed. Finally, a workshop product manufacturing monitoring system was used as an example to verify the feasibility of this approach.

**Session 7****May 25, 2014(17:00-18:00)****Paper ID: 27****Title:** Synthetic Design of High Aspect Ratio Folding Wings Based on Aeroelastic Analysis**Authors:** Shengli Lv, Chen Wang, Yangbiao Ou, Guangjun Yang, Xiaoyan Tong

**Abstract:** Finite element model of folding wings was designed in the light of structural scheme, and each part of the model used composites. Different aeroelastic analysis models were built from emission to cruise, and then the models were made the study focus on flutter analysis. The result showed the change relationship of the critical flutter speed of wings and flutter frequency with sweep angle in state of expansion process, and the change relationship of the critical flutter speed of wings and flutter frequency of folding wings with cruising altitude and cruise Mach number in state of cruise. The whole flight state was analyzed if the folding wings might flutter, and if it took place the structure optimization of wings was needed. Simulation results have a certain guiding significance for practical engineering application.

**Paper ID: J374****Title:** The Development of Bicycle into Trandem: The Bike Can be used as Tandem or Single Depend of The Necessity**Authors:** Bambang Iskandriawan, Jatmiko

**Abstract:** The issue of traffic jam in Indonesia's big cities alike in Jakarta and Surabaya encourage the government, civilization and transportation expert initiate to consider a elucidation to solve the problematic above. The growing of the vehicle number which is extended faster than the establishment of road affect the bottleneck could not to be avoided. Furthermore the pollution problem which is produced by car exhaust where the number of them always increase each year make the air pollution in the settlement becomes crucial. Additionally within the backwards issue of the reducing of the using of fuel because of the source of them become limited. People have to consider sincerely before buying the vehicle due to the high operational cost. One of the solutions of the problem is the using of human power vehicle as

The study try to respond the need of people to enjoy the using of tandem bike but also still could be used as the single bike more over the storage problem is disappear. The research team agrees to give the name of this 'novel bike' as Trandem: the existing tandem bike which is transform to the dual function.

**Paper ID: J373****Title:** Variable Parameters-based Damage Creep Model of Weak Rock Layer and its Engineering Application**Authors:** W.D. Yang, J.P. Chen, F. Sun, Y.M. Zhang

**Abstract:** In order to study the deformation mechanism of the weak layer in diabase dikes under long-term loading at a hydropower dam foundation, in situ plate loading tests were performed. A damage creep model which improved the five-parameter generalized Kelvin model was established to describe the creep behavior of the weak layer. In this model, the deterioration effect of the rock parameters is considered and the creep parameters of the rock deteriorate gradually. This model is applied in a slope design for a dam foundation at a hydropower station. Long-term stability of the slope after excavation is evaluated. It shows that when damage creep is considered, the displacement is larger compared with the case of ignoring damage creep. The study shows that the deterioration effect of the rock parameters is of full importance for the project design and construction safety.

**Paper ID:** 9

**Title:** Study on Hydrothermal Process Variables Correlation to WO<sub>3</sub> Nanostructure through Design of Experiments (DOE) Approach

**Authors:** AMIRUL Abd Rashid, NOR HAYATI Saad , DANIEL Bien Chia Sheng, Lee Kah Yaw, Lee Wai Yee, NORIAH Yusoff

**Abstract:** There are few known parameters which govern tungsten trioxide (WO<sub>3</sub>) hydrothermal synthesis process which includes material source concentration, synthesis temperature, duration, pH value and additive level. Using design of experiments (DOE) approach, a systematic experimental procedure was conducted to investigate the effect of each parameter to the final morphology of the synthesized nanostructure. Despite the response obtained from this study is in quantitative form, the analysis still can be done to identify the combination of variables that most likely can produce 1-D, 2-D or 3-D nanostructure. This insight is essential before further optimization of the process can be done in order to predict the behavior of the WO<sub>3</sub> hydrothermal synthesis process.

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