THE ATHENS INSTITUTE FOR EDUCATION AND RESEARCH

Abstract Book:

1st Annual International Conference on

Mechanical Engineering

17-20 July 2017, Athens, Greece

Edited by

Gregory T. Papanikos

2017

Abstracts
1st Annual International Conference on Mechanical Engineering
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(In Alphabetical Order by Author's Family name)

Preface

This book includes the abstracts of all the papers presented at the *1st Annual International Conference on Mechanical Engineering, 17-20 July 2017*, organized by the Athens Institute for Education and Research (ATINER).

In total 21 papers were submitted by presenters coming from 11 different countries (Canada, China, Germany, Hungary, Lebanon, Poland, Saudi Arabia, South Korea, Thailand, Turkey and USA). The conference was organized into 10 sessions that included a variety of topic areas such as energy systems, experimental methods and more. A full conference program can be found before the relevant abstracts. In accordance with ATINER's Publication Policy, the papers presented during this conference will be considered for inclusion in one of ATINER's many publications.

The purpose of this abstract book is to provide members of ATINER and other academics around the world with a resource through which to discover colleagues and additional research relevant to their own work. This purpose is in congruence with the overall mission of the association. ATINER was established in 1995 as an independent academic organization with the mission to become a forum where academics and researchers from all over the world could meet to exchange ideas on their research and consider the future developments of their fields of study.

It is our hope that through ATINER's conferences and publications, Athens will become a place where academics and researchers from all over the world regularly meet to discuss the developments of their discipline and present their work. Since 1995, ATINER has organized more than 400 international conferences and has published nearly 200 books. Academically, the institute is organized into seven research divisions and 37 research units. Each research unit organizes at least one annual conference and undertakes various small and large research projects.

For each of these events, the involvement of multiple parties is crucial. I would like to thank all the participants, the members of the organizing and academic committees, and most importantly the administration staff of ATINER for putting this conference and its subsequent publications together. Specific individuals are listed on the following page.

Gregory T. Papanikos
President

Organizing and Academic Committee

All ATINER's conferences are organized by the Academic Committee (https://www.atiner.gr/academic-committee) of the association.

This conference has been organized with the additional assistance of the following academics, who contributed by chairing the conference sessions and/or by reviewing the submitted abstracts and papers:

1. Gregory T. Papanikos, President, ATINER.
2. Nikos Mourtos, Head, Mechanical Engineering Unit, ATINER & Professor, San Jose State University, USA.
3. Bala Maheswaran, Academic Member, ATINER & Professor, Northeastern University, USA.
4. Patrick Weidman, Professor Emeritus, University of Colorado, USA.
5. Yves Gagnon, Professor, University of Moncton, Canada.
6. Amos Olagunju, Professor, St Cloud State University, USA.
7. Dong-Wook Jerng, Professor, Chung-Ang University, South Korea.
8. Malgorzata Karczmarzyk, Professor, University of Gdansk, Poland.
9. Ilhan Tuzcu, Associate Professor, California State University, Sacramento, USA.
10. Vassilis Skianis, Research Fellow, ATINER.
11. Olga Gkounta, Researcher, ATINER.
12. Hannah Howard, Research Assistant, ATINER.

FINAL CONFERENCE PROGRAM
1st Annual International Conference on Mechanical Engineering,
17-20 July 2017, Athens, Greece
PROGRAM
Conference Venue: Titania Hotel, 52 Panepistimiou Avenue, Athens, Greece
C O N F E R E N C E P R O G R A M

Monday 17 July 2017

08:00-09:00 Registration and Refreshments

09:00-09:30 (Room B-10th Floor) Welcome and Opening Address

Gregory T. Papanikos, President, ATINER.

09:30-11:00 Session I (Room B-10th Floor): Dynamics & Control

Chair: Nikos Mourtos, Head, Mechanical Engineering Unit, ATINER & Professor, San Jose State University USA.

1. David Schmidt, Professor Emeritus, University of Colorado – Colorado Springs, USA. On Modeling the Dynamics of Flexible Aircraft.
2. Patrick Weidman, Professor Emeritus, University of Colorado, USA. On the Terminal Motion of Sliding Spinning Disks with Uniform Coulomb Friction.
3. Sheng Fu, Professor, Beijing University of Technology, China, Lei Cheng, Post Graduate, Beijing University of Technology, China & Tao Chen, Post Graduate, Beijing University of Technology, China. Online Health Assessment of Gearbox Based on Vibration Signal and PID Control Theory.
4. Ilhan Tuzcu, Associate Professor, California State University, Sacramento, USA. Active Vibration Control of a Thin Plate Using Heat.

11:00-12:30 Session II (Room B-10th Floor): STEAM Education

Chair: Ilhan Tuzcu, Associate Professor, California State University, Sacramento, USA.

1. Christoph Maurer, Vice Dean, Munich University of Applied Sciences, Germany, Lars Brehm, Professor, Munich University of Applied Sciences, Germany & Anne Bergner, Professor, Coburg University of Applied Sciences, Germany. Agile Management in Hardware Related Design Projects.
2. Nabil Semaan, Assistant Professor and Chairman of the Engineering Management Department, University of Balamand, Lebanon. The Periodic Aviation Maintenance Stochastic Schedule Model (PAM-SS).

12:30-14:00 Session III (Room B-10th Floor): Fuel, Power & Energy Systems

Chair: Amos Olagunju, Professor, St Cloud State University, USA.

1. Yves Gagnon, Professor, University of Moncton, Canada, Jompob Waewsak, Thaksin University, Thailand, Chana Chancham, Thaksin University, Thailand & Somphol Chiwamongkhonkarn, Thaksin University, Thailand. On the Wind Resource Assessment of Thailand.
2. Dong-Wook Jerng, Professor, Chung-Ang University, South Korea & Jung-jin Bang, Graduate Student, Chung-Ang University, South Korea. Containment Cooling Methods for Safety Enhancement of Nuclear Power Plants.
3. Hoseong Lee, Senior Researcher, KATECH (Korea Automotive Technology Institute), South Korea. Experimental Study on Heating Performance Characteristics of Coolant Heat-Sourced Heat Pump System in a Fuel Cell Electric Vehicle.
4. Azeddine Draou, Professor, Islamic University of Madinah, Saudi Arabia. Performance Analysis of Photo Voltaic (PV) Panel Emulator Connected to the Grid System.
5. Lidi Wang, Associate Professor, Shenyang Agricultural University, China. Photovoltaic Power Supply is Used to Improve the Voltage Level of Distribution Network and its ETAP Implementation.

14:00-15:00 Lunch

15:00-16:30 Session IV (Room B-10th Floor): Biomedical Applications

Chair: Yves Gagnon, Professor, University of Moncton, Canada.

1. Vimolrat Ngamaramvaranggul, Assistant Professor, Chulalongkorn University, Thailand, Nawalax Thongjub, Lecturer, Thammasat University, Thailand & Gawkij Teeramoke, Chulalongkorn University, Thailand. Simulation of Extrudate for Wet Powder Masses in Pharmaceutical Process.
2. Binnur Sagbas, Assistant Professor, Yildiz Technical University, Turkey. Additive Manufacturing of Biomedical Implants.

16:30-18:30 Session V (Room B-10th Floor): *A Symposium on The Future Developments and Prospects of Engineering and Science Education & Research in a Global World I*

Chair: Nikos Mourtos, Head, Mechanical Engineering Unit, ATINER & Professor, San Jose State University, USA.

1. Bala Maheswaran, Professor, Northeastern University, USA. Engineering Education via Innovations and Inventions (E2 via I2).
2. Itzhak Orion, Head of the Nuclear Engineering Department, Ben-Gurion University of the Negev, Israel. Nuclear Science Research and Education in Israel.
3. Jin He, Professor, Peking University, Shenzhen SOC Key Laboratory, China. New Teaching Technique and Method Function in the Engineering and Science Education and Research.
4. Haiduke Sarafian, Professor, The Pennsylvania State University, USA. The Research Aspect of College Education.
5. Thomas J. J. Mueller, Professor, University of Dusseldorf, Germany. Life Science – Society.

For details on the discussion please click here.

21:00-23:00 The Pragmatic Symposium of the Conference as Organized in Ancient Athens with Dialogues, Food, Wine, Music and Dancing but fine tuned to Synchronous Ethics

Tuesday 18 July 2017

07:30-10:30 Session VI: An Educational Urban Walk in Modern and Ancient Athens

Chair: Gregory Katsas, Vice President of Academic Affairs, ATINER & Associate Professor, The American College of Greece-Deree College, Greece.

Group Discussion on Ancient and Modern Athens.
Visit to the Most Important Historical and Cultural Monuments of the City (be prepared to walk and talk as in the ancient peripatetic school of Aristotle)

11:00-12:30 Session VII (Room B-10th Floor): Thermal – Fluid Applications

Chair: Dong-Wook Jerng, Professor, Chung-Ang University, South Korea.

1. Besir Sahin, Professor, Cukurova University, Turkey, Nehir Tokgoz, Assistant Professor, Osmaniye Korkut Ata University, Turkey & M. Murat Aksoy, Rice University, USA. Experimental Studies of Flow Characteristics in Corrugated Ducts.
2. Oguz Turgut, Professor, Gazi University, Turkey, Fatih Celen, Gazi University, Turkey, Omer Evran, Gazi University, Turkey & Burak Tigli, Gazi University, Turkey. Numerical Study of Flow and Heat Transfer in a Curved Square Duct with Longitudinal Triangular Rib Using Al2O3/Water Nanofluid.
3. Cetin Canpolat, Assistant Professor, Cukurova University, Turkey & Besir Sahin, Professor, Cukurova University, Turkey. The Near Wake of a Circular Cylinder with Single Longitudinal Groove.

12:30-14:00 Session VIII (Room B-10th Floor): Experimental Methods

Chair: Malgorzata Karczmarzyk, Professor, University of Gdansk, Poland.

1. Peter Horvath, Associate Professor, Széchenyi University, Hungary. Nondestructive Bolt Preload Measurement.
2. Soyeon Lee, Researcher, Korea Institute of Industrial Technology, South Korea, Hyung-ick Kim, Senior Researcher, Korea Institute of Industrial Technology, South Korea, Sinhye Moon, Researcher, Korea Institute of Industrial Technology, South Korea, Suk-soo Jang, The Director of Laboratory, Sandong Metal Industrial Co.Ltd., South Korea, Min-kyu Kim, Senior Researcher, Sandong Metal Industrial Co.Ltd., South Korea, Young-ju Kim, Principal Researcher, Korea Institute of Geoscience and Mineral Resources, South Korea & Nam-sub Woo, Senior Researcher, Korea Institute of Geoscience and Mineral Resources, South Korea. The Evaluation of Mechanical Properties for Dissimilar Metal Weld in Offshore Diverter System Housing.
3. Tilman Traub, Research Assistant / PhD Student, TU Darmstadt / Institute for Production Engineering and Forming Machines, Germany, Christoph Miks, Student, TU Darmstadt / Institute for Production Engineering and Forming Machines, Germany & Peter Groche, Professor, Head of the Institute for Production Engineering and Forming Machines, TU Darmstadt / Institute for Production Engineering and Forming Machines, Germany. Force Measurements Supporting the Set-up Process in Roll Forming.

14:00-15:00 Lunch

15:00-16:30 Session IX (Room B-10th Floor): Special Topics

Chair: Patrick Weidman, Professor Emeritus, University of Colorado, USA.

1. Malgorzata Karczmarzyk, Professor, University of Gdansk, Poland & Grażyna Penkowska, Professor, University of Gdansk, Poland. Painting Artist in the Eyes of Children - Semiotic Analysis of the Meanings about Artists Constructed by the Children.
2. Klaus Wuersig, Associate Professor, University of Pittsburgh at Bradford, USA. MatLab, a very Potent Tool to Solve many Electrical Engineering Problems.

16:30-18:30 Session X (Room B-10th Floor): *A Symposium on The Future Developments and Prospects of Engineering and Science Education & Research in a Global World II*

Chair: Bala Maheswaran, Professor, Northeastern University, USA.

1. Nikos Mourtos, Professor, San Jose State University, USA. Teaching & Learning Engineering in the 21st Century: Challenges and Opportunities.
2. Lluis Jofre, Professor, Polytechnic University of Catalonia (UPC), Spain. Catalonia Engineering and Science Educations and Research Trends in the European Context.
3. Dong-Wook Jerng, Professor, Chung-Ang University, South Korea. Some Thoughts for Future Direction of Engineering/Science Education with Insights from a K-POP Story of BTS.
4. Isai Urasa, Professor, Hampton University, USA. International Higher Education: A Vehicle for Global Cooperation and Development in Science and Engineering.
5. Santhi Sambamoorthy, Associate Professor, Bharathidasan University, India. Creative and Inimitable Role Played by Indian Universities in Science, Engineering and Research in a Global World.
6. Ethel Petrou, Professor and Chair, Department of Physics, Erie Community College-South, State University of New York, USA. Emerging Trends in New York State Community Colleges-SUNY.

For details on the discussion please click here.

21:00- 22:30 Dinner

Wednesday 19 July 2017
Educational Island Tour or Mycenae and Epidaurus Visit

Thursday 20 July 2017
Delphi Visit

Cetin Canpolat
Assistant Professor, Cukurova University, Turkey
&
Besir Sahin
Professor, Cukurova University, Turkey

The Near Wake of a Circular Cylinder with Single Longitudinal Groove

In the present study, effects of single longitudinal groove on the cylinder wake, when they are positioned from forward stagnation point of the cylinder, $\theta=0^o$ and 90^o are investigated. Single square groove size, whose dimensions are smaller than the boundary layer was tested using the particle image velocimetry (PIV) technique and compared to the case of bare cylinder. The cylinders are immersed in a uniform flow field with the Reynolds number, Re=5000. The wakes of these cylinders are evaluated using time-averaged flow data such as vorticity, $<\omega>$, streamline, $<\Psi>$, components of streamwise, $<u/U_O>$ and transverse, $<v/U_O>$ dimensionless velocity, Reynolds stresses, $<u'v'>$ and turbulent kinetic energy, TKE. In addition, the Strouhal numbers, St are calculated using frequencies of Karman vortex shedding, which are obtained from single point spectral analysis. It is revealed that the presence of square groove located at forward stagnation point of a circular cylinder has significant effect on the wake formation and turbulence statistics.

Azeddine Draou
Professor, Islamic University of Madinah, Saudi Arabia

Performance Analysis of Photo Voltaic (PV) Panel Emulator Connected to the Grid System

Recently, photovoltaic panels {PV) have become one of the main Distributed Energy Resources (DERs) in the world of renewable power. Such a panel gives DC power which can be directly used in some DC power application. In this paper, we will deal with the modeling and control of a proposed PV panel system comprising an inverter and an induction motor based on photovoltaic system. At first, the modeling and control of a standalone photovoltaic pumping system with integrated maximum power point tracking (MPPT) to reach an optimum power transfer will be addressed. The system performance is measured in terms of the efficiency of the MPPT controller and flexibility in the solar photovoltaic operation. Moreover, we will present a comparative study between two maximum power point tracking methods which are the perturb-and-observe PO method and incremental conductance method. The feature of the proposed algorithm will be supported by theoretical analysis and Matlab-Simulink simulation results.

Sheng Fu
Professor, Beijing University of Technology, China
Lei Cheng
Post Graduate, Beijing University of Technology, China
&
Tao Chen
Post Graduate, Beijing University of Technology, China

Online Health Assessment of Gearbox Based on Vibration Signal and PID Control Theory

Gearbox is widely used in rotating machinery. Health assessment for gearbox is essential for prevention and maintenance. In this paper, a novel health assessment method based on vibration signal and PID control theory is proposed. Conventionally, the PID controller is usually used to keep the system in a stable level through the actuator controlled by the PID output signal. But, in this paper, the gearbox monitored system is considered as a control system without actuator or a long delay control system. Vibration characteristics of gearbox will change with its different conditions. So the mean value of history vibration signal (MVHVS) in unit time is chosen as the given value of PID controller, while the feedback value will be the real-time vibration signal (RTVS). The output of PID controller is considered as the health degree of the gearbox. By checking the health degree table which divides the health condition into different levels between 0 and 1, gearbox's health condition is known, which will contribute to make a decision for maintenance. Simulation with four typical vibration signals has showed the effectiveness of this proposed method. Experiments are needed be carried out to further verify its practicality in the future.

Yves Gagnon
Professor, University of Moncton, Canada
Jompob Waewsak
Thaksin University, Thailand
Chana Chancham
Thaksin University, Thailand
&
Somphol Chiwamongkhonkarn
Thaksin University, Thailand

On the Wind Resource Assessment of Thailand

Situated in South East Asia, Thailand has engaged in public policies to increase the penetration of renewable energy in the electricity portfolio of the country. Under the recent Alternative Energy Development Plan (AEDP), the Ministry of Energy has targeted wind power generation at 3,000 MW by the year 2036. This paper presents an overview of the wind resource assessment for electricity generation in Thailand. The wind resource is obtained using mesoscale (Mesoscale Compressible Community (MC2) and Weather Research and Forecasting (WRF)) and microscale (WAsP and CFD models) wind resource modeling, long-term reanalysis climatic data (NCEP/NCAR and MERRA) and a series of met towers, ranging from 40 m to 120 m in height, distributed throughout the country. Using validated wind resource maps, the technical power potentials are evaluated in the most promising zones, notably in the Southern part of the country. Economic assessments are performed, while estimates of the reductions in CO_2 emissions by installing wind power plants rather than fossil fuel based power plants are evaluated. Specific applications, for both onshore and offshore sites, are presented and analysed.

Peter Horvath
Associate Professor, Széchenyi University, Hungary

Nondestructive Bolt Preload Measurement

Bolts are very important elements of machines and structures. The usual torque wrench technique guarantees only the torque applied, but the real axial load remains unknown because of friction among bolt threads and between the bolt-head and the washer. To make the situation more difficult, the parts of structures prevent direct measurement of axial load, consequently boltings are usually over-sized for safety reasons. The known nondestructive ultrasonic and electromagnetic acoustic resonance methods have many error factors.

This paper proposes a new method that relies on bolt-head deformation due to axial load. As axial load is applied, the frontal surface of bolt-head flattens a bit, that is approximately proportional to the load applied. This deformation was measured by an eddy-current sensor. Effects of bore diameter, eccentricity of bolt in the bore, as well as washer thickness on the measure of flattening of bolt-head was studied by Finite Element Method. Results of calculations and measurements agreed well.

Dong-Wook Jerng
Professor, Chung-Ang University, South Korea
&
Jung-jin Bang
Graduate Student, Chung-Ang University, South Korea

Containment Cooling Methods for Safety Enhancement of Nuclear Power Plants

The essential part of the nuclear power plant design is to ensure safety under any accident condition including severe accidents caused by whole loss of eletric power to operate active safety systems. Especially, ensuring the integrity of the containment of nuclear power plants is of utmost importance as it is the last barrier to prevent the radioactive release out of the reactor systems. During the hypothetical nuclear power plant accidents such as large break loss-of-coolant accidents, the high pressure and high temperature coolant which is water in the reactor systems pours to the containment atmosphere, resulting in rapid pressure and temperature spike and it continuously increases due to the decay of nuclear fission fragments. The primary means to control the contanment pressure and temperature is the containment spray system. However, this system relys on the electric power to pump the water to the spray nozzle located at the dome region of the containment. For such accidents as Fukushima Dai-ichi that happended in March 11, 2011, therefore, the containmnent spray system cannot be available if all the electric power is failed. To cope with such situations, we propose a passive type containment cooling system relying only on the gravitional force to supply cooling water to the heat exchanger installed inside of the containment. The supplied water takes heat from the containmnet atmosphere and then returns back to the water resorvoir located at the outside of the containment on a hihger level than the heat exchanger. All the water and water-vapor mixture flow is maintained by natural circulation between the inside heat exchanger and outside water tank.

To design such a passive cooling system, we found that the size of water reservoir, effective heat transfer area of the heat exchanger, and system intiation time. To quatitatively analyze the impavt of these design parameters, we set up a passive containment cooling system model using the GOTHIC computer code. The GOTHIC code is similar to the computaional flud dynamic code in view of mesh generation in 3-dimensional way, but different as it solves the fluid conditions using lumpled parameters averaged over the computational domain, i.e.,

mesh. According to the analyses presented in the paper, the smaller the water reservoir volume, the higher peak pressure and temperature at the intial phase of the accidents. Howerver, due to the faster boiling time which resulted in the better heat transfer inside of the heat exchanger, the containmnet pressure and temperature was found to be arrestable. The increase of heat transfer area of the heat exchaner definitely helps reduce the pressure and temperature hike. However, in the long term cooling phase after initial spike, the effectiveness of the heat transfer area increase was found to be diminished. The passive cooling initiation time which is determined by the plant operator or automatic signal affects the coolimng performance in short range of time, i.e., within one hour after the accidents. In conclusions, we will also discuss about other parameters that may affect the performace of passive system to cool the nuclear power plant containment.

Malgorzata Karczmarzyk
Professor, University of Gdansk, Poland
&
Grażyna Penkowska
Professor, University of Gdansk, Poland

Painting Artist in the Eyes of Children - Semiotic Analysis of the Meanings about Artists Constructed by the Children

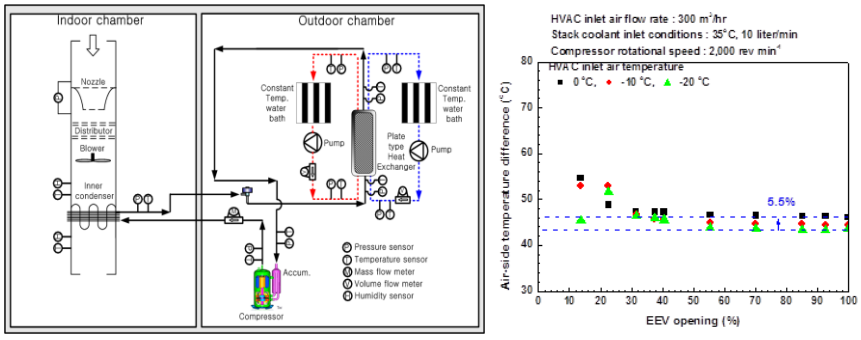
The problem of this study is the contemporary art and person, which is create this art – artist. I would like to focus of the meanings create by the children. Modern vision of the child, too often shows the artist in a distorted, incomplete or reduced way. This kind of naive knowledge, based on the patterns and stereotypes reduces the reflectivity of the child unnecessarily distorts his judgment and closes the road ahead to a full and critical participation in the world.

This text focuses on the theme of transmitting the meanings of the children on the perception by a person he is as an artist. The study comes on the analysis of interviews and children's drawings devoted centered around the perception of the children silhouette artist. But this is a stereotypical vision, and whether the artist is still associated with the person being beyond the pale of "normal" society, it turns out after the analysis of the research material gathered during the study.

Hoseong Lee
Senior Researcher, KATECH (Korea Automotive Technology Institute),
South Korea

Experimental Study on Heating Performance Characteristics of Coolant Heat-Sourced Heat Pump System in a Fuel Cell Electric Vehicle

The objective of this study was to investigate heating performance characteristics of coolant heat-sourced heat pump system in a fuel cell electric vehicle (FCEV). In order to analyze heating performance characteristics of heat pump system with plate type heat exchanger between coolant and a refrigerant, R-134a, each component in the heat pump system was installed and tested under various operating conditions, such as air inlet temperature of inner condenser and compressor speed. Heating performance of tested system was thought to be heating capacity and heating COP(Coefficient of Performance) after various experiments according to FCEV driving conditions. Because tested system had EXV(Electric expansion valve) to control the refrigerant mass flow rate, heating performance was analyzed along with EXV opening. When the air inlet temperature of inner condenser was varied from 0.0℃to –20.0℃heating capacity was found to be similar due to somewhat equal temperature difference between inlet and outlet of inner condenser. However, Heating COP increased until certain EXV opening, especially under 45.0%, because of decreasing power consumption. When the compressor speed was varied from 2,000 to 4,000 RPM, while heating capacity increased, Heating COP decreased by higher refrigerant mass flow rate. In the future works, additional performance characteristics would be analyzed according to stack coolant operating conditions.



Soyeon Lee
Researcher, Korea Institute of Industrial Technology, South Korea
Hyung-ick Kim
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Suk-soo Jang
Director of Laboratory, Sandong Metal Industrial Co.Ltd., South Korea
Min-kyu Kim
Senior Researcher, Sandong Metal Industrial Co.Ltd., South Korea
Young-ju Kim
Principal Researcher, Korea Institute of Geoscience and Mineral Resources, South Korea
&
Nam-sub Woo
Senior Researcher, Korea Institute of Geoscience and Mineral Resources, South Korea

The Evaluation of Mechanical Properties for Dissimilar Metal Weld in Offshore Diverter System Housing

Recently, the importance of oil well control system is increasing because of environmental pollution and loss of life, property caused by oilfield explosion. The diverter, one of the well control systems, is a safety equipment to discharge well fluid out of the ship to prevent that well fluid erupt to the drill floor because of unexpected changes in oil well pressure during drilling. In this study, to retain the integrity of the offshore high pressure diverter, the mechanical properties of dissimilar welded joints and materials applied to the diverter housing is evaluated. The outer housing of diverter is made up of several materials and parts of different materials are welded to the body. It is important to evaluate the mechanical properties of these materials because the offshore high pressure diverter must maintain integrity in the environment. Also, evaluation of mechanical properties for structural weaknesses such as dissimilar welded joint caused by complicated shapes and functions be conducted.

Christoph Maurer
Vice Dean, Munich University of Applied Sciences, Germany
Lars Brehm
Professor, Munich University of Applied Sciences, Germany
&
Anne Bergner
Professor, Coburg University of Applied Sciences, Germany

Agile Management in Hardware Related Design Projects

During the past decade agile project management became a common method in software development. Deliverables are submitted in stages in short delivery cycles. The detailed definition of the final product is created while developing the product. Interdisciplinary self-organized teams are working on the project within a clearly defined schedule. Thus, the product meets the customer´s needs better and can be brought to market faster. A survey in German mechanical industries performed by the authors is introduced which demonstrates the broad interest of practitioners in this field. This paper investigates the chances to apply agile project management methods on hardware related design projects. Usually hardware design cannot be handled as flexible as software design thus commonly a detailed specification list is the first step required in hardware development. But why not letting the product definition grow while the project is in progress? Why not submitting discrete modules in short cycles instead of waiting until the entire product is specified? The authors distinguish between parts of agile project management methods that directly can be leveraged and parts that offer opportunities for adaption. Also, comparisons are made to approaches such as Design Thinking. The types of projects that may be suited for agile management are characterized. In addition, aspects of corporate culture and demands to be met by design managers are brought into focus.

Vimolrat Ngamaramvaranggul
Assistant Professor, Chulalongkorn University, Thailand
Nawalax Thongjub
Lecturer, Thammasat University, Thailand
&
Gawkij Teeramoke
Chulalongkorn University, Thailand

Simulation of Extrudate for Wet Powder Masses in Pharmaceutical Process

The simulation of extrusion spheronization in pharmaceutical industry is constructed to develop drug product. This process has four steps: mixing, extrusion, spheronization and drying/coating. The mixing combines water and powder together with high shear until it creates strong bonds to gather powder particles in liquid solution. The work is focused on extrusion of wet powder masses, that can classified as non-Newtonian fluid. The continuous creeping flow motion is explained in term of the Navier-Stokes equation and the rheology behavior is represented by Oldroyd-B constitutive model. The solution is solved with numerical scheme through the semi-implicit Taylor-Galerkin/pressure-correction finite element method in two-dimensional axisymmetric system under the conditions of isothermal, incompressible, laminar flows. In addition, the velocity gradient recovery and the streamline-upwind/Petrov-Galerkin schemes are forced to improve the converge solution. Finally, the swelling ratio of extruded product is presented to compare with the experiment results in drug manufactory.

Binnur Sagbas
Assistant Professor, Yildiz Technical University, Turkey

Additive Manufacturing of Biomedical Implants

Additive Manufacturing (AM) has become one of the most popular technologies for a wide range of industrial area that contains bio medical implant manufacturing sector. It provides the opportunity to produce custom-based implants from 3D digital modeling of the desired prosthesis with expected properties such as surface finish, appearance and strength. Stereolithography, 3D plotting/direct ink writing, laser assisted bioprinting selective laser sintering (SLS), fused depositon modelling (FDM) and electron beam melting (EBM) are the most general technologies of AM processes. Although the research are going on vigorously, there are still some gaps about manufacturing implants in desired surface quality and dimensional accuracy.

In this study different types of AM methods, which used in biomedical implant manufacturing, are explained and application in this area are reviewed in terms of orthopedic prosthesis and dental implants. Moreover, recent trends and future directions about AM for manufacturing more precise and accurate biomedical implants are discussed.

Besir Sahin
Professor, Cukurova University, Turkey
Nehir Tokgoz
Assistant Professor, Osmaniye Korkut Ata University, Turkey
&
M. Murat Aksoy
Rice University, USA

Experimental Studies of Flow Characteristics in Corrugated Ducts

The goal, in this study, is to demonstrate the flow characteristics of corrugated ducts experimentally for different Reynolds numbers using the technique of particle image velocimetry (PIV). The aspect ratio of the corrugated duct is determined to be s/H=0.3. One of the key intents of this experimental study is to understand an influence of phase shift angles, φ on structures flow and enhancement of heat transfer. For this reason, two different phase shift angles, $\varphi = 0^{o}$ and 90^{o} are taken for the corrugated channel. Transporting energy and rise of momentum along with fluid mixing in terms the shear layers instabilities at the leading edge are amplified as they are transported to the trailing corner of the cavity which promise better enhancement of heat transfer for phase angles, φ of 90 degree and 0 degree.

David Schmidt
Professor Emeritus, University of Colorado – Colorado Springs, USA

On Modeling the Dynamics of Flexible Aircraft

To minimize fuel usage, and its associated cost and environmental impact, aircraft structures are getting lighter, wings are getting thinner, and new composite materials are being utilized. As a result, the strucrures are getting increasingly flexible, which significantly impacts the techniques appropriate for mathematically modeling the vehicle's dynamics. Aircraft flexibility has been investigated since the Wright Brothers, and analytical models of the dynamics are critical to understanding the nature of the dynamcs and to designing and certifying the aircraft. These models are also used, for example, in ground-based flight-simulators for evaluating the vehicle's dynamics prior to flight, as well as training pilots.

In this presentation, we will breifly assess the effects of increased flexibility on aircraft design. The most critical effect of structural flexibility on aircraft design is a phenomenon known as flutter, which can manifest itself in an explosive instability that usually destroys the aircraft. We will also review why this flexibility impacts the analytical modeling approach; present an historical perspective on approaches taken for the modeling; focus in on one approach to develop such models; present some results obtained using this methodolgy; and compare these results to those obtained from other methods, including fight-test results. The overal modeling approach to be highlighted is based on the seminal work of Milne at the University of London in the aerly 1960's. The presentation will draw from the presenter's 35 years of research in this field, as well as from a current research program involving several colleagues from academia and industry.

Nabil Semaan
Assistant Professor and Chairman of the Engineering Management Department, University of Balamand, Lebanon

The Periodic Aviation Maintenance Stochastic Schedule Model (PAM-SS)

Aircraft accidents are the most horrible accidents in modern socitety. It is proved that aircraft maintenance errors form 40% of the causes of accidents, while 35% of maintenance errors is caused by poor scheduled maintenance. With the continuous introduction of new aircrafts with advanced technology, aircraft maintenance is becoming more complicated. Aircrafts were built to fly, so the purpose of the aircraft maintenance program is to maintain the aircraft performance, serviceability, and readiness to stay in the air. . Planning of aircraft maintenance is about planning, controlling and executing materials, resources, and activities. Aircraft maintenance consists mainly of either scheduled maintenance or unscheduled one. Scheduled maintenance is due relevant to operating hours, calendar, or number of cycles. Existing researches used regular project management techniques, or even integrated them in order to produce a plan and a schedule for scheduled aircraft maintenance. However, these researches failed to (i) incorporate uncertainty in the schedule, and (ii) consider all resources in the schedule. Thus, a new model is urgently required that considers uncertainty and delays in the maintenance schedule, and considers all resources, such as work force and work zones.

This research develops the Periodic Aviation Maintenance Stochastic Schedule (PAM-SS) model. The PAM-SS model evaluates the stochastic schedule of an aviation 50-hours maintenance program using the Cyclone model. Cyclone is very powerful in showing the bottlenecks in the maintenance schedule, and indicating which resources are mostly idle or in queue. The PAM-SS model (1) identifies the different inspection tasks of the maintenance schedule, (2) allocate the resources required for each task, (3) evaluate a stochastic duration of each inspection task, (4) evaluate probability of occurrence for each breackdown or repair, (5) develop the Cyclone model of the stochastic schedule, and (6) simulate using Monte Carlo Simulation the Cyclone model.

Data were collected from military aircraft experts, mainly engineers and inspectors, through interviews and questionnaires. the PAM-SS model is applied to the PUMA SA330SM helicopter of the Lebanese Air Forces (LAF). The schedule showed a 50-hours maintenance duration of

323 minutes after steady state is reached. Except the pilot and the electrical team (~ 90% idle), all other teams are around 40% idle. A sensitityvity analysis is also performed, and yielded that the PAM-SS model is not sensisitve to the number of technicians in each team, however it is highly sensitive to the probability of occurrence of the breackdowns/repairs. The PAM-SS solves the problem of stochastic periodic scheduling of aircraft maintenance, both in academic and industry circles.

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Force Measurements Supporting the Set-up Process in Roll Forming

Shorter development cycles and smaller production batches due to a higher demand for individual designed products challenge conventional forming processes. Roll forming is a very competitive manufacturing method for large scale production of profiles. Due to high set-up times and reducing production batches, however, this advantage is increasingly challenged. Recent developments summarized under the slogan 'Industry 4.0' aim at improving process quality and reducing non-productive time by a systematic use of sensors and a smart evaluation of sensor data. This study investigates how measurements of the forming forces in roll forming processes can serve as a basis for an accelerated set-up process and therefore, increase competitiveness, even for smaller production batches. The results show that numerical simulations can be used for the prediction of the forces in a roll forming process featuring a perfect set-up. In contrast, numerical simulations are usually not able to predict forces in a faulty set-up process since the maladjustments are usually not known. The evaluation of measurement data collected during a roll forming process, however, shows a correlation between the intendedly introduced maladjustment and the deviation of the forces evaluated in the numerical simulation and recorded during the process. Hence, the combination of numerical simulations and load measurements in the real roll forming process can serve as a basis for an assistance system for an accelerated set-up process by means of intelligent sensor use.

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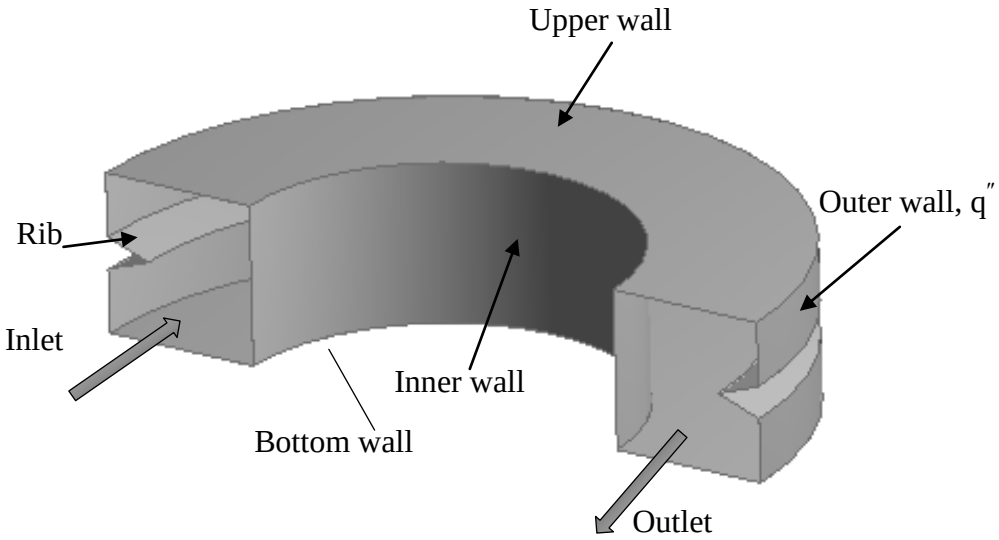
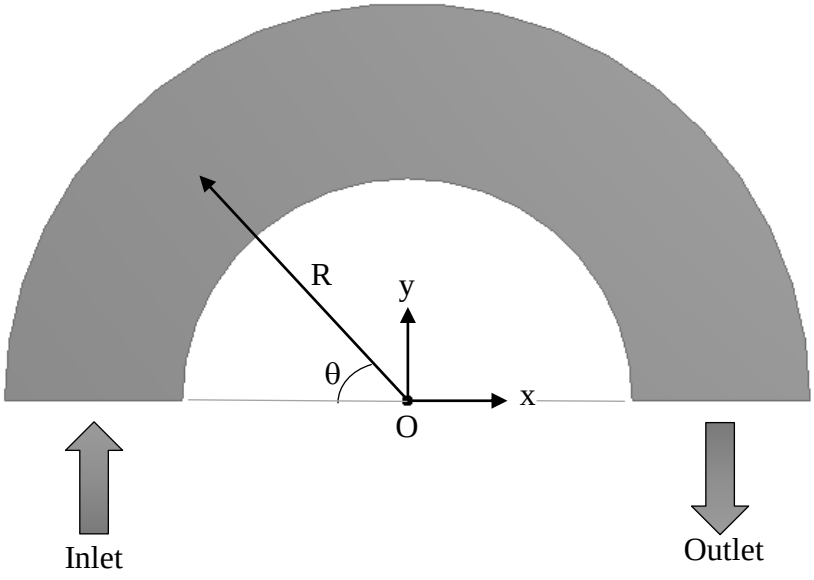
Numerical Study of Flow and Heat Transfer in a Curved Square Duct with Longitudinal Triangular Rib Using Al2O3/Water Nanofluid

A numerical study in a curved square duct with longitudinal rib has been carried out to investigate the effects of rib size, Dean number and volume fraction of nanofluid on flow and heat transfer. Al_2O_3/water nanofluid is used as the working fluid. ANSYS Fluent 15.0 software is used for numerical simulation. Study is conducted for six Dean numbers changing from 250 to 1500, three different rib heights and seven volume fractions varying from 0.1 to 5 percent. Present results are compared with the results of literature. It is seen that present results are in good agreement with the results given in literature. Results show that Dean number, rib size and volume fraction affect the flow and heat transfer. It is also seen that using nanofluid in base fluid increases heat transfer. The square curved duct with longitudinal triangular rib used in this numerical study is shown in Fig. 1. Constant heat flux boundary condition is applied to the outer wall of the curved duct and to the walls of the rib. Other surfaces are assumed as insulated.


Upper wall
Outer wall, q″
Rib
Inlet
Inner wall
Bottom wall
Outlet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Active Vibration Control of a Thin Plate Using Heat

Suppression of unwanted vibration in flexible structures can be achieved by active feedback control, whose Implementation requires sensors, actuators, and an accurate mathematical model of the system. Actuators produce force, moment, strain, heat etc. to affect the system to suppress the vibration. A special attention has been given to piezoelectric actuators in the recent years. These actuators are bonded on surfaces of structures to alter the local strain therein in response to the application of proper voltage signals. This paper, however, aims to investigate the feasibility of heat actuation in the active control of vibration in a thin plate. The heat actuator is simply a thin metal beam rigidly bonded to the plate on one face and subject to external heat input on the opposite face. The actuator then works like a piezoelectric actuator, and expands and contracts in response to applied heat. To keep the model simple and ensure that the heat does not alter the beam's thermal state, we assume that the actuator is insulated so that no heat is transferred to the beam. To avoid necessity of cooling, we consider two actuators working together at the same location, one on the upper and one on the lower face of the plate. Then, by applying heat to the lower and upper actuators, the plate can be bent up or down. The mathematical model is obtained by the derivation of the governing equations, which are partial differential equations for one-dimensional heat conduction of the actuators and the bending vibration of the plate with attached actuators. Through a discretization process, the PDEs are replaced by a system of ordinary differential equations. A feedback control is achieved by means of LQG design technique. A numerical example demonstrates that the heat actuators are in fact effective in active vibration control of the plate.

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Photovoltaic Power Supply is Used to Improve the Voltage Level of Distribution Network and its ETAP Implementation

Due to the large power supply radius, heavy load distribution and the shortage of reactive power, the distribution network can easily be led to low voltage level on the terminal power line. How to use photovoltaic power station in achieving the improvement of the voltage level of terminal grid has important significance. Through the analysis of the influence factors of the low voltage of the distribution network, the simulation model of the terminal voltage of the distribution network is established by using the ETAP power system simulation software. The effect of different positions and the different rate of PV station on the power line is analyzed. Based on the analysis of a real 66KV power distribution line system, by both theoretical analysis and simulation system, it can be shown that on the cases of the PV power station capacity closing to the rated load capacity of the connected point, the connect point is nearer to the end of the power grid, or the longer of the power line, the more obvious of the effect of voltage improvement can be achieved. Photovoltaic power station is also suitable for voltage stability with the installation of energy storage equipment such as battery and heat-electrical combination. When the capacity of PV station is higher than the load demand of the connected point, the voltage will appear higher value. Sometimes it should be resolved by the utilization of the cool-heat-electrical combination system. The voltage of distribution power is sensitive to the load and PV station when the power network has relative small energy source. This study has theoretical and practical reference value for the research of the low voltage problem of distribution power network.

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On the Terminal Motion of Sliding Spinning Disks with Uniform Coulomb Friction

Analysis of the frictional motion of a uniform circular disk of radius R sliding and spinning on a horizontal table shows that the disk always stops sliding and spinning at the same instant with terminal speed E = v/Rw = 0.653 where v is the linear speed, R is the disk radius and w is the angular velocity. We show that different terminal behaviors are found when one considers the motion of a two-tier disk with lower thickness H1 and radius R1 and upper thickness H2 and radius R2. The terminal motion may be analyzed in terms of the normalized radius of gyration k, the radius ratio R = R1/R2 and thickness ratio H = H1/H2. We find that translation and rotation stop simultaneously for 1/2 < k < (2/3)^(1/2), the disk stops spinning and slides to rest for k < 1/2, or it stops sliding and spins to rest for k > (2/3)^(1/2). Experiments are carried out to verify our new findings.

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MatLab, a very Potent Tool to Solve many Electrical Engineering Problems

Students are introduced to MatLab in their second semester at the University. Many problems are solved in all areas of Engineering and Mathematics. The ease of writing a program and executing it makes MatLab a perfect contender for solving Electrical Engineering problems in the Sophomore year and beyond. Mesh and Nodal analysis in Linear Circuits I and II can be greatly simplified with just a few lines of code and answers are quickly obtained with left array and right array and left division. Especially in Linear Circuits II with complex number manipulation any order mesh or nodal problem is solved in a few minutes and the same ease of operation applies to LaPlace transform problems. In Design of Electronic circuits Diodes, MOSFETs and BJT's can be modeled and various outputs can be obtained for different inputs.