7th International Conference on Recent Advances in Automotive Engineering & Mobility Research (ReCAR 2024)

24 – 25th September 2024

Akademia Siber Teknopolis (AST)
Universiti Kebangsaan Malaysia Bangi, Selangor

BOOK OF ABSTRACTS

7th International Conference on Recent Advances in Automotive Engineering & Mobility Research (ReCAR) 2024

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Universiti Kebangsaan Malaysia
Bangi, Selangor

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WELCOME NOTE

Prof. Ir. Dr. Mohd Syuhaimi Ab Rahman

Dean
Faculty of Engineering and Built Environment Universiti Kebangsaan Malaysia

Assalamualaikum wrt wbt.

I would like to welcome all keynote speakers and participants to the 7th *International Conference on Recent Advances in Automotive Engineering and Mobility Systems* (ReCAR 2024).

ReCAR is a biennial event of the Centre for Automotive Research (CAR), a Centre of Excellence under the Faculty of Engineering and Built Environment, UKM. Over the years, ReCAR has been a platform that successfully brings together researchers, engineers and practitioners from higher learning institutions, research organizations, government agencies and industry to share knowledge and experience in a broad field related to automotive and mobility systems.

As the Dean of Faculty, I strongly support the organizing of this knowledge sharing platform as it will certainly spur more advanced research and collaborations among participants locally and abroad. Through advanced research and collaborations, innovative solutions can be generated and benefitted by our industry and community at large. I sincerely hope that the conference will establish and foster meaningful networking among the participants so that cross-discipline and translational research can be nurtured.

I would like to take this opportunity to extend my highest appreciation to all keynote speakers and presenters from local and abroad for their willingness to impart knowledge and expertise during this two-day conference. Lastly, I would like to express my heartiest congratulations to the Organising Committee of ReCAR 2024 for their dedication in making ReCAR 2024 a success.

I wish all participants an enjoyable and meaningful conference.

Dean
Faculty of Engineering and Built Environment

WELCOME NOTE

Dr. Wan Aizon W Ghopa

CHAIR of ReCAR 2024

Centre for Automotive Research (CAR)
Faculty of Engineering and Built Environment
Universiti Kebangsaan Malaysia

Assalamualaikum wrt wbt.

First and foremost, I would like to welcome all participants to the 7th *International Conference on Recent Advances in Automotive Engineering and Mobility Systems* (ReCAR 2024).

ReCAR 2024 is opened to a wider scope or theme related to automotive and mobility systems. This is in line with the worldwide initiatives in complying with the requirements of standards related to Environment-Social-Governance in all our endeavours and the need to support the attainment of the Sustainable Development Goals and aspirations of the Circular Economy.

The conference is fortunate to have 4 keynote speakers who are renowned experts in their field. Close to sixty one good quality papers were submitted to the conference. These submissions can be categorised under Thermofluids, Applied Mechanics, Fatigue, Structural Integrity, Control, End of Life Vehicle, Safety, Ergonomics, Intelligent Vehicles, EV and Hybrid, Noise, Vibration and Harshness (NVH), Additive Manufacturing, Engineering applications, Supply Chain, Life Cycle, Advanced Material and Manufacturing. I am very hopeful that ReCAR 2024 will be successful in elevating research, development and innovations to the next level.

I would like to take this opportune moment to express my greatest appreciation to all keynote speakers and participants. To my colleagues, the Organising Committee of ReCAR 2024, Congratulations on your hard work and dedication in making ReCAR 2024 a success.

May you have a pleasant and fruitful conference.

Chair of ReCAR 2024

1 KEYNOTE SPEAKER

Prof. Dr. Sonia Leva

- Deputy Director – Department of Energy Politecnico di Milano
- Head – Electrical Engineering and Measurement Unit (REEM), Politecnico di Milano
- Head – Solar Technology Laboratory (Solar TechLAB), Politecnico di Milano
- Head – Multigood MicroGrid Laboratory (MG2LAB), Politecnico di Milano

Sonia Leva received the M.Sc. degree and the Ph.D. degree, both in Electrical Engineering, from the Faculty of Engineering, Politecnico di Milano, Italy. Since 2016 she is Full Professor in "Elettrotecnica" (Electrical Engineering-Circuit Theory) at the Department of Energy where she is deputy director. The activity of scientific research of Sonia Leva regards mainly the following topics:

- MultiGood MicroGrid analysis, control and optimization.
- Models and analysis of devices for the production, management and monitoring of generation systems based on renewable sources.
- Photovoltaic, wind systems, load and EV power forecasting.

She is author of two patents and more than 300 papers published in international Journal or presented in international Conferences. Sonia Leva has obtained several prizes and awards for her research activity. She is also Editor and Associate Editor of some international journals. He has given several invited lectures and lectures in various European, Asian and American countries. She is coordinator of a research group in the field of photovoltaic systems and microgrids, including PhD students and post-graduated grant holders, and head of the SolarTech Lab and multi-good microgrid lab at the Department of Energy, Politecnico di Milano.

KEYNOTE ABSTRACT

Title:

MicroGrid and EV charging Forecast to Minimize Impacts on the Grid

The fast growth of Electric Vehicles (EVs) is likely necessary to meet decarbonizing goals in most countries. High charging power peaks and large overall energy needs can significantly increase carbon emissions and strain electric grids. Often grids will need to be upgraded, with the costs borne by consumers.

Rather, we can better utilize the existing infrastructure with optimal charging management aided by forecasting, as well as thoughtful planning of new charging stations. In this field, Microgrids (multi-energy) and new energy management systems (EMS) represent a very up-to-date way to increase the penetration of renewable energy sources (RES) and of Electric Vehicles (EV).

However, EV load forecasting can be very different from load forecasting: if we have to define a daily operation plan of the charging station, it is important to know not only the power profile but also how many charging sessions will there be and when they are requested. The forecasting has become increasingly challenging and important considering small e-stations and taking into account vehicle-to-grid (V2G) scenarios and programmable charging.

2 KEYNOTE SPEAKER

Dr Hairi bin Zamzuri

- Chief Executive Officer
  eMooVit Technology Sdn. Bhd.

Dr Hairi Zamzuri has more than 20 years of experiences in developing, testing, and commercialization of autonomous intelligent vehicle systems. He received his B.Electrical Eng in control system from Universiti Teknologi Malaysia (UTM), Master of Electrical Engineering at the same university, and Ph.D. in the field of Artificial intelligence and control design from Loughborough University in 2008. Publish more than 100 papers with related to autonomous and active safety technology as researcher and academician before joining industries to further commercialise the technology. His have more than 8 years experiences in setting up technology company compromise of business development, talent development, technology road map and product development life cycle especially in software and autonomous vehicle technology.

Dr Hairi Zamzuri currently a CEO of eMooVit Technology Sdn Bhd, focusing on design and development of autonomous driving software solutions for last mile autonomous bus for public transport.

Dr Hairi also actively as a speakers and consultations in autonomous driving in the area of technology, regulatory and policy for government agencies, universities, and private sectors.

KEYNOTE ABSTRACT

Title:
Advancements in Autonomous Driving Technology: A Focus on Malaysia's Progress and Regulatory Framework

As the global landscape rapidly evolves toward autonomous driving technology, Malaysia is making significant strides in integrating these advancements within its transportation ecosystem. This talk will explore the current state of autonomous driving in Malaysia, highlighting key developments and ongoing projects. Additionally, it will delve into the regulatory and legislative frameworks that are shaping the future of autonomous technology in the country. By addressing both the technological progress and the legal landscape, this presentation aims to provide a comprehensive overview of Malaysia's journey toward a more autonomous and connected future.

3 KEYNOTE SPEAKER

Dr. Che Hang Seng

- Technical Director
  EV Connection Sdn. Bhd.

Dr. Che Hang Seng was appointed as Technical Director at EV Connection Sdn Bhd. He has obtained his Beng in 2009 from University of Malaya, Malaysia, and then his PhD degree under the LJMU-UM dual PhD program in 2013. He is the sole recipient of the 2009 Kouk Foundation PhD Scholarship. Dr. Che's research interests are in the area of multiphase machines and drives, power electronics converters and renewable energy. Dr. Che is previously worked as associate editor for the IET-Electric Power Application (IET-EPA) journal.

Dr. Che Hang Seng is currently lead the EV Connection Sdn Bhd, which partnered with BMW Group Malaysia to develop the first mobile EV charging vehicle in Malaysia using repurposed BMW and MINI electric vehicle batteries.

KEYNOTE ABSTRACT

Title:
EV Adoption and EV charging Infrastructure in Malaysia: Current Status and Challenges

As more and more countries moves towards embracing electric mobility, Malaysia has also stepped up its game in the last few years to spur electric vehicle (EV) adoption within the nation. Through various initiatives, it is no longer a foreign scene to see EVs like Tesla and BYD on Malaysian streets. Nevertheless, the road toward transport electrification is not an easy one, and there are different challenges that need to be overcame. In particular, establishing a reliable EV charging network with good coverage and interoperability is crucial in instilling market confidence with EV ownership. Apart from the high cost of setup, the limitation of grid infrastructure is also one of the hindering factor for setting EV charging network in country like Malaysia. In this keynote speech, the speaker will bring the audiences through some of the recent developments of EV adoption in Malaysia as well as the challenges and solutions for expanding EV charging network in the nation.

4 KEYNOTE SPEAKER

Associate Professor. Ir. Ts. Dr. Wira Jazair bin Yahya

- **Fellow** – Institute of Vehicle System and Engineering
- **Advisor** – Society of Automotive Engineers Malaysia (SAE Malaysia)

Assoc. Prof. Ir. Ts. Dr. Wira Jazair bin Yahya was born in 1976. He attained his Bachelor of Mechanical Engineering degree in 2000 from Kagoshima University, Japan. Next, he completed his Masters in Mechanical Engineering in the year 2002 and accomplished his PhD in year 2008. He joined UTM in the year 2003 and currently working under Malaysia-Japan International Institute of Technology and Institute of Vehicle System and Engineering. He has worked on utilisation of alternative fuels such as biofuel and emulsion fuel for diesel engines and burners more than 20 years.

Overall, he has published numerous high-impact factor journals. He also was an active member of Society of Automotive Engineers Malaysia holding position as Treasurer, Vice Chairman, Chairman and currently as an Advisor. He is working closely with various industrial partners and Japanese universities.

KEYNOTE ABSTRACT

Title:

Global Auto-Industry Decarbonisation: One Size Doesn't Fit All

Tooling plays an important role in the automotive development. OEM spends up to 200mil in tooling for a new project and it contributes to 30% of the total BOM cost. Tooling investment is one of the main decision factors on whether to proceed with a future car development project. With the high competitiveness of car sales from both local and overseas OEMs, each OEM had to strategize the investment to ensure profitability gained from the limited volume. The local tooling industry is highly affected with the competitive price from overseas tool maker. It is important to ensure the competitiveness of the local tooling industry in term of quality, speed & cost. Various supports from OEMs, government as well as academicians are important to sustain the industry.

PROGRAMME SCHEDULE

Tuesday 24th September 2024 (Day 1)	
0800 – 0900	**Registration** **Venue: Auditorium, Akademia Siber Teknopolis (AST), UKM**
0900 - 1000	**Parallel Session 1**
1000 - 1015	**Morning Break**
1015 - 1030	Safety Briefing **Venue: Auditorium AST, UKM**
1030 – 1040	Negaraku and Varsiti Kita Doa recitation
1040 – 1045	**Welcoming Speech** Dr. Wan Aizon W Ghopa (Chairman of ReCAR2024)
1045 – 1100	**Opening speech** Deputy Director (Planning, Operations & Quality), **CRIM-UKM**: Prof. Ir. Dr. Abu Bakar Sulong Video Montage Photo Session
1100 – 1140	**Keynote 1: MicroGrid and EV charging Forecast to Minimize Impacts on the Grid** Prof. Dr. Sonia Leva Deputy Director, Department of Energy, Politecnico di Milano Head, Electrical Engineering and Measurement Unit (REEM), Politecnico di Milano Head, Solar Tecnology Laboratory (SolarTechLAB), Politecnico di Milano Head, MultiGood MicroGrid laboratory (MG2LAB), Politecnico di Milano (Chairperson: Prof. Dr. T.Prakash G.Thamburaja) **Venue: Auditorium AST, UKM**
1140 - 1220	**Keynote 2: Advancements in Autonomous Driving Technology: A Focus on Malaysia's Progress and Regulatory Framework** Dr. Hairi Zamzuri, Chief Executive Officer, eMooVit Technology Sdn. Bhd. (Chairperson: Prof. Ir. Dr. Shahrum Abdullah) **Venue: Auditorium AST, UKM**
1220 – 1230	Token Giving & Photo Session
1230 – 1400	**Lunch Break (Dewan Serbaguna)**
1400 – 1500	**Parallel Session 2**
1500 - 1600	**Parallel Session 3**
1600	**Coffee Time and End of Conference Day 1**

Parallel Session 1 (Morning): 24 September 2024, Tuesday (Day 1)					
Room	**AST 4**	**AST 1**	**AST 2**	**AST 3**	**MERCU Room**
Sessions	**Session 1: Applied Mechanics/Fatigue/Structural Integrity**	**Session 2: Applied Mechanics/ Control**	**Session 3: EV/Hybrid**	**Session 4: Intelligent Vehicles/ELV**	**Session Online**
Chairperson	**Assoc. Prof. Dr. Wan Mohd Faizal Wan Mahmood**	**Assoc. Prof. Dr. Sallehuddin Mohamed Haris**	**Dr. Nurhasyimah Abd Aziz**	**Ts. Dr. Nor Azwan Mohamed Kamari**	**Assoc. Prof. Dr. Nizaroyani Saibani**
0900 - 0915	ID 10 An economical Precise Laser surface texturing technique to produce improved tribological performance in an engine valve train *Muhammad Rizwan Siddiqui (National University of Science and Technology, NUST)*	ID 5 Kinematic modelling of a 6-DOF hybrid configuration motion platform for Driver-In-the-Loop testing *Vimal Rau Aparow (University of Nottingham Malaysia Campus)*	ID 8 Evaluation of Light Duty Truck Electrification in Klang Valley Malaysia *Mohd Fareez Edzuan Abdullah (Heriot-Watt University Malaysia)*	ID 23 A Machine Learning based Motion Planning for Autonomous Harvesting Cranes in Palm Oil Plantations *Mohd Faisal Ibrahim (Universiti Kebangsaan Malaysia)*	ID 42 Finite Element Analysis of Filler Shape in Photopolymerization Additive Manufacturing Using the Fusion RSA-RVE Algorithm *Mohd Sabri Bin Hussin (Unimap)*
0915 - 0930	ID 18 A Study of the Mechanical, structural, thermal, morphological and migration properties of polylactic acid (PLA)/ostrich (Struthio camelus) eggshell powder (OES) bio-composites for food packaging application *Albert U Ude (Botswana International University of Science and Technology)*	ID 15 Novel Z-Chart for Predicting Insufficient Oil of Automotive Belt-Driven Air Conditioning Compressor *Muhammad Nur Othman (Universiti Kebangsaan Malaysia)*	ID 11 Revolutionizing Mobility : Decoding EVs and HFCVs *Samarjeet Singh, Shubham Chauhan (Delhi Technological University)*	ID 26 Development of Real-Time Simultaneous Vibrotactile Sensation on the Lower Limb for Drowsiness Prevention: An Exploratory Study *Nor Kamaliana Khamis (Universiti Kebangsaan Malaysia)*	ID 59 Mechanical Properties Optimization of LM6: A Case Study at Eng Teknologi Sdn. Bhd. *Muhd Afif Asnawi Muhammad Azizan (Engtek Sdn Bhd)*
0930 - 0945	ID 22 Structural Optimization of Tractor Arm in Palm Oil Plantation *Mohd Hairi Mohd Zaman (Universiti Kebangsaan Malaysia)*	ID 19 Numerical Computation of Modified-Homogeneous Single-Phase Gravity-Propelled MHD Viscoelastic Nanofluid Flow with Variable Thermal Conductivity down an Inclined Plane *Idrees Khan (Universiti Kebangsaan Malaysia)*	ID 12 Worldwide Driving Cycle Comparison: Implications on Carbon Dioxide Emissions and Fuel Efficiency in Light-Duty Vehicle Emission Standards *Muhammad Noh Aiman Mohd Sham (Universiti Kebangsaan Malaysia)*	ID 32 Maximizing Efficiency: Enhancing AGV Path Planning through Algorithm Optimization *Ruizhe Yin (Universiti Kebangsaan Malaysia)*	ID 44 The Needs of Continuous Wavelet Transform for Analysing Road Load Data *Chuin Hao Chin (Universiti Kebangsaan Malaysia)*
0945 - 1000	ID 30 Characterization of 316 stainless steel produced using wire arc additive manufacturing for automotive applications *Siti Khaiyisah Haidah Baharudin (Universiti Kebangsaan Malaysia)*	ID 39 Predictive Analysis of Semi-active Engine Mount with PID Control for Passenger Vehicle *Mohd Sabirin Rahmat (Universiti Kebangsaan Malaysia)*	ID 13 Study on Carbon Dioxide Emissions Reductions Prediction for Malaysia Light Duty Vehicles by 2030 *Muhammad Aiman Saharudin (Universiti Kebangsaan Malaysia)*	ID 6 A Review of End-of-Life Disassembly Models: An Investigation of Inventory Challenges and Supply Chain Uncertainties *Fatin Amrina A Rashid (Universiti Kebangsaan Malaysia)*	ID 9 Analysis on the Potential Carbon Dioxide Emissions Reduction from Passenger Vehicle in Malaysia *Dahlia Binti Mohd Faisol (Universiti Kebangsaan Malaysia)*
1000 - 1030	**Morning Break and End Parallel Session 1**				

Parallel Session 2 (Afternoon): 24 September 2024, Tuesday (Day 1)					
Room	**Auditorium**	**AST 1**	**AST 2**	**AST 3**	**AST 4**
Sessions	**Session 1: Applied Mechanics/Fatigue/Structural Integrity**	**Session 2: Applied Mechanics/ Control**	**Session 3: EV/Hybrid**	**Session 4: Intelligent Vehicles/ELV**	**Session Online**
Chairperson	**Dr. Abdul Hadi Azman**	**Assoc. Prof. Dr. Mohd Zaki Nuawi**	**Assoc. Prof. Dr. Zulkifli Mohd Nopiah**	**Dr. Hawa Hishamuddin**	**Ir. Dr. Mohd Sabirin**
1400 - 1415	ID 31 Simulasi Pembakaran Hidrogen Suntikan Terus Dalam Enjin Pencucuhan Bunga Api Di Bawah Kelajuan Enjin Yang Berlainan *Norhidayah binti Mat Taib (Universiti Kebangsaan Malaysia)*	ID 24 Simulation of Pole Slip Control In An Axial Flux Magnetic Gear With Changeable Transmission Ratios using Stateflow and Simulink *Nurul Najwa Mohd Nasir (Universiti Kebangsaan Malaysia)*	ID 14 Simulation of Hydrogen Direct Injection Spark Ignition Engines Combustion *Syafira Izwani Abdul Shukor (Universiti Kebangsaan Malaysia)*	ID 3 Analysis of autonomous emergency steering system using lateral skyhook based estimated lateral force feedback in IPG CarMaker *Vimal Rau Aparow (University of Nottingham Malaysia Campus)*	ID 56 Effect of fiber orientation on mechanical property of carbon/epoxy composites *Yusuf Şahin (Ostim Technical University)*
1415 - 1430	ID 34 Study on ZL205A Matrix Composites reinforced with in-situ TiB2 particles *Jingchuan Tang (Universiti Kebangsaan Malaysia)*	ID 64 Assessment of Train Pass-By Noise After Residential Complaints: A Combined Approach of Field Measurements and Simulation Analysis *Azli Arifin (Universiti Kebangsaan Malaysia)*	ID 17 A Review of Carbon Emissions and Reduction Strategies in Container Terminal Operations *Iliani Mohd Ikram (Universiti Kebangsaan Malaysia)*	ID 27 Optimal Location and Threshold Value of Comfortable Vibration System for Drowsy Detection *Nor Kamaliana Khamis (Universiti Kebangsaan Malaysia)*	ID 58 ADC12 Composition Optimization using Taguhci Method: A Case Study in Eng Teknologi Sdn Bhd *Muhd Afif Asnawi Muhammad Azizan (Engtek Sdn Bhd)*
1430 - 1445	ID 47 Life Prediction for Rail Track Integrity Assessment based on Fibre Bragg Grating Shifting Wavelength and Rainflow Counting Method *Meor Iqram Bin Meor Ahmad (Universiti Kebangsaan Malaysia)*	ID 37 Simulation of Two Stage Photovoltaic-Electrodialysis Regeneration Using Engineering Equation Solver For Solar Cooling Application *Mohd Anas Mohd Sabri (Universiti Kebangsaan Malaysia)*	ID 20 A Discrete Jellyfish Search Optimizer for Optimal Operation Scheduling of Plug-in Hybrid Electric Vehicle *Ahmad Asrul Ibrahim (Universiti Kebangsaan Malaysia)*	ID 29 Evaluation of Multi-Criteria Decision-Making Approach using Analytic Network Process for Performance Upgrade of Automotive Turbocharger Component in Remanufacturing Applications *Nurhasyimah Abd Aziz (Universiti Kebangsaan Malaysia)*	ID 28 A Review of the Fatigue Reliability Assessment on a Leaf Spring under Random Loading *Lennie Abdullah (Universiti Kebangsaan Malaysia)*
1445 - 1500		ID 21 Economic Load Dispatch For Power System Using Bird Swarm Algorithm *Nor Azwan Mohamed Kamari (Universiti Kebangsaan Malaysia)*		ID 51 Optimized Deep Learning Model for PM2.5 and PM10 Concentration Prediction in Formal ELV Recycling Zone: A Stacked LSTM-GRU Approach with Explainable AI *Altaf Hossain Molla (Universiti Kebangsaan Malaysia)*	ID 48 Fickian diffusion model for oil palm fiber reinforced thermoplastic composites by fused deposition modeling *Mohd Nazri Ahmad (UTEM)*
End Parallel Session 2					

Parallel Session 3 (Afternoon): 24 September 2024, Tuesday (Day 1)			
Room	**Auditorium**	**AST 1**	**AST 4**
Sessions	**Session 1: Applied Mechanics/Fatigue/Structural Integrity**	**Session 2: Applied Mechanics/ Control**	**Online Session**
Chairperson	**Dr. Salvinder Singh Karam Singh**	**Ts. Dr. Mohd Faizal Mat Tahir**	**Dr. Zaliha Wahid**
1500 - 1515	ID 66 Investigation of Vibrational Response of Bio-Lubricants and SAE40 for Journal Bearing Application *Muhammad Hafizzuddin Noorazzmy (Universiti Kebangsaan Malaysia)*	ID 41 The Effects of Refrigerant and Compressor Oil Volume On The Performance of Automotive Air-Conditioning Systems: A Comparative Study *Nor Azazi B Ngatiman (UTeM)*	ID 60 Study of A380 Composition for Material Optimization using Taguchi Method: A Case Study in Eng Teknologi Sdn. Bhd. *Muhd Afif Asnawi Muhammad Azizan (Engtek Sdn Bhd)*
1515 - 1530	ID 57 Effect of T6 Heat Treatment on Graphene Reinforced Aluminium Composites Produced by Semi-Solid Process: Microstructure and Wear Study *Nur Farah Bazilah Wakhi Anuar (UTeM)*	ID 45 Real-Time Monitoring System Development for Switchgear Machines in Railway Operations *Meor Iqram Bin Meor Ahmad (Universiti Kebangsaan Malaysia)*	ID 55 Optimization of the machinability behavior of AISI 304 stainless steel using Taguchi method *Yusuf Şahin (Ostim Technical University)*
1530 - 1545	ID 61 A Review on Machine Learning Implementation in Impact Fracture *Saeed Hossein Moghtaderi (Universiti Kebangsaan Malaysia)*	ID 68 The effect of a mixed bio-lubricant and nano particle on static and dynamic performance in journal bearing applications *Muhammad Imran Sadiq (Universiti Kebangsaan Malaysia)*	ID 7 V2X Communication for Optimised Route Selection in Accident Management *Nor Fadzilah F Abdullah (Universiti Kebangsaan Malaysia)*
1545 - 1600	ID 50 Recent Trends of Hybrid Lattice Structures: from Architectural Design and High-accuracy Additive Manufacturing Process, to Enhance Mechanical Properties *Asfarina Seharing (Universiti Kebangsaan Malaysia)*	ID 33 Development of Graphical User Interface for Upper Limb Exoskeleton Rehabilitation using ROS and Visual Systems *Mohd Soleimani Amiri (Universiti Kebangsaan Malaysia)*	ID 53 A Survey on Global Mobility-as-a-Service Levels of Integration and Opportunities *Nor Fadzilah F Abdullah (Universiti Kebangsaan Malaysia)*
End of Day 1			

Wednesday 25 September 2024 (Day 2)	
0800 - 0900	**Registration** **Venue: AST Bilik Seminar 1**
0900 - 1000	**Parallel Session 4**
1000 - 1030	**Morning Break**
1030 – 1110	**Keynote 3 : EV Adoption and EV charging Infrastructure in Malaysia: Current Status and Challenges** Dr. Che Hang Seng Technical Director, EV Connection Sdn Bhd (Chairperson: Ts. Dr. Muhammad Ammirrul Atiqi Mohd Zainuri) **Venue: AST Bilik Seminar 1**
1110 - 1200	**Keynote 4 : Global Auto-Industry Decarbonisation: One Size Doesn't Fit All** Associate Professor Ir. Ts. Dr. Wira Jazair Yahya Malaysia-Japan International Institute of Technology, Universiti Teknologi Malaysia. (Chairperson: Prof. Dr. Mohd Nizam Ab Rahman) **Venue: AST Bilik Seminar 1**
1200 – 1300	**Lunch** **Closing and Award Ceremony** **Venue: Dewan Serbaguna, AST**
1300	**End of ReCAR 2024 Conference**

Parallel Session 4 (Morning): 25 September 2024, Thursday (Day 2)					
Room	**AST Seminar 1**	**AST 2**	**AST 3**	**AST 4**	**AST 4**
Sessions	**Session 1: Applied Mechanics/Fatigue/Structural Integrity**	**Session 2: Applied Mechanics/ Control**	**Session 3: EV/Hybrid**	**Session 4: Intelligent Vehicles/ELV**	**Online Session**
Chairperson	**Ts. Dr. Muhamad Alias Md Jedi**	**Dr. Mohammad Soleimani Amiri (UTEM)**	**Dr. Ahmad Asrul Ibrahim**	**Ir. Dr. Zambri Harun**	**Dr. Mohd Anas Mohd Sabri**
0900 - 0915	ID 54 Subsurface Vortex Control Parametric Study at Submersible Pump Intake Using Plate-Type Floor Splitters *Zulkhairi Zainol Abidin (Universiti Kebangsaan Malaysia)*	ID 49 Preliminary Study on Urban Farming Concept as Temporary Acoustic Barrier to Reduce Traffic Noise Pollution *Mohd Faizal Mat Tahir (Universiti Kebangsaan Malaysia)*	ID 38 Evaluation and Modelling of Planar Electrolyte-Supported SOFC *Ole Ronie (Fuel Cell Institute, UKM)*	ID 4 Classification of Test Scenarios based on Operational Design Domain for Safety Testing of Autonomous Vehicles *Vimal Rau Aparow (University of Nottingham Malaysia Campus)*	ID 35 Controlling the Autonomous Mobile Robot (AMR) based on Rocker-Bogie Mechanism for Classification of Uncertainty Terrains *Nurul Muthmainnah Mohd Noor (Universiti Teknologi MARA, UiTM)*
0915 - 0930	ID 63 Multicollinearity Analysis in Measuring Work Fatigue: A Case Study with Subjective and Objective Approaches *Sajiyo (Universitas 17 Agustus 1945 Surabaya)*	ID 36 Study of Thermal Comfort and Heat Islands in High-Risk Areas *Muhammad Zainul Arifin Bin Suhaimi (Universiti Kebangsaan Malaysia)*	ID 46 Comparative Analysis of Charge/Discharge Performance of Various Batteries Using CC-CV and PMSM Load Profiles *Muhammad Ammirrul Atiqi Mohd Zainuri (Universiti Kebangsaan Malaysia)*	ID 52 Corrosion Resistance of Aluminium after End-of-Life Vehicles Recycling in Malaysia *Nizaroyani Saibani (Universiti Kebangsaan Malaysia)*	ID 43 Effect of B10 Biodiesel-Blends of POME and JOME on Fuel Properties and Diesel Engine Performance *Helmisyah Bin Ahmad Jalaludin (Universiti Teknologi Mara)*
0930 - 0945	ID 65 Effects of Varying Magnetic Treatment Parameters on The Combustion Performance of a Diesel Engine run on Biodiesel *Wan Mohd Faizal Wan Mahmood (Universiti Kebangsaan Malaysia)*	ID 69 Biodiesel from unrefined, refined and waste-derived black soldier fly larvae palm oil – formulation, characterization and engine test *Taib Iskandar Mohamad (Universiti Teknologi Petronas)*	ID 25 Enhancing Day-Ahead Forecasting of EV Recharging Power Consumption Using LSTM and Hybrid Models: A Comparative Study *Emanuele Giovanni Ogliari (Politecnico di Milano)*	ID 62 Driving Indonesia's Circular Economy through Remanufacturing: An Exploration of Policy and Institutional Frameworks *Tatbita Titin Suhariyanto (Institut Teknologi Sepuluh Nopember)*	ID 40 Study of drag Reduction Strategy of 3 Dimentional Idealized Automotive Body *Ikram Derghal (Uitm)*
0945 - 1000				ID 67 Design for Performance Upgrade of Automotive Turbocharger in Remanufacturing Applications *Nurhasyimah Abd Aziz (Universiti Kebangsaan Malaysia)*	ID 26 Development of Real-Time Simultaneous Vibrotactile Sensation on the Lower Limb for Drowsiness Prevention: An Exploratory Study *Nor Kamaliana Khamis (Universiti Kebangsaan Malaysia)*
1000 - 1030	**Morning Break and End Parallel Session 4**				

ABSTRACTS

Paper ID :	3
Paper Title :	Analysis of Autonomous Emergency Steering System using Lateral Skyhook Based Estimated Lateral Force Feedback in IPG Carmaker

Abstract :
Collision avoidance is one of the important safety systems for automated vehicle to avoid potential collision due to frontal collision or rear-end collision. One of the main systems used in automated vehicles are the autonomous emergency braking (AEB) system to halt the vehicle from rear end collision. However, during high-speed driving and low time-to-collision (TTC) conditions, the capability of AEB to halt the vehicle from motion is affected. This increases the probability for the rear end collisions with other traffic vehicle which leads to road accidents. Therefore, an active safety system namely autonomous emergency steering (AES) control using estimated lateral force feedback (EsLaF) system was developed and implemented in this study along with AEB for collision avoidance application. The proposed estimated lateral force feedback (EsLaF) system is designed based on the imaginary lateral skyhook damper mounted at front and rear of the vehicle. The imaginary lateral skyhook generates the lateral forces for the vehicle to perform lane changing profile once the TTC is low and the vehicle is at high-speed driving condition. The performances enhancement for system with the implementation of proposed controllers and without controllers were being evaluated with the standard of root mean square error (RMSE) in terms of percentage differences. The percentage improvements were obtained as 37.5% and 54.3% for the yaw rate and lateral acceleration responses respectively and can be concluded that the proposed controllers demonstrated good capabilities to perform the maneuvering control.

Paper ID :	4
Paper Title :	Classification of Test Scenarios based on Operational Design Domain for Safety Testing of Autonomous Vehicles

Abstract :
Scenario-based testing allows the tester to execute a wide variety of scenarios, which are often considered inefficient, risky, and/or infeasible to be tested physically. This can include many rare scenarios that may not occur very frequently in real life. Each scenario can cover multiple scenario categories, with a diversity of activity parameter sets per class. The term scenario can be referred as description of a situation that can happen or has happened in the real world. Moreover, scenarios are used to describe any type of situation that a vehicle in operation can encounter during its lifetime. Furthermore, each scenario can be parameterized to form concrete test cases for the scenario-based testing process. Each test case includes a set of parameters that are assigned specific values. The combinations of applicable parameters add on to the diversity and volume of the tests required to cover the desired safety goals. Many of these scenarios may also involve a high level of risk, making physical tests infeasible. The set of scenarios described by the scenario categories will not fully cover all possible situations that can occur in reality. Due to the above reasons, it is imperative to test these variety of scenarios through virtual testing and selected relevant scenarios for the physical testing. In this study, the test scenarios are identified based on the actual scenarios from the real environment based on the Operational Design Domain approach as stated in the ISO 34504. In this study, the set of scenarios are focusing on developing countries such as Malaysia urban driving conditions.

Paper ID :	5
Paper Title :	Kinematic Modelling of a 6-DOF Hybrid Configuration Motion Platform for Driver-In-The-Loop Testing

Abstract :
Driver-in the loop (DiL) testing is important in the development of the Advanced Driving Assistance system (ADAS) and automated driving (AD). DiL testing is done by utilizing a driving simulator consisting of a steering wheel and pedal to accept human input during a virtual simulation. A common static simulator will generate false cues and do not reflect actual driving condition. To address this issue, automotive developers commonly utilize dynamic motion platform which is a mechanical device that contains actuators to generate motion in different directions. Among all varieties, Stewart platform is the most renowned structured being applied due to its large workspace in the application of flight and driving simulators [2]. However, the cost of building a Stewart platform that can support the necessary component for DiL and driver is expensive. In this work, a hybrid manipulator robot which can generate a 6-DOF (degree of freedom) movement is proposed, and the cost is much lower than Stewart platform with more compact structure.

Paper ID :	6
Paper Title :	A Review of End-of-Life Disassembly Models: An Investigation of Inventory Challenges and Supply Chain Uncertainties

Abstract :
Diving into the complexities of handling end-of-life (EOL) products, this study delves into the challenges of disassembly within closed-loop and reverse supply chains. The process of disassembling EOL products is consistently complicated due to many inventory issues and uncertainty in the supply chain. Therefore, a review is essential to elucidate the evolution of inventory strategies to alleviate emerging difficulties in the EOL product disassembly process. A comprehensive analysis of 50 articles regarding EOL product disassembly that were published from 2002 to 2024 was conducted using the systematic literature review (SLR) method. The results indicate that 60% of the inventory models proposed solutions to mitigate backorders and lost sales issues, while 34% of the formulated model addressed the supply chain uncertainties in the EOL product disassembly process. This review offers a comprehensive guide for future research, providing key insights for developing efficient inventory models specifically designed for EOL product disassembly. This review also identifies crucial factors in the EOL disassembly process that need more exploration and provide direction in this area of study towards achieving greater clarity.

Paper ID :	7
Paper Title :	V2X Communication for Optimised Route Selection in Accident Management

Abstract :
The rapid development of vehicle technology and the increased amount of road users have resulted in congestion and increased possibility of accidents happening on the road. The emergence of Vehicle-to-Everything (V2X) communication was introduced as a solution to improve road safety and more efficient traffic management. This project aims to utilize V2X capabilities for optimized route selection in accident situations. This study integrates the vehicle mobility model into a Vehicular Ad Hoc Network (VANET) by using OMNeT++, VEINS and SUMO simulation. The simulation of accident scenarios is adopted to evaluate the performance of the V2X rerouting algorithm. In addition, the technique of disseminating warning messages by using periodic beacons is also implemented to spread warning messages to nearby or neighbouring vehicles. The message dissemination serves to notify other road drivers about the accident happening, allowing them to take proactive measures to avoid the incoming congestion. The utilization of V2X rerouting resulted in a notable improvement in traffic flow during accidents, as evidenced by a significant 39.88% increase in the average vehicle speed compared to situations without V2X. Moreover, the average waiting time for vehicles was reduced by 36.69%, and the average driving time was shortened by 18.73% when V2X rerouting was employed during accidents at the UKM road intersection. In conclusion, V2X communication contributes to the optimisation of route selection in accident scenarios, thereby enhancing road safety and overall traffic efficiency.

Paper ID :	8
Paper Title :	Evaluation of Light Duty Truck Electrification in Klang Valley Malaysia

Abstract :
Adoption of full electric vehicle EV in commercial vehicle sector is challenging not only due to higher EV price tag, but also due to higher uncertainty on its impact on the day-to-day business such as driving range and performances compare to that of a Diesel-powered vehicle. In this study, possibility of electrification of light duty truck fleet for cold pharmaceutical products delivery in urban area of Klang Valley, Malaysia is evaluated using MATLAB-Simulink Model-Based Design MBD simulation. The actual driving profile including range, average running speed, top speed, and idling rate extracted from the GPS data are being used for the MBD simulation. Simulation results suggested that the high-voltage battery HVB of 75 kWh and the electric motor of 100 kW-280 Nm should be sufficient for the converted EV truck. EV truck performance with the suggested motor integration were analysed from fundamental vehicle dynamic theorem. It was shown that the EV truck should be able to reach top speed at 86 km/h, climb 27% slope from stand still condition, and could be driven for approximately 180 km mileage with a single charge at the full load of 5-tonne. Moreover, the vehicle weight only increased by approximately 400 kg after the conversion, suggesting a suitability for electrification for urban-delivery light duty truck in Malaysia urban area.

Paper ID :	9
Paper Title :	Analysis on the Potential Carbon Dioxide Emissions Reduction from Passenger Vehicle in Malaysia

Abstract :
The transportation sector in Malaysia emits around 14 million tonnes of CO2 annually, necessitating urgent measures to promote sustainable mobility. The Energy Efficient Vehicle (EEV) standard aims to improve fuel efficiency and reduce carbon footprints, but further steps are needed for substantial reductions. This study examines potential CO2 emissions reductions from passenger vehicles by 2030 under four scenarios: Baseline, Business-as-Usual (BAU), Fuel Economy Standard, and Policy-based or Government Target-based (GOV). Results highlight significant emissions reductions under the Fuel Economy Standard scenario, showcasing the impact of fuel-efficient technologies. However, transitioning to electrified vehicles poses challenges, emphasizing the need for comprehensive strategies. The study underscores the importance of a holistic approach, integrating effective policies and targeted interventions, to achieve emissions reduction targets and foster a sustainable transportation sector in Malaysia.

Paper ID :	10
Paper Title :	An Economical Precise Laser Surface Texturing Technique to Produce Improved Tribological Performance in an Engine Valve Train

Abstract :
Minimizing friction, a critical factor in optimizing performance and efficiency has been a longstanding research pursuit. This study tackles this challenge by introducing an economical micro-texturing technique using fiber laser engraving machine. We aim to assess its effectiveness in reducing friction under high-temperature and high-revolution conditions. Traditional friction reduction methods have limitations, including surface polishing, lubricant optimization, and coatings. Surface texturing, particularly Laser Surface Texturing (LST), has emerged as a promising approach due to its ability to create intricate micro-patterns that enhance lubrication and optimize contact area. However, current LST techniques often lack adaptability and convenience. This study addresses this gap by presenting an economical, customizable laser engraving technique for micro-texturing. We analyze the effectiveness of this new technique in lowering friction under operating conditions with high temperatures and rotation speeds. The findings show the potential of this innovative approach for enhancing the performance and longevity of a wide range of mechanical components. This LST technique aided in reducing the frictional torque upto 10.7% compared to untextured surfaceIn this paper, we have focused on creating surface textures using relatively simple, cost-effective equipment. Laser textures are produced on the hardened steel surface of a bucket-type tappet shim using a fiber laser engraver. A real engine cylinder-head-based test rig has been developed to study the effect of fiber laser surface texturing on friction. The tappet and the shim are allowed to rotate as in the real operating conditions of an engine. The surface texture area density of 10% and the width-to-depth ratio of 0.1 are used based on the literature review. Experiments show textured tappet shim reduces friction torque at high temperature across RPMs, 10.7% reduction seen at 500 RPM.

Paper ID :	11
Paper Title :	Revolutionizing Mobility : Decoding EVs and HFCVs

Abstract :
In recent years, the rise in carbon emissions and the widespread effects of global warming have brought new energy vehicles into the spotlight. Electric vehicles (EVs) and hydrogen fuel cell vehicles (HFCVs), both producing zero tailpipe emissions, are seen as promising alternatives. This paper examines the working, structural characteristics, and safety designs of EVs and HFCVs, comparing their carbon emissions, charging infrastructure, energy efficiency, and safety features. The analysis reveals that both EVs and HFCVs significantly reduce carbon emissions and enhance safety compared to traditional vehicles, with EVs showing greater emission reductions. Moreover, EVs are advancing more rapidly in terms of charging infrastructure compared to hydrogen energy vehicles. However, HFCVs exhibit lower energy efficiency than EVs. In terms of safety, both types surpass conventional vehicles, though EVs are more prone to overheating and fire hazards due to battery design issues. Current research suggests that EV technology and its supporting infrastructure are more comprehensive, cost- effective, and efficient in reducing carbon emissions. With continued investment in the development of new energy vehicles and potential advancements in hydrogen energy production, the future for HFCVs appears promising. The paper also expresses optimism for innovative solutions that could accelerate the growth of hydrogen energy vehicles.

Paper ID :	12
Paper Title :	Worldwide Driving Cycle Comparison: Implications on Carbon Dioxide Emissions and Fuel Efficiency in Light-Duty Vehicle Emission Standards

Abstract :
The transportation sector is a major contributor to global CO2 emissions, particularly by light-duty vehicles. To assess vehicle performance in terms of CO2 emissions and fuel efficiency, driving cycles that mimic real-world conditions are crucial. This paper explores how different global driving cycles impact CO2 emissions and fuel efficiency standards for light vehicles. The study examines how variations in driving cycles affect CO2 emissions and fuel efficiency results, the difficulties these variations pose for global standardization and implications for both manufacturers and consumers. The objectives of this study are to compare different global driving cycles for light vehicles, analyze the correlation between vehicle types with CO2 emissions and fuel efficiency, and formulate coefficients to predict CO2 emissions and fuel efficiency based on different driving cycles. Through data collection, the study assesses CO2 emissions and fuel efficiency for a standard light vehicle model using several driving cycles, including Japanese JC08 Cycle, New European Driving Cycle (NEDC), Worldwide Harmonize Light Vehicle Test Procedure (WLTP) and Malaysia Driving Cycle (MDC). The findings show notable differences, with the WLTP generally indicating higher CO2 emissions and lower fuel efficiency compared to JC08, NEDC and MDC, due to its more realistic driving conditions.

Paper ID :	13
Paper Title :	Study on Carbon Dioxide Emissions Reductions Prediction for Malaysia Light Duty Vehicles by 2030

Abstract :
The demand for transport services is expected to rise, causing the CO2 emissions level to increase as well. In Malaysia, the transport industry is responsible for 28% of the country's total CO2 emissions, with road transport contributing 85% of these emissions. Decarbonization of road transport is necessary for Malaysia to meet its goals for carbon neutrality and CO2 emission reduction. Malaysia sees the use of next-generation vehicles as essential to cutting down on carbon emissions from road transport. These vehicles include fuel cell vehicles (FCVs), plug-in hybrid electric vehicles (PHEVs), hybrid electric vehicles (HEVs), and battery electric vehicles (BEVs). Four scenarios were proposed to predict the potential carbon emissions reduction of passenger car use in 2030: baseline, business-as-usual, government's target-based, and aggressive scenarios. Several mitigation strategies from government policies have been used to analyze the potential impact of reducing CO2 emissions. The findings indicate that PHEVs have the lowest CO2 emissions per km traveled, followed by HEVs and BEVs. Electrified vehicles, such as HEVs, PHEVs, and BEVs, could contribute to the decarbonization of the passenger car industry, according to the prediction for carbon emissions from automobiles. The number of vehicles on the road, the number of vehicles made, the fuel cycle from well to wheel, and fuel efficiency will all have a major impact on CO2 emissions

Paper ID :	14
Paper Title :	Simulation of Hydrogen Direct Injection Spark Ignition Engines Combustion

Abstract :
Hydrogen combustion in spark ignition (SI) engines promises high efficiency and clean emissions. Hydrogen commonly works as a secondary fuel in spark ignition engines, but it leads to knock and pre-ignition problems. Direct injection of hydrogen can solve the problem of abnormal combustion. The use of hydrogen as a fuel is less common now, which is the focus of this study. The purpose of this research is to examine the characteristics of hydrogen combustion in direct injection spark ignition engines and compare the effects of combustion on changes in injection timing and injection duration. This study was carried out by using a simulation method using Converge CFD software based on the parameters of the PROTON CAMPRO spark ignition direct injection hydrogen engine. Converge software is designed specifically for an internal combustion engine and equipped with an adaptive mesh refinery (AMR) function to automatically refine the mesh during combustion. The SAGE combustion model and the RANS model are selected as the turbulence models. Hydrogen as the sole fuel was injected directly into the combustion chamber. The preliminary results shows that an adjustment of injection timing and injection duration is needed for current setup to combust hydrogen.

Paper ID :	15
Paper Title :	Novel Z-Chart for Predicting Insufficient Oil of Automotive Belt-Driven Air Conditioning Compressor

Abstract :
Air conditioning is essential to maintain environmental comfort in residential and automotive sectors, especially in a tropical country like Malaysia. Hot and humid weather makes a person uncomfortable and very tiring during the day of long distances. Besides, malfunctioning air conditioning could also reduce eye view due to fogging, which could cause an accident. In this paper, a driven car air conditioning compressor that was faulty due to insufficient oil was studied. A compressor with five different amounts of oil (ml) was examined at six different speeds. Triaxial vibration data was recorded using a wireless Phantom ATEX sensor. The effects of various amounts of oil (ml) at varying speeds toward the vibration were investigated using a new novel Z-freq 3D statistical method. Results show that compressors with 80ml oil produced the lowest vibration compared to 60ml, 100ml, 120ml, and 40ml. A control chart named Z-Chart was created, and the Gauss Amp model equation was derived. From the equation, the technical person in charge could easily predict the current oil amount inside the compressor and take necessary action.

Paper ID : 17
Paper Title : A Review of Carbon Emissions and Reduction Strategies in Container Terminal Operations

Abstract :
Container terminals are crucial infrastructures for fostering economic expansion. Container terminals are typically characterised as open systems of cargo movement with two external interfaces: the quayside, where containerships are loaded and unloaded, and the landside, where containers are brought in and taken out by trucks and trains. The carbon emissions produced by container terminal activities are a major environmental factor that worsens climate change. The shipping business, particularly container terminals, is a complicated sector that requires in-depth study. These complexities can be quantified through the process flow involving management, equipment, organisations, engineering, maintenance, and the crucial aspect of continuous operations throughout the year. This paper compiles ways to reduce the influence of container terminals on climate change and carbon emissions due to their significance. The primary aim of this study is to provide a comprehensive overview of low-carbon and green port activities, encompassing the methods and technology implemented as well as their effects on environmental sustainability and operational efficiency. When making future energy decisions, the container terminal must increase its capacity for abatement by combining various strategies, grasp the zero-carbon target as soon as feasible, and contribute to the preservation of the environment and the ecological advancement of the locality and the globe.

Paper ID :	18
Paper Title :	A Study of the Mechanical, Structural, Thermal, Morphological and Migration Properties of Polylactic Acid (PLA)/Ostrich (Struthio Camelus) Eggshell Powder (OES) Bio-Composites for Food Packaging Application

Abstract :
The advent of environmental awareness and need for circular economies have led to huge effort towards using sustainable materials in the place of non-biodegradable conventional plastics. Packaging plastics are the biggest source of mismanaged plastic waste. Biopolymers are expected to serve as alternative material that could be utilised without heavy penalties to the environment and one such promising candidate is polylactic acid (PLA). However, they still have some performance drawbacks that hinder their total domination of the plastic market. Several strategies are being investigated to improve their performance including blending with fibers and fillers to produce biopolymer based composite materials. One such important filler is calcium carbonate which is sourced from mining of a sedimentary rock, a non-renewable resource. Waste valorisation of aviculture waste in the form of eggshells could serve as a suitable source of biobased organic calcium carbonate. In this study, the biggest and calcite rich ostrich eggshells were proposed as sustainable filler material to the PLA biopolymer matrix to yield composite materials for packaging application. PLA was loaded with different weights of ostrich eggshell waste powder (OES) and subjected to several characterisation tests including structural, mechanical, thermal, food contact migration and Biodegradability testing. Loading with 5wt% OES resulted in the optimum tensile strength. Compared to neat PLA film, the composites had remarkable reduced water vapour permeability and after subjecting to food contact migration testing, the migration levels from the composites were far below the overall migration limit (). Biodegradability also improved with increase in OES filler loading. The results of this study primarily suggested potential valorisation of OES with PLA biopolymer to obtain bio composites with potential application in food packaging.

Paper ID :	19
Paper Title :	Numerical Computation of Modified-Homogeneous Single-Phase Gravity-Propelled MHD Viscoelastic Nanofluid Flow with Variable Thermal Conductivity down an Inclined Plane

Abstract :
This investigation explores the dynamics of electrically-conductive viscoelastic-fluid-based nanofluids (ECVFBN) under the influence of gravity, exothermic reactions, and magnetic field on an inclined plane. Additionally, the convective cooling effects on the free surface are considered, by using Newton's law of cooling. The Giesekus viscoelastic constitutive model is employed with necessary adjustments to accommodate non-isothermal effects. Spherical nanoparticles are homogeneously dispersed within the viscoelastic base fluid, following a single-phase model. The mathematical model of the problem results in a set of unsteady and interrelated nonlinear partial differential equations (PDEs). To efficiently solve these equations, a numerical approach known as finite difference method is utilized. The study's findings for flow variables are presented graphically, depicting the variations in key flow parameters. In particular, it highlights unique responses of ECVFBN velocity, ECVFBN temperature, and ECVFBN thermal-conductivity, to changes in nanoparticle volume fraction. These novel findings regarding the impact of nanoparticle volume fraction on VFBN flow variables and the susceptibility of thermal runaway (closely related to exothermic reactions) in Newtonian-fluid-based nanofluids (NFBN) and viscoelastic-fluid-based nanofluids (VFBN) serve as the central contributions of this research.

Paper ID :	20
Paper Title :	A Discrete Jellyfish Search Optimizer for Optimal Operation Scheduling of Plug-in Hybrid Electric Vehicle

Abstract :
This paper presents a discrete jellyfish search optimizer (DJSO) for optimal operation plug-in hybrid electric vehicle (PHEV) scheduling framework to tackle intermittent issue of consumption and generation from renewable resources. The main objective is to improve the efficiency of distribution system operation by minimizing transmission power losses. This can be achieved by suggesting the best location for charging and discharging of PHEVs and number of their participation at each location. A modified 33-bus benchmark system is used as a test system to showcase the performance of the proposed framework in two worst case situations: high generation at low demand and high demand at no generation. The performance of DJSO is evaluated by comparing it with other well-known heuristic optimization techniques. In addition, various decision functions are considered to find the most suitable decision function in solving the PHEV scheduling problem. The results show that JSO outperforms GSA, GWO and WDO in terms of accuracy for an optimal PHEV scheduling solution. A simple rounding decision function is found to be the best function to transform JSO into a discrete optimization in the form of DJSO. The improvement of power system efficiency can be achieved up to 12.7% during high generation at low demand, and 14.8% during high demand at no generation when the PHEV scheduling scheme is in place. As a conclusion, a new paradigm of PHEVs as a medium for energy transportation will help to reduce burden on the existing infrastructure.

Paper ID :	21
Paper Title :	Economic Load Dispatch For Power System Using Bird Swarm Algorithm

Abstract :
This study compares the efficacy of the Bird Swarm Algorithm (BSA) with the Moth Flame Optimization Algorithm in addressing the Economic Load Dispatch (ELD) problem. ELD is a critical technology used in power grid management to maximize power generation from each generator. The process entails developing an objective function to describe the whole generation cost, which includes the fuel cost of each generator. The objective function, a mathematical formula, seeks to minimize a variable that represents each generator's output power. This goal function might be linear or nonlinear, depending on the restrictions and requirements of the power system. The BSA is a new stochastic optimization algorithm developed based on the information sharing mechanism and search technique used by birds during their foraging phase. This algorithm was applied to the IEEE 6 bus 3 generator system. These algorithms were evaluated and tested using MATLAB software.

Paper ID :	22
Paper Title :	Structural Optimization of Tractor Arm in Palm Oil Plantation

Abstract :
Agricultural automation has emerged as a promising avenue to address the growing demand in the rapidly evolving farming industry. Cultivating crops such as palm oil requires precision, efficiency, and adaptability to navigate the complex environment. Robot arms solve these challenges by enhancing farming processes by executing tasks such as precise cutting that surpass manual labor. For example, a tractor typically used in the agricultural sector with an arm and boom can be viewed as a robot arm, which has considerable potential in palm oil plantation mechanization, such as fresh fruit bunch harvesting and picking tasks. By examining the optimal dimensions synthesis for the robotic arm by analyzing the Denavit-Hartenberg (DH) convention for kinematic modeling, this study aims to optimize the robot arm structure, enabling precise and flexible movements crucial for navigating palm oil plantations. This research evaluates two optimization methods, i.e., artificial bee colony (ABC) and particle swarm optimization (PSO) algorithms, tailored explicitly for robotic arms in the agricultural sector, to optimize three arm lengths. All optimization methods and kinematic modeling simulations are conducted using MATLAB software. The results show that the PSO algorithm outperforms the ABC algorithm. This research strongly emphasizes optimization to ensure the accurate and efficient execution of tasks.

Paper ID :	23
Paper Title :	A Machine Learning based Motion Planning for Autonomous Harvesting Cranes in Palm Oil Plantations

Abstract :
In recent years, there have been various efforts to improve conventional robotic motion planning techniques to cater complex and wide-range agricultural applications. Yet, due to specific characteristics of agricultural environments namely as dynamic, cluttered, and harsh, the agricultural robots driven by conventional motion planning approaches have not met the required performance to replace labor force in many cases. In this paper, a motion planning method using Deep Reinforcement Learning is proposed for harvesting cranes for application of palm oil plantations. The learning model is trained to learn precise coordination and synchronization between the crane joints to drive the end-effector to desired target points. Based on the results, the proposed method succeeded in achieving the expected tasks and demonstrated as a feasible solution for further development.

Paper ID :	24
Paper Title :	SIMULATION OF POLE SLIP CONTROL IN AN AXIAL FLUX MAGNETIC GEAR WITH CHANGEABLE TRANSMISSION RATIOS USING STATEFLOW AND SIMULINK

Abstract :
Magnetic gears (MG) have shown significant developments over the years and is seen as a potential direct substitute for conventional mechanical gears. The contactless nature of magnetic gears leads to pole slipping if the load exceeds the transmitted torque. While this prevents potential damage to the MG, it also causes a loss of output speed, which would ultimately reduce the driven rotor to a standstill. In conventional automotive vehicles, gearboxes with multiple transmission ratios are used to vary the transmitted torque and output speed according to operating conditions. Based on a similar concept, a prototype MG with two switchable transmission ratios has been proposed in an earlier study. In the present work, the control system that regulates switching of the MG ratio is studied through simulations using Simulink and Stateflow. In the simulation runs, the system starts with the high gear ratio (1:2) engaged. After two seconds, the load was increased until it exceeded the transmitted torque and slipping started to occur. The system then switches to the lower gear ratio (4:1). It was observed that slipping stopped, and the driven rotor starts rotating steadily again. The simulation results demonstrate that proper control of switching ratio MGs could prevent unwanted pole slipping from occurring.

Paper ID :	25
Paper Title :	Enhancing Day-Ahead Forecasting of EV Recharging Power Consumption using LSTM and Hybrid Models: A Comparative Study

Abstract :
Accurate day-ahead forecasting of Electric Vehicle (EV) recharging power consumption is critical for optimizing grid management and ensuring efficient energy distribution. This paper evaluates and compares three forecasting methods: a baseline persistence model, Method 1 employing a sequence-to-sequence Long Short-Term Memory (LSTM) network with Empirical Mode Decomposition (EMD) preprocessing, and Method 2 combining LSTM predictions for peak hours with a 1-workday persistence model for non-peak hours. Performance is assessed using Mean Absolute Error (MAE), normalized MAE (nMAE), and Forecasting Skill (FS). The results show that both advanced methods significantly outperform the persistence model, with Method 1 achieving a lower MAE and higher FS on average, indicating greater overall accuracy. However, Method 2 demonstrates superior consistency, with a higher percentage of days showing positive FS. Daily forecast evaluations for January 13th, 14th, and 15th highlight Method 2's robustness, maintaining positive FS on most days compared to Method 1. This study concludes that while Method 1 is optimal for minimizing forecasting errors, Method 2 offers more reliable day-to-day performance. The findings suggest that integrating both methods' strengths could further enhance the accuracy and reliability of EV power consumption forecasting. Future research will focus on refining these hybrid approaches and adapting models to address day-to-day variability.

Paper ID :	26
Paper Title :	Development of Real-Time Simultaneous Vibrotactile Sensation on the Lower Limb for Drowsiness Prevention: An Exploratory Study

Abstract :
Drowsiness is one of the contributing reasons to road accidents. So far, researchers and practitioners have undertaken many preliminary investigations to reduce drowsiness. Most of these research have mainly concentrated on evaluating drowsiness rather than preventing it. However, previous studies frequently neglected to analyze a diverse range of vibrotactile elements, such as frequency, waveform, and amplitude. As a result, there is a lack of knowledge regarding the most efficient vibration characteristics for preventing drowsiness. This creates an opportunity for more research to determine and enhance these elements for practical use. Hence, the purpose of this study is to determine the optimal vibration parameters for the vibrotactile system to stimulate drivers. This study developed four sets of different vibrotactile sensation systems to be tested on the particpants. The results showed that majority of participants chose System 1 which offered vibration characteristics with the frequency at 125-140 Hz, 255 PWM amplitude, and sinusoidal signal type as the optimal vibrotactile system. It is expected that this study will benefit the Road Transport Department and help achieve SDG 11 (Sustainable Cities and Communities), which aims to make cities safer and improve road safety.

Paper ID :	27
Paper Title :	Optimal Location and Threshold Value of Comfortable Vibration System for Drowsy Detection

Abstract :
To determine the criteria of the vibrator system from the driver's perspective, a series of questionnaires were developed. A series of experiments were conducted by using actual car to determine the optimal value and location of the warning system. The system was built using Arduino Uno and is equipped with vibrators, ultrasonic sensors, and driver's seat backrests to provide vibrations as a warning to drivers who nod off while operating a vehicle. Postural evaluation and subjective measurements were used to confirm the onset of sleepiness. Head nodding was identified as a sign of sleepiness in this study. The results of the questionnaire revealed that the majority of respondents (87.8%) believed that the product that placed the vibrator on the lower part of the driver's thigh was more effective at providing vibrations to the driver, and the majority of them estimated that this product would cost between RM100 and RM200. In response to the driving test, the majority of subjects nodded their heads after driving for more than 30 minutes at a demanding time such as 2:00 p.m. When the ultrasonic sensor located 45 cm from the driver detects head movement, the vibrator will be activated to alert the driver. This research is anticipated to reduce the number of accidents caused by drowsy drivers. Additionally, this research aligns with the third and eleventh Sustainable Development Goals.

Paper ID :	28
Paper Title :	A Review of The Fatigue Reliability Assessment on a Leaf Spring Under Random Loading

Abstract :
This paper reviews a fatigue failure of a leaf spring for durability and reliability assessment based on random loading. Leaf spring failure in automotive suspension system due to fatigue damage is always a major concern, in which a component experiences crack initiation, crack propagation and fracture. Therefore, the knowledge related to fatigue reliability is needed in monitoring a probability of failure. The review begins with a method for assessing fatigue life prediction involving the stress-life and strain-life approaches. The load cycle sequence-based model, namely the Effective Strain Damage, is also included. In predicting fatigue life, the rainflow cycle counting method and the Palmgren-Miner linear damage rule are discussed. With subjected to fatigue loading under random loads, the time and frequency domain signal processing approaches are briefly discussed. The statistical analysis also has been reviewed as characterising fatigue strain data. Then, a reliability theory has also been discussed i.e. reliability calculation, hazard rate and mean cycle to failure parameters. Probability methods using the stochastic Monte Carlo approach are discussed. The reliability assessment involves the mean cycle between failure and the reliability index is also described. Lastly, the summary highlights the importance of fatigue reliability assessment in automotive applications.

Paper ID :	29
Paper Title :	Evaluation of Multi-Criteria Decision-Making Approach using Analytic Network Process for Performance Upgrade of Automotive Turbocharger Component in Remanufacturing Applications

Abstract :
Performance upgrade in remanufacturing process is one of the lifecycle extension strategies which provides additional values in a used product. The consideration to upgrade the performance requires thorough investigation at the design stage, by integrating Design for Upgrade (DfU) strategies. One of the factors that need to be considered include the service life of the component to ensure proper upgrade can be accomplished in the next life cycle of the component. This study is aimed to evaluate the service life related criteria that affect the decision making when selecting the suitable and best alternative to upgrade the performance of the automotive component. An automotive turbocharger has been selected as the case exemplary of the study. Hence, this study proposes the multi-criteria decision-making approach by using Analytic Network Process (ANP) to evaluate the best selected alternative for performance upgrade of turbocharger component. There are four (4) alternatives were identified which include Alternative 1-Dual bearing system, Alternative 2-Compressor diameter, Alternative 3-Heat insulator layer on compressor and Alternative 4-Improve lubrication system. Besides, ten criteria were identified through literature surveys and online survey involving 20 respondents and eight criteria were finalised for evaluation using ANP. The eight criteria involved were arranged according to different levels of criteria and sub-criteria. To complete the evaluation using ANP, three experts were involved to assign the scores in each criteria, sub-criteria and alternatives and thus, the weightage can be further calculated using ANP model. The findings show that Alternative 4 ranked at the first place with priority score of 0.50 compared to other alternatives. The robustness of the ANP model was further verified using sensitivity analysis which depict that Alternative 4 is still remain at the first place as the best selected alternatives.

Paper ID :	30
Paper Title :	Characterization of 316 Stainless Steel Produced using Wire Arc Additive Manufacturing for Automotive Applications

Abstract :
Wire arc additive manufacturing (WAAM) presents an opportunity to revolutionize the production of automotive components. However, WAAM is a challenging manufacturing process due to the fast solidification rate and heat cycle during the printing process. In this study, 316L steel produced by WAAM process and casted process were compared in terms of their mechanical properties and microstructures. WAAM-fabricated 316L steel achieved higher microhardness of 223–257 HV0.5 and nanohardness of 2.98–5.02 GPa, ultimate tensile of 554–557 MPa and yield strength of 319–337 MPa. Whereas for the cast steel, it was 160–184 HV0.5, 2.88–4.02 GPa, 528 ± 13 MPa and 212 ± 8 MPa, respectively. Nanohardness, Young's modulus and resistance to plasticity was not significantly influenced by the maximum load applied to both WAAM and as-cast 316L steel.

Paper ID :	31
Paper Title :	Simulasi Pembakaran Hidrogen Suntikan Terus Dalam Enjin Pencucuhan Bunga Api Di Bawah Kelajuan Enjin Yang Berlainan

Abstract :
Dalam kajian ini, simulasi Dinamik Bendalir Komputasi (CFD) telah digunakan untuk mengkaji kesan suntikan terus dalam enjin hidrogen silinder tunggal 1.6L. Kajian ini mengenal pasti hidrogen sebagai alternatif yang berpotensi untuk mengurangkan pelepasan gas rumah hijau. Walaupun kenderaan elektrik diiktiraf sebagai penyelesaian yang baik, kos tinggi menjadi halangan. Sebaliknya, hidrogen sebagai bahan api menawarkan jalan penyelesaian yang lebih lestari dengan impak alam sekitar yang lebih sedikit. Kajian ini memberi tumpuan kepada simulasi pembakaran hidrogen suntikan terus dalam enjin pencucuhan bunga api pada kelajuan enjin berbeza untuk mengenal pasti strategi suntikan bagi kecekapan optimum dan menilai prestasi enjin. Kajian ini menerangkan sifat-sifat hidrogen sebagai bahan api, menganalisis strategi pembakaran dalam enjin pencucuhan bunga api, dan menetapkan objektif untuk memahami punca pembakaran tidak normal. Pendekatan penyelidikan melibatkan kaedah simulasi menggunakan perisian Converge CFD pada suntikan terus hidrogen dalam enjin pembakaran dalaman. Kajian ini memberi tumpuan kepada parameter tekanan suntikan bahan api dan kelajuan enjin sebagai pembolehubah yang dimanipulasi untuk mencapai pembakaran enjin yang optimum. Keputusan dibandingkan dengan kajian terdahulu untuk mengesahkan model. Penemuan menunjukkan bahawa tekanan suntikan 10 MPa dan kelajuan enjin 1200 rpm mencapai pembakaran hidrogen optimum untuk model enjin empat lejang. Penemuan ini menyediakan pemahaman mendalam mengenai perkembangan dan kemajuan dalam menggunakan strategi ini.

Paper ID :	32
Paper Title :	Maximizing Efficiency: Enhancing AGV Path Planning through Algorithm Optimization

Abstract :
In the background of Industry 4.0, Automated Guided Vehicles (AGVs) have been widely applied in actual production to increase production efficiency and decrease operation risks of human workers. AGVs are very important in enhancing material handling, streamlining workflows, and ensuring safe and reliable operations within manufacturing environments. However, despite their advantages, the implementation of AGVs comes with challenges. Manufacturing enterprises have identified several problems when using AGVs due to variations in the production environment, such as layout changes, dynamic obstacles, and fluctuating operational demands. All these changes can significantly impact the performance and efficiency of AGVs. Therefore, there is a demand for research on the optimization of AGVs, and route planning is one of the most important research areas, aiming to improve operational efficiency in various industrial scenarios. Path planning is essential for maximizing AGV performance, minimizing travel time, and reducing energy consumption. Several common algorithms have been developed and employed to address the complexities of AGV path planning. These include the A* algorithm for finding the shortest path through grid-based maps, the ant colony algorithm for simulating ant behaviour in solving complex optimization problems, and the genetic algorithm for generating high-quality solutions using evolutionary principles. Each of these algorithms has its strengths and they are suitable for different types of path planning scenarios. This study provides an overview of the latest research on advancements in algorithmic techniques for improving AGV path planning. Simultaneously, this paper offers valuable insights for developing more effective AGV systems and contributes to advancing logistics automation technologies.

Paper ID :	33
Paper Title :	Development of Graphical User Interface for Upper Limb Exoskeleton Rehabilitation using ROS and Visual Systems

Abstract :
Strokes are the second most common chronic disease, contributing to 6.6 million deaths and the third leading cause of 143 million disabilities worldwide. In Malaysia, the existing rehabilitation process is costly and primarily limited to manual therapy. To address this, the utilization of exoskeleton robots has been proposed to assist patients during rehabilitation. This study aimed to develop a user-friendly graphical interface (GUI) that integrates visual systems based on human movement and exoskeleton robots. The frontend development involved JavaScript, HTML, and CSS, while the backend utilized ROS, organized with Python, for image processing, upper limb joint detection (including shoulders, elbows, and wrists), and real-time angle calculations. The Flask framework was used to integrate the frontend and backend systems. Additionally, a Proportional-Integral-Derivative (PID) control was implemented in a closed-loop system. Real-time data on the angles of major joints, such as shoulders, elbows, and wrists, were collected and stored in CSV files. The study successfully developed a GUI featuring visual systems and movement angle graphics for the upper limb exoskeleton.

Paper ID :	34
Paper Title :	Study on ZL205A Matrix Composites reinforced with in-situ TiB2 particles

Abstract :
As carbon emission limits continue to rise around the world, effectively reducing carbon emissions from vehicles can have large ecological and economic benefits. The use of aluminium alloys in the design and manufacture of automobiles can effectively reduce the weight of automobiles and thus reduce carbon emissions. Aluminium composites have better mechanical properties than traditional aluminium alloys and can be used in more environments. In this paper, it is found that the addition of TiB2 particles in the casting process of ZL205A aluminium alloy can effectively refine the grain size, the grain size from the traditional ZL205A aluminium alloy of 195um, refined to 162um (0.1wt.%TiB2), 148um (0.5wt.%TiB2), 134um (1wt.%TiB2), 122um (2wt.%TiB2), 120um (3wt.%TiB2).The fabricated ZL205A/TiB2 composites have better mechanical properties. Especially when TiB2 reaches 2wt.%, Ultimate tensile strength(UTS), Yield Strength(YS), Elongation(EL) reach the maximum value. However, when TiB2 further reaches 3 wt.%, the mechanical properties show a decline compared to the 2 wt.%TiB2 specimen. This may be due to the occurrence of agglomeration of excess TiB2. In future studies, more advanced analytical methods and equipment would be used to further analyse the strengthening mechanism of TiB2 on ZL205A.

Paper ID :	35
Paper Title :	Controlling the Autonomous Mobile Robot (AMR) based on Rocker-Bogie Mechanism for Classification of Uncertainty Terrains

Abstract :
Nowadays, the use of autonomous mobile robots (AMRs) is rapidly increasing, with research also intensifying on integrating mobile robots into everyday applications. This paper aims to develop a smart controller that functions as a control interface for the AMR, enabling users users to monitor and command the robot's movement. The controller was designed using IoT technology with an ESP32 Wi-Fi module. The physical structure and electronics components of the robot were fabricated according to the design specifications created with Fusion 360 CAD software. The system's algorithm was programmed using the Arduino IDE and implemented with IoT tools,. Through the experimental results, the AMR's ability to navigate various terrain, including smooth, rough, and uneven surfaces. The AMR's traversal speed over distances of 3, 5, and 7 meters was recorded, showing the highest speed on smooth surfaces compared the other two terrains. In this project, the controller was designed based on the basic commands for movement such as turn left, turn right, forward and reverse movement.

Paper ID :	36
Paper Title :	Study of Thermal Comfort and Heat Islands in High-Risk Areas

Abstract :
The purpose of this study is to study the existence of urban heat islands (PHBs) and determine the level of thermal comfort in Putrajaya. Thermal comfort is an element that will determine the level of comfort that will be obtained by the residents in Putrajaya. The calculation method of the PMV (Expected Average Vote) and PPD (Percentage of Dissatisfied Expectations) Index is guided by ISO 7730 and ASHRAE 55-1992 standards. To conduct this study, the EK-H4 tool was used. Among the parameters required are air temperature, average radian temperature, relative temperature, and air velocity. The EK-H4 V1.0 software will be used to download data from the EK-H4 and its counterparts will be analyzed using Microsoft Excel software. The distribution of data is also observed by plotting it on a Psychometric Chart. From the calculations made, the PMV Index ranges from -2.05 to 2.78. While the air temperature is 28.4 oC - 36.9 oC, relative humidity is between 48.1% - 72% and air velocity is in the range of 0 m/s -2.32 m/s.

Paper ID :	37
Paper Title :	Simulation of Two Stage Photovoltaic-Electrodialysis Regeneration Using Engineering Equation Solver For Solar Cooling Application

Abstract :
Conventional vapor pressure cooling systems commonly used in commercial buildings use very high energy due to their uncontrolled process where the air temperature cooling is too low, and the air temperature heating is too high. Desiccant cooling systems are the best alternative to replace vapor pressure cooling systems. In the regeneration system there are three methods of regeneration namely thermal energy regeneration, electrodialysis, and reverse osmosis. This study was conducted using several software such as Engineering Equation Solver EES, AutoCAD 2021, and Microsoft Excel 2019. The liquid material to be used is lithium chloride and lithium bromide because these two liquids are easily available at low cost. At the beginning of this study will compare the energy consumption between single stage photovoltaic-electrodialysis regeneration system with thermal energy regeneration system. This study is continued by comparing the difference in energy consumption of single stage photovoltaic-electrodialysis regeneration system with two stages. Finally, this study will compare the energy consumption of a single stage photovoltaic-electrodialysis regeneration system with two stages using two different types of solute materials namely lithium chloride and lithium bromide. The results of this study prove that the electrodialysis regeneration method uses less energy than the thermal energy regeneration. Next, this study found that a two-stage photovoltaic-electrodialysis regeneration system is more energy efficient than a single-stage. Finally, lithium bromide shows better energy consumption performance for two -stage systems than single -stage systems because desiccant liquids have different properties such as crystallization. This study can help other researchers in making the selection of appropriate desiccants not only choose according to the properties, but the energy consumption of the system as well.

Paper ID :	38
Paper Title :	Evaluation and Modelling of Planar Electrolyte-Supported SOFC

Abstract :
Solid Oxide Fuel Cells (SOFCs) represent a promising technology for converting chemical energy into electrical energy, offering high efficiency and operating conditions suitable for renewable energy applications. This research addresses the challenge of accurately simulating SOFC performance through computational modeling. The study involves conducting a Grid Independence Test and validating the developed model against existing literature. The primary objective is to develop and evaluate SOFC modeling using Computational Fluid Dynamics (CFD) methods. Results indicate that variations along the y-axis have the most significant impact on the model's accuracy compared to the x-axis and z-axis. The Grid Independence Test confirms a percentage difference of less than 5%, ensuring the robustness of the model. Validation with past studies further substantiates the model's reliability. Consequently, the research concludes that the SOFC model demonstrates high accuracy and can be considered trustworthy based on the thorough validation and testing conducted.

Paper ID :	39
Paper Title :	Predictive Analysis of Semi-Active Engine Mount with PID Control for Passenger Vehicle

Abstract :
This manuscript presents the analysis of semi-active engine mounting systems offer the prospect of reducing engine vibration by providing controllable damping forces known as semi-active engine mount. Controlling the semi-active engine mounting systems is challenging. The control should not only adequately provide the desired damping forces but also account for the vibration reduction. The aim of this study is to develop a vibration control for a semi-active engine mounting model based on the input of vibration generated from an engine able to model in the MATLAB Simulink software using sinusoidal input. This analysis also is conducted to assess the effectiveness of the vibration control applied to the semi-active engine mount system. In order to assess the effectiveness of semi-active engine mounting, a three-degree-of-freedom 3-DOF passive engine mounting is required. The 3-DOF engine mounting system presented an actual passive engine mount system in the engine compartment. The passive engine mounting is represented by the spring and damper since the passive mount made from rubber and its properties similar behavior. The engine mount behavior is evaluated mathematically by comparing its performance between passive and semi-active engine mount. In order to control a semi-active engine mount system, PID controller is proposed. Then, the PID controller parameters are tuned by using Nicholas Zieler method in obtaining optimum performance of semi-active engine mount system to attenuate unwanted produced by the engine. The expected finding of this analysis, the semi-active engine mount shows a promising result on three performance criteria which are roll, pitch and vertical accelerations for vibration control in attenuating unwanted vibration from engine.

Paper ID :	40
Paper Title :	Study of Drag Reduction Strategy of 3 Dimentional Idealized Automotive Body

Abstract :
The flowfield characteristics are studied using 3D simulation for different Cfj (Cfj21, CFJ opt run1 and CFJ opt run2) in order to analyse the effect of slot location, momentum coefficient and slot angle on the vehicle which experiencing drag. Despite all the efforts that have been done to reduce the Ahmed body drag using various active flow control system, most of the drag reduction were only less than 15%. 25° Ahmed body with build in co-flow jet is modelled using Catia software. The flow around the Ahmed body is simulated at Reynolds number based on length Re== 4.29 × 106. The governing equation were solve using OpenFOAM software package. Pressure Implicit with Splitting of Operator (PISO) and SIMPLE algorithm is applied to solve the equation.

Paper ID :	41
Paper Title :	The Effects of Refrigerant and Compressor Oil Volume On The Performance of Automotive Air-Conditioning Systems: A Comparative Study

Abstract :
In this comprehensive study, an examination was conducted to assess the impacts of varying refrigerant and compressor oil volumes on the performance of automotive air-conditioning systems, employing a Perodua MyVi car as the test rig. The focus was specifically on the modifications these variables induce in the system's efficiency and operational capabilities. To achieve precise measurements of vibrations emanating from the air-condition compressor, a wireless vibration accelerometer was utilized, capturing data in both horizontal and vertical orientations. Prior to data collection, rigorous calibration of the sensor ensured the accuracy of the measurements obtained. The analytical approach incorporated the newly developed Z-freq 2D statistical technique, designed to interpret complex vibration data effectively. This method facilitated a nuanced understanding of the relationship between the studied variables and the air-conditioning system's performance. Further validation of the findings was achieved through the application of machine learning algorithms, specifically Support Vector Machine (SVM) and K-Nearest Neighbors (KNN). These algorithms were instrumental in corroborating the statistical analysis, providing a robust framework for performance evaluation. The outcomes of this investigation offer significant insights into the optimal configuration of refrigerant and compressor oil volumes for enhancing the efficiency of automotive air-conditioning systems. The findings not only contribute to the existing body of knowledge but also propose practical guidelines for the automotive industry, aiming to improve vehicle comfort and energy conservation. The study underscores the importance of integrating advanced sensor technology, sophisticated statistical analysis, and machine learning validation techniques in automotive research, paving the way for future innovations.

Paper ID :	42
Paper Title :	Finite Element Analysis of Filler Shape in Photopolymerization Additive Manufacturing Using the Fusion RSA-RVE Algorithm

Abstract :
Photopolymerization-based additive manufacturing has gained significant attention due to its advantages such as low energy consumption and rapid processing times. This study aims to develop a comprehensive understanding of how varying filler shapes and densities influence the mechanical properties of composite materials produced through photopolymerization. To achieve this, a Finite Element Representative Volume Element (FE-RVE) approach was employed, using ABAQUS scripting combining RSA formulation for the creation of Representative Volume Element (RVE) models, followed by non-linear dynamic tensile testing simulations which validated by experimental approach based on ASTM D-638 standards. The study focused on three different filler shapes: sphere, prism, and polyhedron. The results revealed that polyhedron-shaped fillers exhibited the highest tensile stress levels, followed by prism and sphere, indicating superior structural integrity. On the other hand, prism-shaped fillers demonstrated the highest tensile strain values, suggesting better flexibility before material failure. These findings highlight the critical role of filler geometry in optimizing the mechanical tensile performance of composites in additive manufacturing photopolymerization. In conclusion, this research provides valuable insights into the design of composite materials for additive manufacturing, suggesting that specific filler shapes can be strategically selected to enhance either strength or flexibility, depending on the application requirements. This study contributes to the advancement of material engineering by offering a pathway to improve the performance of photopolymerization-based composites in automotive and other high-performance applications.

Paper ID :	43
Paper Title :	Effect of B10 Biodiesel-Blends of POME and JOME on Fuel Properties and Diesel Engine Performance

Abstract :
The research is to investigate the effect of B10 biodiesel-blends from Palm Oil Methyl Ester (POME) and Jatropha Oil Methyl Ester (JOME) on the fuel properties and diesel engine performance. Tests have been carried out to measure the fuel properties of the blended fuels (J10D90, J5P5D90, and P10D90) such as density, kinematic viscosity and calorific value. The experiments were performed with single cylinder four stroke diesel engine at constant engine load of 3 Nm and variation engine speeds from 1000 to 3000 rpm. The engine fuelled with variation of biodiesel blends to investigate the brake specific fuel consumption (BSFC), and brake thermal efficiency (BTE). The results of fuel properties show that blend J10D90 have the highest density and kinematic viscosity which were 3% and 4% higher than base fuel respectively. The result shows that BSFC is increased with the increase of density and kinematic viscosity. The BSFC increased 16% when engine fuelled with J10D90 as compared with base fuel at 3000 rpm and constant engine load of 3Nm. In contrast, BTE is decreased 20% as compared with base fuel at same engine test condition. This is due to high viscosity which led to poor fuel atomization and mixing process. In conclusion, the blending of fossil fuel with POME and JOME led to changes in several fuel properties which significantly improved the engine performance.

Paper ID :	44
Paper Title :	The Needs of Continuous Wavelet Transform for Analysing Road Load Data

Abstract :
This study aims to demonstrate the capability of continuous wavelet transform (CWT) for analysis of random road load data of automotive. The road load data of a ground vehicle often exhibits stochastic and non-stationary properties. Conventional methods such as the Fourier transform are insufficient to analyse the complex data. Hence, CWT is introduced for the characterisation of the vibration and strain data in the suspension system of vehicles. This is because CWT is popular for its outstanding capabilities in identifying transient events in the time series. In this study, a road test is conducted to acquire vibration and strain data from the suspension system subjected to random road excitations. Next, CWT using Morlet wavelet is performed on both signals and the wavelet scalograms in time-frequency domain are obtained. Furthermore, the strain signal had been used to calculate the fatigue damage in coil spring using Morrow strain-life model. Results showed that CWT successfully reveal a high energy of wavelet coefficient at transient events such as bumps and potholes. These events are also regarded as high amplitude cycles which contributed to high fatigue damage to the coil spring. This confirmed that CWT is an effective tool for the processing of road load data to identifying high fatigue damage in the suspension components.

Paper ID :	45
Paper Title :	Real-Time Monitoring System Development for Switchgear Machines in Railway Operations

Abstract :
A switchgear machine is a device for operating railway turnouts especially at a distance. There are more than 500 switchgear machines throughout the entire LRT lines of which the operational status is unknown until failure happens. The maintenance of the switchgear needs to be done manually every day to ensure the smooth running of the train and only can be monitored physically or upon failure occurrence. Therefore, this study focuses on the development of a real-time monitoring system to automatically monitor the condition of the switch gear machine to avoid any problems that may occur during operation. A system called Condition of Switchgear Monitoring System (CoSMoS 1.0) has been developed to measure and monitor the several parameters, including current, voltage, humidity, temperature, pressure and oil level in the switchgear machine during operation. For dashboard monitoring, the Monitoring of Switchgear Machine Network (MoSNeT 1.0) has also been integrated with the developed system to collect the monitoring data, plotting the trend graph, analyse any abnormality and give warning/ alarm to end user via email or apps messenger. From this development, a proper action can be taken before the switchgear machine failed/ disturbed and increase the effectiveness to verify any troubleshooting action and maintenance activity. Thus, early detection can be taken on the switchgear machine abnormality and can reduce probability of train service delay and help plan maintenance activity.

Paper ID :	46
Paper Title :	Comparative Analysis of Charge/Discharge Performance of Various Batteries Using CC-CV and PMSM Load Profiles

Abstract :
The global shift towards sustainable energy solutions amidst diminishing fossil fuel resources and increasing environmental concerns has accelerated the development of alternative energy technologies. This study addresses the challenges associated with various battery technologies used in Electric Vehicles (EVs), specifically focusing on Lithium-ion, Lead-Acid, Nickel-Cadmium, and Nickel-Metal Hydride batteries. The primary objective is to evaluate the performance and management of these batteries through the development of a charging and discharging circuit through multiple loads to identify the batteries' suitability for EV application. The research adopts a comprehensive approach by modeling and simulating battery circuits using MATLAB Simulink, and subsequently analyzing their performance in Constant Current-Constant Voltage (CC-CV) circuits as well as dynamic load operations in Permanent Magnet Synchronous Motors (PMSM). The study finds that Lithium-ion batteries is most suitable of EV applications due to low charging time and better regenerative braking performance as well as superior voltage stability. Nickel based batteries fall short but are suitable for smaller EV applications due to slow discharge rates while Lead Acid batteries are obsolete in EV.

Paper ID :	47
Paper Title :	Life Prediction for Rail Track Integrity Assessment based on Fibre Bragg Grating Shifting Wavelength and Rainflow Counting Method

Abstract :
The integrity of rail tracks is paramount for maintaining the safety and efficiency of railway systems. Over time, rail tracks are subjected to continuous mechanical stress, leading to material fatigue and potential failures. This study introduces a comprehensive method for predicting the lifespan of rail tracks by integrating Fibre Bragg Grating (FBG) technology with the Rainflow Counting Method, offering a sophisticated approach to rail track integrity assessment. FBG sensors are deployed to monitor the strain and deformation in rail tracks by detecting shifts in the wavelength of reflected light, which correspond to changes in stress levels. These sensors provide high-resolution, real-time data on the mechanical behavior of the rail tracks under various loading conditions. The captured data is processed using the Rainflow Counting Method, a widely recognized technique for analyzing fatigue and estimating the cumulative damage within the material. By combining these two advanced techniques, the proposed method allows for precise identification of stress concentrations and potential failure points along the rail tracks. The application of this method facilitates the prediction of remaining service life and enhances maintenance planning by identifying critical areas that require intervention. The integration of FBG technology with the Rainflow Counting Method not only improves the accuracy of life prediction but also enables proactive maintenance strategies, thereby reducing unplanned downtime and extending the operational life of rail infrastructure. The findings of this study highlight the potential of this approach in advancing rail track monitoring practices and contributing to safer railway operations.

Paper ID :	48
Paper Title :	Fickian diffusion model for oil palm fiber reinforced thermoplastic composites by fused deposition modeling

Abstract :
Over the past twenty years, researchers have become increasingly interested in natural fibers reinforced thermoplastics. The oil palm fiber reinforced acrylonitrile butadiene styrene (ABS) composites at different fiber loadings (0, 3, 5 and 7 wt %) were fabricated by FDM according to the ASTM D6980 and the water absorption was analyzed by a Fickian diffusion model. The results showed that the percentage of water absorption increases with increasing of fiber loadings from 0 wt% to 7 wt%. The result of applying the Fickian model showed that when the fiber loading increased, the D value decreased. On the other hand, when the fiber loading rose, the M_∞ value rose as well. The values of the kinetic parameters; n and k were closer to 1.0. It showed that the absorption process behaved like a Fickian process.

Paper ID :	49
Paper Title :	Preliminary Study on Urban Farming Concept as Temporary Acoustic Barrier to Reduce Traffic Noise Pollution

Abstract :
raffic noise in urban areas contributes to reducing residents' acoustic comfort and can lead to health problems such as stress and sleep disorders. Rapid development in urban areas, characterized by rapid building construction and increased traffic, exacerbates noise pollution and leads to a decrease in green spaces. The scarcity of land and the prevalence of high-rise buildings make urban agriculture concepts, such as hydroponic systems, an attractive alternative for supplementing food sources while offering various other benefits. However, there are only few studies examining the acoustic effects of urban farming, especially for vegetables. This study aims to investigate the acoustic impact of sound attenuation in urban agriculture, specifically hydroponics, through laboratory measurements. Salad vegetables were used for this study. The measurement was taking place in the acoustics laboratory at Universiti Kebangsaan Malaysia, involving both an echo chamber and a semi-anechoic chamber. Sound attenuation data were analyzed according to plant age, ranging from 2 to 6 weeks. The ISO 10140 standard served as a reference for developing the testing methods. Results indicate that sound attenuation is directly proportional to the age of plant. Lettuce at the age of six weeks contributed to a reduction in noise of approximately 18 dBA within the measured frequency range. The average sound attenuation coefficient (SAC*) was 16 dB at week 6, compared to 12.2 dB at week 2. This study demonstrates that transmission loss increases with the age of the plant and is influenced by its physical characteristics. The findings are expected to support the promotion of urban farming with hydroponic systems and highlight their potential as temporary natural sound barriers.

Paper ID :	50
Paper Title :	Recent Trends of Hybrid Lattice Structures: from Architectural Design and High-accuracy Additive Manufacturing Process, to Enhance Mechanical Properties

Abstract :
Lattice structure has gained attention due to its design flexibility and lightweight structure. Lattice structures have inspired researchers to redesign and come up with novel lattice structure designs in order to manipulate and increase its mechanical properties. While combining two or more types of triply periodic minimal surface lattice structure in one structure, breeding a new configuration named hybrid lattice structure. Hybrid lattice structure or multi morphology lattice structure with different design configurations such as gyroid-primitive, primitive-diamond, and gyroid-IWP have proven to exhibit higher mechanical properties compared to the conventional lattice structure. The configuration of hybrid lattice structure, the mechanical properties testing based on tensile test, quasi-static compression test, and energy absorption test, and its additive manufacturing process is discussed in this work. These hybrid lattice structures are particularly beneficial in applications requiring progressive deformation behaviour, such as crashworthiness, impact, and ballistic protection, due to their ability to maintain structural integrity under excessive loading conditions.

Paper ID :	51
Paper Title :	Optimized Deep Learning Model for PM2.5 and PM10 Concentration Prediction in Formal ELV Recycling Zone: A Stacked LSTM-GRU Approach with Explainable AI

Abstract :
This paper presents an optimized stacked LSTM-GRU model for predicting PM2.5 and PM10 concentrations in a formal ELV recycling zone. The model, developed using sensor data and enhanced with Explainable AI techniques, significantly outperforms baseline models. For PM2.5, the model improved MAE by 66.75%, MSE by 81.59%, and MAPE by 66.68%. For PM10, improvements were 64.45% in MAE, 81.64% in MSE, and 63.65% in MAPE. The results demonstrate the model's superior accuracy and interpretability, offering valuable insights for air quality management. The integration of Explainable AI further contributes to the model’s practical utility by providing transparent insights into feature importance. This research contributes a novel approach to air quality prediction in industrial settings, offering both improved accuracy and actionable insights.

Paper ID :	52
Paper Title :	Corrosion Resistance of Aluminium after End-of-Life Vehicles Recycling in Malaysia

Abstract :
Aluminum is increasingly preferred in the automotive industry due to its lightweight and malleable properties. However, research on the quality of aluminum after the ELV recycling process in Malaysia is limited, mainly because of inadequate alignment in ELV research and the lack of proper laws and regulations for ELV disposal. This can affect the quality of recycled aluminum if improper segregation occurs, leading to lower-quality materials and fluctuating market prices. This research aims to evaluate the mechanical properties of recycled aluminum, particularly its corrosion resistance compared to non-recycled aluminum, to demonstrate that recycled aluminum may have varying grades and potentially lower prices than virgin aluminum. The study tested recycled ADC12 aluminum alloy, revealing that it has poor corrosion resistance after the ELV recycling process, likely due to contamination with other materials and insufficient purity control before recycling.

Paper ID :	53
Paper Title :	A Survey on Global Mobility-as-a-Service Levels of Integration and Opportunities

Abstract :
Mobility-as-a-Service (MaaS) represents a novel paradigm in transportation that seeks to provide users with seamless access to diverse modes of transport through a singular platform. This paradigm shift implies that individuals are no longer constrained to a singular transportation modality, such as personal vehicle ownership or public transit usage. Instead, they are able to select from an array of alternatives, including ride-sharing, bike-sharing, and public transit, all accessible through the same application or service. MaaS distinguishes itself from conventional transportation frameworks by prioritizing convenience, flexibility, and sustainability. By providing users with a spectrum of transportation options that are customized to their preferences, MaaS has the potential to alleviate congestion, decrease emissions, and enhance overall mobility within urban environments. MaaS implementations have been executed in numerous countries globally, yielding varying levels of success. A notable illustration is the subscription-based Whim application, which has successfully expanded its reach to metropolitan areas such as London, Vienna, Antwerp, and Tokyo. Furthermore, the Moovit application exemplifies another successful initiative, as it offers real-time data regarding public transport schedules and routes across more than 3,000 cities worldwide. Malaysia has also adopted MaaS solutions, integrating a comprehensive public transport system in Kuala Lumpur that combines various transportation modes, including buses, trains, and bike-sharing services, into a unified platform facilitated by RapidKL. This study undertakes a comparative analysis of the degree of MaaS integration on a global scale and examines the prospects for MaaS adoption among various stakeholders.

Paper ID :	54
Paper Title :	Subsurface Vortex Control Parametric Study at Submersible Pump Intake Using Plate-Type Floor Splitters

Abstract :
Vortex formation near the pump inlet in the sump during intake is a phenomenon that needs to be controlled to maximize the pump efficiency. In this study, five variants of an AVD type called the plate type floor splitter are installed in a single intake pump sump model to evaluate the effect of geometry of the floor splitter on the effectiveness of vortex control in the intake flow. The acceptance criteria according to ANSI HI 9.8 2012 standard are that the vortex formed in the sump must be eliminated and the swirl angle in the flow must not exceed 5°. The submergence of the inlet was varied to observe the swirl reduction effect at different water levels. All floor splitter variants employed in this study have successfully eliminated the vortex but most of them did not manage to reduce the swirl angle below 5° as required. The variants with different heights displayed significant differences in swirl angle values with higher variants produce greater swirl angle reduction. The highest floor splitter variant managed to produce a swirl angle reduction below 5°. With varying lengths, however, the swirl angle values did not differ much in each case with the installation of the floor splitter variants. The advantage of the long floor splitter is that the fluctuation of swirl angle values is minimum for all submergence depths greater than 0.9 times the minimum inlet submergence which implies that the swirl reduction effect is less affected by the change in water level. By combining the advantages of both floor splitter design variation, the optimal design of plate type floor splitter can be achieved.

Paper ID :	55
Paper Title :	Optimization of the Machinability Behavior of AISI 304 Stainless Steel using Taguchi Method

Abstract :
The machinability behavior of AISI 304 stainless steel in turning process are experimentally investigated under effects of main factors, type of insert while outputs are surface roughness/metal removal rate. Taguchi L9 (34) design is adopted for this experiments. The experimental results indicated that the least surface roughness was obtained about 1.297 μm at a spindle speed of 800 rpm, a feed rate of 0.076 mm/rev, a depth of cut of 0.5 with using P10 carbide insert. The optimum parameters were determined from experiment trial 1. For metal removal rate, however, optimum levels were found at conditions of spindle speed of 1200 rpm, feed rate of 0.24 mm/rev., depth of cut of 1.5 mm as cut with or without any tool. The optimum metal removal rate of 38.4 cm3/min was provided from the trial 9. Further, the feed rate was dominant effect on surface roughness, but the feed rate and the depth of cut were effective on metal removal rate.

Paper ID :	56
Paper Title :	Effect of Fiber Orientation on Mechanical Property of Carbon/Epoxy Composites

Abstract :
Aim of this study is to manufacture carbon fiber-reinforced composites (CFRCs) through Vacuum-Assisted Resin Transfer Molding method (VARTM), investigate the effect of fiber orientation on tensile strength and fracture behavior. The results indicated that 0o orientation showed the larger tensile strength than those of other orientations, and improvements in tensile strength for this oriented composite was 96.3% in comparison to 0/90o orientation due to forming strong interface bonding between the constituents. In addition, Stereo micrographs at failure as samples loaded to tensile force revealed that 0o and 0/90o oriented samples showed brittle behaviors, whereas, fracture surfaces of 30o orientation indicated debonding layers due to buckling phenomenon of the composites.

Paper ID :	57
Paper Title :	Effect of T6 Heat Treatment on Graphene Reinforced Aluminium Composites Produced by Semi-Solid Process: Microstructure and Wear Study

Abstract :
In this study, T6 heat treatment was applied to graphene-reinforced A356 composites after the thixoforming process. T6 heat-treated composite samples were characterized with microstructure analysis and hardness testing. The wear test was carried out by using 10, 50, and 100 N loads and 3000 m wear distance with a sliding speed of 1 m.s-1. The results indicated that eutectic Si became more spheroidal and homogenously dispersed in graphene-reinforced A356 composites after the T6 heat treatment and significantly impacted the characteristics of the composites. T6 heat-treated sample showed higher hardness compared to the thixoformed samples. The specific wear rate and friction coefficient of composite samples decreased with increasing applied load. The wear resistance of composite samples was improved after the T6 heat treatment process.

Paper ID :	58
Paper Title :	ADC12 Composition Optimization using Taguhci Method: A Case Study in Eng Teknologi Sdn Bhd

Abstract :
The optimization of the composition of ADC12 aluminum alloy using the Taguchi Method at Eng Teknologi Sdn is the main focus of this paper. The goal is to improve production effectiveness and reduce the waste of material. ADC12 is important material in die casting processes, especially in automotive and electronic industries where precision and strength are of utmost importance. It is noted for its low viscosity and good mechanical characteristics. This research contacted a detailed study of nine ADC12 samples with the purpose of finding the most optimal alloy composition which would minimize the waste, and the quality of the output product will remain higher. The study applies MINITAB software for the analysis of data and performs tensile tests for the confirmation of mechanical properties. The study lists a substantial increase in material utilization and decrease in scrap waste. The findings offer a chance to cut down on the operation cost by getting rid of wastage and improve the environmental aspect of the production processes. This case study is part of a comprehensive program for improving resource efficiency and sustainability within the metal casting industry. It serves as a model that can be replicated by other companies that face the problems of waste treatment.

Paper ID :	59
Paper Title :	Mechanical Properties Optimization of LM6: A Case Study at Eng Teknologi Sdn. Bhd.

Abstract :
This research is a detailed study that was carried out at Eng Tek Sdn Bhd aimed at improving recycling of LM6 aluminum alloy to achieve a material efficient factory and sustainability in manufacturing operations. The company was faced with considerable waste generation and rising costs and as a result, it undertook a project to improve the composition of the alloy to improve both its mechanical properties and waste material reusability. This study utilized Taguchi method in the experimental design to accurately control the ratios of aluminum, silicon and binder in search of the best composition that improves the tensile strength and reduces waste. The mechanical properties of the new alloy compositions were later tested by tensile tests and the results were verified by simultaneous equations for precision and reliability. The results not only demonstrate improved material characteristics, but also suggest the potential for reduced environmental impact and production costs. The study shows the efficient inclusion of both recycled and fresh ingot materials, providing a sustainable model for replication in related industrial settings. This is part of a wider focus on circular economy in the manufacturing sector.

Paper ID :	60
Paper Title :	Study of A380 Composition for Material Optimization using Taguchi Method: A Case Study in Eng Teknologi Sdn. Bhd.

Abstract :
The study is concerned with the enhancement of the A380 aluminum alloy composition at Eng Teknologi Sdn Bd. The primary goal is achieving material efficiency and waste formation reduction for industrial uses. This study aims at developing an ideal alloy composition by exacting controlling the portions of aluminum, binder, and silicone. The troubles linked with the generation of waste during manufacturing processes are formidable, therefore materials refining is carried out to reduce waste and improve sustainability. This study utilizes the Taguchi method for experimental design to examine various alloy compositions and find the best combination that would offer good mechanical performance and reduced ecological impact. The anticipated results include an advanced material structure that features remarkable mechanical properties, thereby prolonging the service life and durability of many industrial applications. This study improves the technological development of A380 alloy utilization and promotes sustainable manufacturing practice through resource utilization reduction.

Paper ID :	61
Paper Title :	A Review on Machine Learning Implementation in Impact Fracture

Abstract :
The study of fracture mechanics, particularly impact fracture, has evolved significantly with the introduction of machine learning (ML) techniques. These data-driven methods offer promising approaches for predicting fracture behavior, assessing material properties, and optimizing designs. This paper provides a comprehensive review of the integration of machine learning in impact fracture analysis. We examine various machine learning models, their applications, and how they have improved fracture prediction accuracy. Moreover, we highlight current challenges and future research directions to advance the implementation of ML in impact fracture.

Paper ID :	62
Paper Title :	Driving Indonesia’s Circular Economy through Remanufacturing: An Exploration of Policy and Institutional Frameworks

Abstract :
This paper explores the current policy, regulatory, and legal frameworks impacting the remanufacturing industry in Indonesia, with a focus on identifying gaps and providing actionable recommendations for improvement. Through a detailed analysis of key documents, including the Master Plan for National Industrial Development (RIPIN), The Economic, Social, and Environmental Benefits of a Circular Economy in Indonesia, and specific regulations such as Regulation of the Minister of Trade Number 127/M-DAG/PER/12/2015 and Law Number 03 of 2014 on Industry, the study highlights the need for targeted reforms. These reforms include the introduction of clear remanufacturing policies, regulatory adjustments, and financial incentives to better integrate remanufacturing into Indonesia's industrial and environmental strategies. By aligning with Sustainable Development Goals (SDGs) such as Industry, Innovation, and Infrastructure (SDG 9), Responsible Consumption and Production (SDG 12), and Climate Action (SDG 13), the proposed changes aim to enhance the sustainability, competitiveness, and resilience of the country's industrial sector.

Paper ID :	63
Paper Title :	Multicollinearity Analysis in Measuring Work Fatigue: A Case Study with Subjective and Objective Approaches

Abstract :
Work fatigue is a condition that can lead to a loss of efficiency, decreased productivity, reduced work capacity, and diminished health and endurance, potentially resulting in workplace accidents (Innah et al., 2021). This study investigated the impact of various factors on work fatigue among heavy machinery operators in the wood furniture industry. Data was collected from six operators over five days, with measurements taken every 30 minutes, providing valuable insights into how different parameters affect work fatigue. The study concludes that find reveal the heart rate change 25,6%, heart rate work load 14,5% and calorie expenditure 24,8% are key factors in understanding work fatigue. Oxygen saturation 13,7% and humidity 21,3% also affect work fatigue but are inversely proportional which if the oxygen saturation and room humidity are higher, the less likely it is to cause work fatigue. In contrast, the temperature parameter and oxygen saturation were excluded from the work fatigue variables due to their low impact. This study aims to analyze these four factors—heart rate, calorie needs, oxygen saturation, and room temperature—to determine their impact on work fatigue. By understanding the contribution of each factor, the goal is to develop more effective ergonomic recommendations for the wood industry to continuously improve worker productivity.

Paper ID :	64
Paper Title :	Assessment of Train Pass-By Noise After Residential Complaints: A Combined Approach of Field Measurements and Simulation Analysis

Abstract :
Environmental noise pollution from transportation, especially railways, is a major concern in urban and suburban areas. This study examines train pass-by noise in response to residential complaints by combining on-site measurements with predictive simulations. Noise levels were recorded at key locations along the railway during train pass-by, focusing on maximum noise level (Lmax) and equivalent continuous sound level (LAeq). These measurements were used to adjust simulation models based on the Calculation of Railway Noise (CRN) method, which considers local environmental factors, terrain, and track characteristics. A crucial part of the study is comparing both the measured and simulated noise levels with the Department of Environment (DOE) noise guidelines to check for compliance. The results show cases where current noise levels do not exceed the permissible limits set by the DOE. While the CRN-based simulations provided estimates of noise propagation, the study found some differences between the simulated and actual noise levels, especially in complex environments. This highlights the need for field measurements to validate and improve the accuracy of noise predictions, ensuring better management of railway noise and adherence to regulations.

Paper ID :	65
Paper Title :	Effects of Varying Magnetic Treatment Parameters on The Combustion Performance of a Diesel Engine run on Biodiesel

Abstract :
Magnetic treatment on biodiesel fuel provides promising benefits to the performance of a diesel engine. Poor combustion resulting from the compacted hydrocarbon molecules were proven to be improved when the magnetic field was sufficiently supplied. Most of the previous studies were focused to one cylinder engine, while factors in influencing the treatment also have been discussed separately among researchers. This led to the opportunities to study more engine characteristics when various parameters were considered in a study. Thus, the research objective was to study the effects of magnetic fields on the engine performances when the different magnitudes, number of pairs and shape of the magnets were fitted to the fuel hose under various runningconditions. Block magnets and a fuel-saving gadget brand KEER, a hollow cylindrical shape, were used and tested on a diesel engine with a dynamometer. The strength of the block magnets was varied from 3000 to 5800 Gs with different numbers of magnetic pairs. This study is expected to explain the influence of the magnetic strength, ionization length and shape of the magnet to the engine performance. With the application of the block magnets, the brake specific fuel consumption was reduced as high as 5.11% by using the highest magnitude and the most significant number of pairs of the magnet. With the same configuration, the brake thermal efficiency was improved up to 3.49%. Observation of soot particles also showed a significant reduction of the soot diameter. These results showed that the strength of the magnet and its total exposing length to the fuel hose are the crucial parameters in influencing the fuel treatment.

Paper ID :	66
Paper Title :	Investigation of Vibrational Response of Bio-Lubricants and SAE40 for Journal Bearing Application

Abstract :
In the context of modern industrial development, journal bearings are critical components widely used in various types of rotating machinery. This study focuses on the complex dynamics of journal bearings, particularly the nonlinear characteristics observed in oil film pressure. A journal bearing test rig (JBTR) is designed to investigate the dynamic behavior of these bearings through a series of experimental trials. The research examines how bearing load, eccentric mass, and rotational speed influence the dynamic performance of journal bearings, providing valuable insights into their operation. Journal bearings play a crucial role in supporting loads and maintaining positional stability, making them vital to the reliable operation of machinery. Vibrational analysis is employed as a key diagnostic tool to assess the condition of essential industrial equipment. Previous research indicates that bearing-related issues account for approximately 40% of machinery failures, highlighting the importance of early detection and diagnosis. This study contributes to the ongoing efforts to identify the underlying causes of bearing failures and to develop innovative methods for detecting potential issues before they lead to significant damage. Moreover, the analysis also provides an ample study of the huge potential for expanding the usage of bio-based lubricants as opposed to conventional mineral-based lubricants for practical industrial use.

Paper ID :	67
Paper Title :	Design for Performance Upgrade of Automotive Turbocharger in Remanufacturing Applications

Abstract :
Remanufacturing process has emerged as a method for restoring components to extend the life of used automotive parts, such as turbochargers supporting sustainable development and a circular economy. This study identifies ways to upgrade the performance of turbochargers through Computational Fluid Dynamics (CFD) and Finite Element Analysis (FEA) simulations. Analysis was conducted at angles of 35º, 45º, and 65º to verify the safety and performance of the compressor wheel design. The study focuses on identifying key performance components, enhancing isentropic efficiency, and improving the structural integrity of remanufactured turbochargers. The methodology includes systematic use of CFD and FEA simulations to assess aerodynamic performance and structural integrity under various loading conditions. CFD was used to analyse airflow, while FEA assessed stress and deformation of the compressor wheel under pressure. The study results show that a compressor wheel at β=65º significantly improves isentropic efficiency and structural integrity, with lower stress and deformation compared to other angles (original, 35º, and 45º). This optimization leads to a turbocharger that meets performance standards. This study makes an important contribution to the field of remanufacturing by providing a comprehensive analysis of performance improvement through blade angle modification in used turbochargers. Therefore, the proposal of a performance improvement framework in remanufacturing is also proposed in this study. This study implies that the widespread use of remanufacturing methods in the automotive sector can improve sustainability and resource conservation.

Paper ID :	68
Paper Title :	The Effect of a Mixed Bio-Lubricant and Nano Particle on Static and Dynamic Performance in Journal Bearing Applications

Abstract :
The journal bearing is a critical component for the industrial world and mechanical system. The capability and performance of a journal bearing to function rely heavily on the type and effectiveness of lubricant used. Mineral- based oil is widely used but still has many shortcomings, such as high toxicity, non-renewability, and adverse environmental effects. This study focuses on experimentation to determine the actual performance of a selected bio lubricant after being mixed with nano powders to enhance static and dynamic characteristics, thereby increasing the life of the journal bearing. Nano powders of CuO, MgO, Fe2 O3 and Al2 O3 with concentration of 0.5% will be chosen as one of the nano powders to be added to the bio palm oil, rapeseed oil or soy bean oil samples of before being inserted into the journal bearing system. Different nano-particle combination with bio oil will be used to determine the effectiveness of the nano-particles in improving the performance of the bio oil as a journal bearing lubricant. Based on the results, the static performance of all tested bio oils after being mixed with nano particles was positive. The addition of nano particles increased both the viscosity index and the lubricant's viscosity at different temperatures. This suggests that bio oils with added nano particles have potential applications in situations that require high viscosity at varying temperatures. The bio palm oil with MgO, Al2 O3 , and Fe2 O3 showed a reduction in operating temperature compared to the bio oil without nano particles at all tested speeds. However, the soybean oil with CuO only exhibited a temperature reduction at 1000rpm, while other mixtures did not significantly reduce the operating temperature at any speed. The analysis revealed that adding 0.5% nano particles of CuO and Al2 O3 to the soybean oil reduced vibrations by 9.82% and 0.96%, respectively.

Paper ID :	69
Paper Title :	Biodiesel from Unrefined, Refined and Waste-Derived Black Soldier Fly Larvae Palm Oil – Formulation, Characterization and Engine Test

Abstract :
This study focuses on parametric variation of producing biodiesel from unrefined and refined palm oil as well as from palm-oil-waste-based black soldier fly larvae (BSFL) using transesterification to achieve high yields. Palm oil or BSFL lipid is first converted to fatty acid methyl esters (FAME) through transesterification, with production varying based on temperature, alcohol ratio, and stirring time. FAME is then blended with diesel to create biodiesel blends (B5 to B50). The properties of the biodiesel blends are measured and analyzed with respect to fuel composition and energy content. With optimal parameters of 60 minutes stirring time, 60^{o}C temperature and alcohol-to-oil ratio of 6:7, we a conversion of 99.5% refined palm oil to biodiesel was achieved. This sample not only results in a high conversion rate of 99.5% but also boasts a calorific value of 40,051 kJ/kg. From the elemental analysis, the POBDs are mainly built up by stearic and palmitic acid, which accounts for over 96% of its content. With the optimal result, the POBD was blended with petroleum diesel to form B0 to B50 with 5% incremental. The resulting calorific values were 46,317 and 42,055 kJ/kg respectively. Adding 5% volume of POBD with petroleum diesel decreases 1% of the blend's calorific value. This research contributes to sustainable energy development by offering a clean and cost-effective alternative to diesel fuel and improving the achievement of net zero CO_2 emissions.

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