SCHOLARLY PUBLICATIONS
School of Mechanical Engineering
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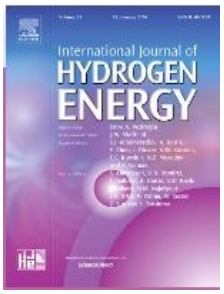
Journal Name: International Journal of Hydrogen Energy **IF: 7.2**

Title: Investigations on the performance, emission and combustion characteristics of a dual-fuel diesel engine fueled with induced bamboo leaf gaseous fuel and injected mixed biodiesel-diesel blends

Author: Van Nhanh Nguyen, Biswajeet Nayak, Thingujam Jackson Singh, Swarup Kumar Nayak, Dao Nam Cao, Huu Cuong Le and Xuan Phuong Nguyen

Details: Volume 54, February 2024, Pages 397-417

Abstract: The present paper briefly elaborates upon the combination of waste palm and waste sunflower oil methyl ester as post-mixed biodiesel blends being injected into a four-stroke compression ignition engine, which is also fueled with inducted bamboo leaf generated producer gas (BLP.gas) that includes gaseous components of CO (carbon monoxide), H2 (hydrogen), CH4 (methane), and CxHy (hydrocarbons). The objective of the present research is to evaluate the overall performance, emission, and combustion behavior of a Kirloskar TAF1 modified dual fuel diesel engine fueled with induced bamboo leaf-derived gaseous fuel at a fixed mass flow rate of 21.69 kg/h and injected mixed biodiesel-diesel blends. Initially, diesel fuel and post-mixed methyl ester were examined in dual-fuel mode with a fixed gas flow rate for different loads. It can be seen from the analysis that brake thermal efficiency got reduced by 4.66% and brake-specific fuel consumption increased by 5.26% for PMOME20 (20% post-mixed oil methyl ester + 80% diesel fuel) + BLP. gas with respect to diesel fuel at extreme loading conditions. Moreover, smoke opacity, carbon monoxide, and unburnt hydrocarbons were reduced by 11.22%, 20.44%, and 10.36%, respectively. On the other hand, oxides of nitrogen were reduced by 19.17% at maximum load for PMOME20 + BLP. gas in dual-fuel operation in contrast to that of petroleum diesel. In light of this, the current research concluded that the use of biodiesel and BLP. gas for dual-operative engines may be regarded as an appropriate option for reducing pollutant environment and petroleum fuel scarcity.



URL: https://www.sciencedirect.com/science/article/pii/S036031992302935X

SCHOLARLY PUBLICATIONS
School of Mechanical Engineering
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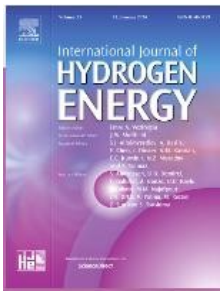
Journal Name: International Journal of Hydrogen Energy **IF: 7.2**

Title: Performance and emission characteristics of diesel engines running on gaseous fuels in dual-fuel mode

Author: Van Nhanh Nguyen, Swarup Kumar Nayak, Huu Son Le, Jerzy Kowalski, Balakrishnan Deepanraj , Xuan Quang Duong, Thanh Hai Truong, Viet Dung Tran, Dao Nam Cao and Phuoc Quy Phong Nguyen

Details: Volume 49, Part B, January 2024, Pages 868-909

Abstract: Conventional fossil fuels are being substituted with alternative green fuels because of their greenhouse gas emissions and pollution problems, which pose a severe threat to the environment. Several studies have reported the usage of biodiesel and gaseous fuels in both single and dual-fuel modes. Gaseous fuels such as producer gas, biogas, syngas, and hydrogen produced from renewable biomass could potentially be used along with biodiesel in dual-fuel engines. Still, these are the least investigated in terms of their use as potential energy carriers. This review article encapsulates the viability as well as the impact of various gaseous fuels, including producer gas, biogas, compressed natural gas, liquefied petroleum gas, syngas, and hydrogen, in dual-fuel mode diesel engines with the aim of evaluating the performance, emission, and combustion behavior at various induction as well as operational parameters. Considering emission behaviors of diesel engines fueled with producer gas, biogas, compressed natural gas, and hydrogen, it is found that hydrocarbon and carbon monoxide emissions increase in the range 17.5–31.4% and 11.73–23.6%, respectively. On the contrary, oxide of nitrogen and smoke opacity tend to reduce from 14.3 to 18.2% and 21.4%36.5–63.7%, respectively. Moreover, there is a slight deterioration in performance characteristics for diesel engines fueled with producer gas, biogas, compressed natural gas, and hydrogen in the range of 2.1–8.84% for brake thermal efficiency, and 3.1–7.3% for brake-specific energy consumption. In addition, the combustion characteristics of gaseous fuels is also discussed in detail. Moreover, a SWOT analysis has been carried out with an emphasis on possibilities for usage of gaseous fuels in dual-fuel diesel engines. Finally, the limitations and perspectives of using gaseous fuels are also critically presented.



URL: https://www.sciencedirect.com/science/article/pii/S036031992304702X

SCHOLARLY PUBLICATIONS
School of Mechanical Engineering
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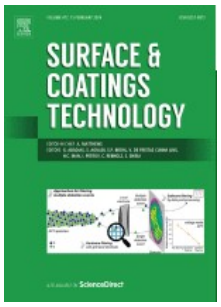
Journal Name: Surface and Coatings Technology **IF: 5.4**

Title: Elevated temperature tribological assessment of Ni-based cermet self-lubricating coatings deposited by cold spray

Author: Rohit Kumar Singh Gautam, Vivek Mani Tripathi, Jitendra Kumar Gautam, Sunny Singhania , Sudesh Singh, Pushkar Jha , Sana Shahab, Subhash Mishra and Hemant Nautiyal

Details: Volume 477, February 2024, 130380

Abstract: Solid lubricant coatings provide reduced friction and wear resistance and hence finding widespread application in harsh environmental conditions, such as gas turbine, aircraft, and internal combustion engines. It is apparent that single lubricant fails to offer effective lubrication over wide temperature range. Hence, two or more solid lubricants are mutually incorporated to achieve the appropriate lubrication by their synergy under harsh service conditions. The current investigation is being carried out to evaluate the synergistic impact of different solid lubricants viz. silver (Ag), molybdenum disulfide (MoS2), hexagonal boron nitride (h BN) and chromium oxide (Cr2O3) on the frictional properties of coatings from room temperature (RT) to 800 °C. Cold spraying process has gathered extensive acceptance for the development of metallic and metallic-ceramic coatings. The current study elucidated the tribological characteristics of cold sprayed nickel-based high temperature lubrication coatings, namely, Ni-Al-MoS2-Ag (NB0), Ni-Al-MoS2-Ag-5 wt% h-BN (NB5), Ni-Al-MoS2-Ag-7.5 wt% h-BN (NB7.5), Ni-Al-MoS2-Ag-10 wt% h-BN (NB10) and Ni-Al MoS2-Ag-Cr2O3–7.5 wt% h-BN (NB7.5 + 7 wt% Cr2O3) against Al2O3 ball in an operative testing regime from (RT-800 °C) using ball-on-disc tribometer. Results indicated that NB7.5+ 7 wt% Cr2O3 coating exhibited remarkable self-lubricating and wear resistance properties as compared to other coatings. However, NB7.5+ 7 wt% Cr2O3 revealed slightly higher coefficient of friction (COF) in compare to NB7.5 coating till 400 °C, and beyond that it showed a decreasing trend and lesser COF in compare to other coatings. The observed wear mechanisms at different temperatures were discussed in detail after analyzing the morphologies of worn surface. The pivotal role played by the participating solid lubricants were also discussed in detail which help in to provide the continuous compacted layers at the worn surfaces at elevated temperature.



URL: https://www.sciencedirect.com/science/article/pii/S0257897224000100

SCHOLARLY PUBLICATIONS
School of Mechanical Engineering
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Journal Name: Chemical Engineering Science **IF: 4.7**

Title: Understanding of head-on coalescence of binary drops onto a cylindrical target

Author: Sahoo, Prakasha Chandra; Senapati, Jnana Ranjan; Rana, Basanta Kumar

Details: Volume 290, 15 May 2024, 119886

Abstract: In this paper, a numerical exercise in understanding the binary head-on collision of equal-sized vertically aligned drops on the cylindrical substrate is reported. Subsequently, radial spreading of the liquid bridge, impact, and detachment of merged drop from the solid target. Different dimensionless relevant factors, namely Weber number (We), contact angle θ, Ohnesorge number (Oh), Bond number (Bo), and diameter ratio Dc/Do are used to characterize the coalescence, and subsequent impingement onto the cylindrical substrate. Temporal deformation factor βf is predicted throughout the entire droplet cycle, and the maximum deformation factor $\beta f,ax$ is obtained just after the collision of drops because of the significant radial expansion of merged drop. A larger value of $\beta f,ax$ is achieved at a higher We for a constant θ, Dc/Do, and Oh. Interestingly, the ring drop is pinched off from the parent merged drop when the value of Dc/Do is lower at a higher value of We. Again, the possibility of the appearance of the ring is significantly higher when the target surface becomes non-wetting. A correlation for the maximum deformation factor is developed using computational data points, which fits well with the simulated data within ± 6 %. Lastly, a theoretical framework is also predicted to determine the maximum deformation factor.

URL: https://www.sciencedirect.com/science/article/abs/pii/S0009250924001866?via%3Dihub

SCHOLARLY PUBLICATIONS
School of Mechanical Engineering
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Journal Name: Soft Computing **IF: 4.1**

Title: Intelligent fault diagnostic system for rotating machinery based on IoT with cloud computing and artificial intelligence techniques: A review

Author: Van Nhanh Nguyen, Swarup Kumar Nayak, Huu Son Le, Jerzy Kowalski, Balakrishnan Deepanraj , Xuan Quang Duong, Thanh Hai Truong, Viet Dung Tran, Dao Nam Cao and Phuoc Quy Phong Nguyen

Details: Volume 28, January 2024, Pages 477–494

Abstract: The important part of mechanical equipment is rotating machinery, used mostly in industrial machinery. Rolling element bearings are the utmost dominant part in rotating machinery, so even small defects in these components could result in catastrophic system failure and enormous financial losses. Hence, it is crucial to create consistent and affordable condition monitoring and fault diagnosis systems that estimate severity level and failure modes and to create an appropriate maintenance strategy. The studies reveal that the fault diagnostic system focuses on single fault diagnosis of the shaft bearing system. However, in real scenarios, the occurrence of a single fault is very unlikely. Thus, multifault diagnosis of the shaft-bearing system is of greater significance. This paper aims at steadily and broadly summarizing the development of the intelligent multifault diagnostic and condition monitoring systems. In addition, there is a rapid development of application of Internet of things, cloud computing and artificial intelligence techniques for fault diagnosis. In this paper, we summarize the study of various fault diagnostic system built on the architecture and application of these cutting-edge technologies for predictive maintenance of mechanical equipment.

URL: https://link.springer.com/article/10.1007/s00500-023-08255-0

SCHOLARLY PUBLICATIONS
School of Mechanical Engineering
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Journal Name: Heat Transfer **IF: 3.6**

Title: Decision support system based on a hybrid genetic algorithm–Kohonen map for combined mode conduction–radiation heat transfer in a porous medium: A comparative assessment of three variations of the Kohonen map

Author: Ansari M.D.M.A., Mishra V.K., Sahu K.B., Chaudhuri S., Ghose P., Kar V.R.

Details: Volume 53, Issue 3, Pages 1556 – 1585, May 2024

Abstract: A hybrid genetic algorithm (GA)–Kohonen map, with its three variants, is explored for the first time for the decision-making system in a porous ceramic matrix (PCM)-based burner through determination of the regime of operation. Four different attributes of PCMs such as convective coupling (P2), extinction coefficient (β), downstream porosity (ϕ2), and scattering albedo (ω) are selected for determining the regime of operation of a PCM-based burner. Changes in any of these attributes of a PCM lead to significant changes in the temperature profiles of the gas and solid phases. Temperature profiles of the gas and solid phases are computed by developing a numerical model. Various samples corresponding to different regimes are generated and used in a hybrid GA–Kohonen map. The best architectural details such as the neuron number and training epochs are obtained from GA as output. The best Kohonen map is trained with the input data, and regimes of operation for new temperature profiles are predicted. A supervised Kohonen map is able to provide the highest average class prediction of more than 40%. All the variants are assessed under two different types of neuron grids: hexagonal and rectangular. Comparative assessments of the three different variants of Kohonen maps, in terms of CPU time and average class prediction, are carried out.

URL: https://onlinelibrary.wiley.com/doi/10.1002/htj.23005

SCHOLARLY PUBLICATIONS
School of Mechanical Engineering
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Journal Name: Journal of Adhesion Science and Technology **IF: 2.3**

Title: An investigation on metallurgical features and joint characteristics of ultrasonic spot welded Al-Ni sheets

Author: Das, Soumyajit; Satpathy, Mantra Prasad; Routara, Bharat Chandra; Pattanayak, Suvranshu; Sahoo, Susanta Kumar

Details: April 2024

Abstract: Several potential benefits in joining thin, dissimilar and highly conductive metals in a solid-state environment make ultrasonic welding (USW) a popular method for building Li-ion battery packs. The USW method is highly complex and relies on multiple factors. In this study, aluminum (AA1100) and nickel (UNS N02200) dissimilar sheets were ultrasonically welded using various process parameters. Plastic deformation, microstructural development, and the corresponding mechanical characteristics of the joints were evaluated qualitatively and quantitatively. The joint strength and critical intensity factor values seemed to rise until the welding duration of 0.3 s, following which there was a subsequent drop in their values. Based on the mechanical analysis, it is observed that the optimal condition records an amplitude of 68 µm, a weld time of 0.3 s, and a clamping pressure of 0.24 MPa. It showed that the joint performance was significantly impacted by the plastic deformation and microstructural changes at the weld region. On the Al side, substantial plastic deformation was observed, and it was primarily attributed to the sonotrode knurls' penetration. The Al sheet's thickness was reduced by more than 40%. The microhardness readings at the welding region experienced diminution due to the acoustic softening effect. The cross-section and fracture surfaces of the Al/Ni weld exhibited several distinct microstructural characteristics, such as atomic diffusion, crimped interface, dimple pattern, and swirl pattern flow. Additionally, the diffusion zone is also investigated using X-ray diffraction analysis. These observations offer valuable insights for enhancing weld quality and controlling the overall welding process.

URL: https://www.tandfonline.com/doi/full/10.1080/01694243.2024.2334135

SCHOLARLY PUBLICATIONS
School of Mechanical Engineering
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Journal Name: Journal of the Brazilian Society of Mechanical Sciences and Engineering **IF: 2.2**

Title: Hard turning of AISI H10 steel using AlTiN and AlTiSiN coated carbide tools: comparative machining performance evaluation and economic assessment

Author: Das, Anshuman; Kumar, Anuj; Padhan, Smita; Das, Sudhansu Ranjan; Satpathy, Mantra Prasad; Patel, Saroj Kumar

Details: Volume 46, Article number 277, April 2024

Abstract: This study focuses on comparative machining performance evaluation and economic assessment between recently developed nanocomposite AlTiSiN coating (deposited by scalable pulsed power plasma, S3P method) with AlTiN coated (accomplished by two different techniques, namely arc deposition method and the S3P technique) carbide tools in turning of hardened AISI H10 hot work steel (65 HRC) under dry environment. For the purpose of evaluating machining performance under different cutting factors (depth of cut, axial feed, and cutting speed), several machinability criteria (cutting temperature, crater wear, flank wear, chip morphology, surface roughness' and cutting force) were analyzed. Finally, a creative way concerning cost assessment for economical hard machining has been proposed. Due to the development of enhanced machined surface morphology, lower cutting force and minimum temperature, improved chip morphology, and reduced tool wear, it is highlighted that AlTiSiN coated tools are superior to both AlTiN (LATUMA) and S3P-AlTiN coated tools. S3P-AlTiN and AlTiN (LATUMA) were the same coating material; however, AlTiN performed better due to the smooth coating and higher micro-hardness gained by S3P technique. The tool life of AlTiSiN coated inserts is 17% and 55% longer, respectively, when compared to the tool life obtained while using S3P-AlTiN and AlTiN (LATUMA) coated tools for dry machining. According to the findings, the hard turning process employing an S3P-AlTiSiN coated carbide insert is more cost-effective in a dry environment than using AlTiN (LATUMA) and the S3P-AlTiSiN coated carbide inserts, with a minimal machining cost per component in Indian rupees of Rs. 27.53 compared to Rs. 30.93 and Rs. 28.93, respectively. The nanostructured AlTiSiN coating accomplished by S3P technique significantly reduced tool wear (VB = 0.061–0.136 mm), improved surface finish (Ra = 0.576–1.458 µm), and higher surface quality, resembling cylindrical grinding.

URL: https://link.springer.com/article/10.1007/s40430-024-04855-5

SCHOLARLY PUBLICATIONS
School of Mechanical Engineering
KIIT Deemed to be University

Journal Name: International Journal of Interactive Design and Manufacturing - IJIDEM **IF: 2.1**

Title: Implementation of simultaneous localization and mapping for TurtleBot under the ROS design framework

Author: Pandey, Anish; Prasad, Kalapala; Zade, Shrikant; Babbar, Atul; Singh, Gaurav Kumar; Sharma, Neeraj

Details: March 2024

Abstract: This work presents a comprehensive implementation of Simultaneous Localization and Mapping (SLAM) techniques on the TurtleBot robot within the Robot Operating System (ROS) framework. The study aims to advance the capabilities of the TurtleBot, a popular and cost-effective robot, by integrating hardware and software components, including laser and odometry sensors. The SLAM algorithm, specifically Gmapping, is employed for mapping while utilizing ROS visualization tools like Rviz. The robot's simulation in Gazebo enhances testing in controlled environments. Leveraging teleoperation for data collection, the research delves into the challenges and considerations specific to SLAM on the TurtleBot platform, addressing a notable research gap. The study extends the exploration by investigating potential future enhancements and benefits, showcasing the adaptability and versatility of SLAM-integrated robotic systems. Simulation results detail the successful execution of SLAM through teleoperation, providing insights into mapping accuracy, computational performance, and the overall quality of the generated maps. The work concludes with a discussion on the distance travelled, future prospects, and the profound impact of SLAM on robotic navigation.

URL: https://link.springer.com/article/10.1007/s12008-024-01781-7

SCHOLARLY PUBLICATIONS
School of Mechanical Engineering
KIIT Deemed to be University

Journal Name: Proceedings of the Institution of Mechanical Engineers Part C-Journal of Mechanical Engineering Science **IF: 2**

Title: Impact of process parameters in drilling of glass epoxy composite with clam shell and cenosphere filler: A comparative analysis

Author: Kumar, Manoj; Jena, Hemalata

Details: March 2024

Abstract: Drilling is one of the secondary machining techniques most frequently utilised when Glass Fibre Reinforced Polymer (GFRP) materials are assembled into a structure. The present work examines the drilling GFRPs and analyses hole quality based on the different traditional parameters: feed rate, spindle speed, and drill tool diameter. However, the hybridization of glass fiber- reinforced polymers (GRPs) by incorporating fillers as secondary reinforcement in the present piece of research has introduced new challenges for hole drilling and achieving the desired surface finishes. The delamination at the hole entrance and exit, considering the drill diameter of the HSS twist drill (6, 8, 10 mm), feed rate (0.04, 0.08, 0.12 mm/rev), cutting speed (1000, 1200, 1400 rpm), and filler content (0, 10, 20 wt.%) in GFRP, are the major factors are considered. The fillers used are clamshell powder and cenosphere, which are marine waste and thermal power plant waste, respectively. The present paper aims to study the effect of these fillers on the drilling-induced damages to the holes in terms of delamination factor, surface roughness, and dimensional accuracy of the hole (taper error, circularity error) of GFRPs. The most widely preferred Taguchi experimental design has been used for optimising the process parameters to obtain minimum delamination, surface roughness, and hole error. The study also aims to develop a correlation between feed rate, cutting velocity, drill diameter, and filler content with the delamination factor, surface roughness, taper error, and circularity error in a GFRP material. The observed results show that clamshells filled GFRP shows lower delamination, surface roughness, circularity error, and taper error compared to cenosphere filled GFRP composites under the same process parameters. It indicates the positive impact of the fillers in the drilling of GFRP, where the main objective is to reduce drilling-induced defects.

URL: https://journals.sagepub.com/doi/10.1177/09544062241235090