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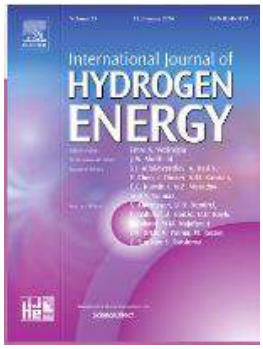
Journal Name: International Journal of Hydrogen Energy **IF: 7.2**

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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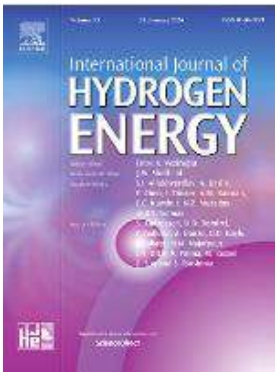
Journal Name: International Journal of Hydrogen Energy **IF: 7.2**

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:

SCHOLARLY PUBLICATIONS
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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: Mechanics Based Design of Structures and Machines **IF: 3.9**

Title: Higher-order finite element solution of graphene platelets reinforced nanocomposite curved panels with uniform/non-uniform porosity

Author: Kamal Kishore Joshi,Vishesh Ranjan Kar and Benedict Thomas

Details: Volume 52, Issue 1, January 2024

Abstract: This paper reveals the deformation behavior of graphene platelets reinforced (GPLR) nanocomposite shell panels including the porosity effects. The graphene platelets are assumed to be uniformly distributed across the thickness of the panel. The spatial-dependent elastic properties of the nanocomposite are computed via the modified Halpin-Tsai micromechanics scheme including the porosity effect. Three different patterns of porosity distribution are assumed through the thickness of the panel structure, namely, uniformly distributed (UD), non-uniformly distributed (ND-Type A), and non-uniformly distributed (ND-Type B). The kinematics of the present shallow shell structure is based on the equivalent single-layer higher-order theory via Green-Lagrange geometric nonlinearity. The weak form is governed through the principle of virtual work and further solved using 2D-isoparametric finite element approximations in conjunction with Picard's successive iteration scheme. The convergence of the present model is achieved by performing a mesh refinement process and the accuracy of the model is verified by comparing numerical results with previously published literature. Finally, the influence of porosity distribution is analyzed on the center deflection of GPLR nanocomposite curved panels subjected to uniform and sinusoidal loads of different panel geometry under different support conditions.

URL:

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: MD Mumtaz A. Ansari, Vijay K. Mishra, Kunja B. Sahu, Sumanta Chaudhuri, Prakash Ghose and Vishesh Ranjan Kar

Details: January 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/full/10.1002/htj.23005

SCHOLARLY PUBLICATIONS
School of Mechanical Engineering
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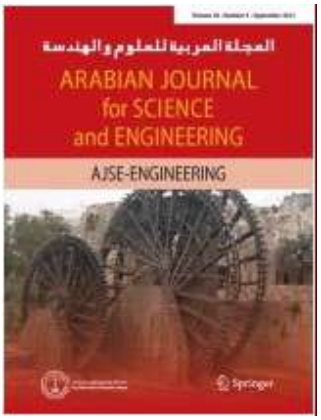
Journal Name: Arabian Journal for Science and Engineering **IF: 2.9**

Title: Decision Support System for Porous Ceramic Matrix-based Burner by Hybrid Genetic Algorithm-Supervised Kohonen Map: A Comparative Assessment of Performance of Neural Network Under Different Minor Attributes

Author: Acharya S., Mishra V.K., Chaudhuri S., Patel J.K., Ghose P., Kar V.R.

Details: Volume 49, Issue 2, Pages 2179-2197, February 2024

Abstract: Hybrid Genetic Algorithm (GA)-supervised Kohonen (SK) map is explored for the decision support system in the operation of porous ceramic matrix (PCM)-based burners. Four features of PCM are selected for defining the regime of operation of PCM-based burner. Based on the values of these four features, 16 distinct regime of operations are identified. Hybrid GA-SK map is fed with the numerical generated temperature profiles of the PCM. The GA is able to give the architectural details of the best SK map. The SK map is then supplied with new samples from PCM, and good prediction of their regime of operation is obtained. Minor attributes of hybrid GA-SK map are altered and analyzed for the higher accuracy in prediction of regimes. Hexagonal grid under eigen values initialization of weights was able to give highest average class prediction (acp) of 57.14%. Under initialization of weights by eigen values, a network of 10×10 size and 300 epochs gives high optimization criterion of 0.79, while maintaining high frequency of 0.6. Present work intends to strengthen the hybrid GA-SK map approach for decision support system for PCM-based burner.



URL: https://link.springer.com/article/10.1007/s13369-023-08195-9

SCHOLARLY PUBLICATIONS
School of Mechanical Engineering
KIIT Deemed to be University

Journal Name: International Journal on Interactive Design and Manufacturing (IJIDeM) **IF: 2.1**

Title: Path planning design for a wheeled robot: a generative artificial intelligence approach

Author: Kailash Kumar Borkar, Mukesh Kumar Singh, Ratna Kishore Dasari, Atul Babbar, Anish Pandey, Urja Jain and Pradumn Mishra

Details: January 2024

Abstract: This article suggests a generative method of path planning design for wheeled robots in narrow streets that uses a high-speed emerging generative AI algorithm—the generative adversarial networks (GANs). The proposed GAN-based architecture efficiently provides accurate footstep planning design for TurtleBot4 on the ROS (Robot Operating System) platform. The designed robot's perception of its surroundings allows it to generate a precise path for navigation during travel. Even though various algorithms, such as A* and RRT* (rapidly exploring random tree), are often employed to plan the path, they need more efficiency in confined spaces. However, deep learning approaches such as GANs have shown remarkable results in solving real-world issues such as image generation and simulation of difficult scenarios in robotics. This article proposes a mechanism to design the GAN algorithm for path generation, thus facilitating the efficient navigation of wheeled robots in complex environments such as narrow streets. According to the experiments, the approach based on GAN works better than traditional algorithms such as heuristic Q-Learning and A*. In comparison to the actual path, it is discovered that the generated path using the path planner based on GAN is approximately 94% accurate.

URL: https://link.springer.com/article/10.1007/s12008-023-01721-x#:~:text

SCHOLARLY PUBLICATIONS
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Journal Name: International Journal on Interactive Design and Manufacturing (IJIDeM) **IF: 2.1**

Title: Optimization of CNC turning parameters of copper–nickel (Cu–Ni) alloy using VIKOR, MOORA and GRA techniques

Author: Soham Das, Ranjan Kumar Ghadai, Gaurav Sapkota, Spandan Guha, Praveen Barmavatu and Kottala Ravi Kumar

Details: January 2024

Abstract: Computerized numeric control (CNC) turning is the most widely used machining process for material removal in cylindrical jobs. Cu–Ni alloys have found widespread applications in shipbuilding industries and hydropower plants. While the material's mechanical properties have been proven to be exceptional over the years, optimizing machining parameters becomes crucial to ensure good machinability of the alloy. Multiple Criteria Decision-Making (MCDM) tools are an effective means to identify the best compromise solutions for an optimization problem when conflicting objectives are at play. In the present work, GRA, VIKOR and MOORA techniques have been employed to study the effect of Speed (S), Feed (F), and Depth of Cut (DOC) on Material Removal Rate (MRR) and Surface Roughness (SR) in the turning of Cu–Ni alloys using a carbide cutting tool. The deployment of MCDM techniques indicated the spindle speed of 1500 rpm, feed rate of 0.57 mm/rev and DOC of 1.2 mm as the top-performing input parameters in achieving optimal MRR and SR. The study also suggests that the best compromise is consistently achieved at maximum S, F, and DoC, as indicated by all the MCDM techniques used.

URL: https://link.springer.com/article/10.1007/s12008-023-01698-7#:~:text

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: 2.0**

Title: Sliding wear behaviour of micro-sized Kota stone dust reinforced epoxy composites using Taguchi method and Grey Wolf optimisation algorithm

Author: Gaurav Gupta, Virendra Rajput, Bhavana Ayachit, Mantra Prasad, Pravat Ranjan, Vivek Mishra, and Alok Agrawal

Details: January 2024

Abstract: Kota stone dust (KSD) is an unwanted material engendered throughout the process of manufacturing Kota stone. The present work comprises the appropriate consumption of KSD for evolving a composite system with epoxy as the base matrix material. The samples are developed by the hand lay-up technique. The micrographs clearly show that KSD is uniformly distributed within the epoxy matrix and establishes good adhesion with it. With the inclusion of filler, density unwillingly increases by 21.86%, but voids generated are limited to only 4.98% for a maximum filler content of 40 wt. %. A very low water absorption rate of 0.81% for maximum filler loading is observed. The compressive strength and micro-hardness increased by 31.8% and 26.25% respectively. Tensile strength, as well as flexural strength, improves for low filler loading of 20 wt. % and decreases thereafter. The sliding wear tests of the fabricated composites are studied in this research employing fairly advanced nature-inspired Grey wolf optimisation (GWO). The wear tests are based on a real-world issue that is framed in Taguchi L25 OA. A simple linear regression equation demonstrates adequate agreement between predicted and experimental values. The inclusion of KSD decreases the wear rate. Further, it is found that the KSD loading is the utmost significant factor, whereas normal load is the least significant factor that administrates the sliding wear rate of the composite system. Using the grey wolf optimiser, the optimal settings are 2500 m sliding distance, 40 wt.% KSD content, 52 cm/s sliding velocity, and 10 N normal load. The validation test results suggest that GWO is superior to the classical Taguchi approach. The wear loss mechanism is examined under the scanning electron microscope.

URL: https://journals.sagepub.com/doi/10.1177/09544062231219578?icid=int.sj-abstract.citing-articles.1

SCHOLARLY PUBLICATIONS
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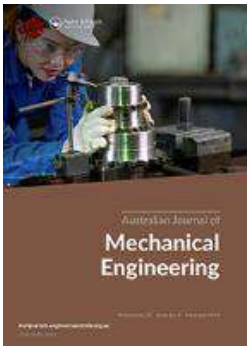
Journal Name: Australian Journal of Mechanical Engineering **IF: 1.4**

Title: Comparative performance of jet and spray impingement cooling in steel strip run-out table: experimental results

Author: Mrutyunjay Jena, Purna Chandra Mishra and Sudhansu Sekhar Sahoo

Details: January 2024

Abstract: This paper presents a comparative performance study of cooling techniques based on air-assisted water spray and jet impingement for heated moving metallic plates. To achieve the heat transfer characteristics of spray and jet cooling methods, an experimental setup was developed to accommodate the spray (SIC) and jet impingement cooling (JIC). The temperature at different locations of the plate was taken by K-type thermocouples embedded therein and attached to CHINO-make data acquisition system. The cooling curves obtained were utilised for computing the cooling rates. Experiments were conducted by varying the parameters, e.g. pressure of air and water, distance between plate and nozzle tip and speed of plate as per Taguchi design of experiments. The results revealed that SIC has great advantage over the JIC method under the same thermal conditions. There was a fall of cooling rate with increase in plate thickness for both SIC and JIC. The requirement of shorter length of run-out table (ROT) in case of SIC has established the cost effectiveness of using SIC compared to JIC. The cooling process played a critical role in steel manufacturing industry where the determined cooling rates evaluated the setup costs during planning phase of the project.



URL: https://www.tandfonline.com/doi/full/10.1080/14484846.2022.2066854