SCHOLARLY PUBLICATIONS
School of Mechanical Engineering
KIIT Deemed to be University

Journal Name: Fuel **IF: 7.5**

Title: Computational modelling of pulverized coal combustion to explore the effect of particle size on overall combustion characteristics and NO formation within a limited time frame

Author: T.K., Sahoo, Tarak Kumar; P., Ghose, Prakash

Details: Vol. 405, February 2026

Abstract: Pulverized coal combustion is widely used for power generation and metal extraction. The movement of coal particles within the combustion chamber and their size play an important role in obtaining proper combustion and pollutant formation, like NOx. In this work, the thermo-chemical behaviour of particles of different sizes within a certain travelling period is analysed intensively with the help of 3-D CFD simulations. A large-scale laboratory furnace is considered for this work, and a few results of the CFD work are verified against the experimental results. From the investigation, it is observed that the smaller particles absorb heat at a faster rate; hence the devolatilization process begins early. The devolatilization process occurs at a lower temperature for large particles, and its rate becomes highest at 1200 K of gas temperature. The devolatilization process continues at a higher temperature for smaller particles. A similar trend is also observed for the char reaction rate. The thermal NO rate is negligible for the larger particle, irrespective of gas or particle temperature, whereas the smaller particles contribute the maximum amount of Thermal NO. The Prompt and Fuel NO rate is significant for the larger particles, whereas the rate of both Prompt and Fuel NO is much higher for the smaller particles, and it occurs at a higher temperature. Therefore, the smaller particles dominate the overall NO contribution.

URL: https://www.sciencedirect.com/science/article/abs/pii/S001623612502294X?via%3Dihub

SCHOLARLY PUBLICATIONS
School of Mechanical Engineering
KIIT Deemed to be University

Journal Name: Measurement: Journal of the International Measurement Confederation **IF: 5.6**

Title: Synthesis, characterization and machinability investigation of novel ultrasonically aided stir-squeeze cast Al 7075/Fe-Cr slag nanocomposite and squeeze cast unreinforced Al 7075 alloy: Comparative assessment

Author: Sethy, P.; Poddar, P.; Sahoo, A.K.; KUMAR, R.; Panda, A.; Das, D.

Details: Volume 260, February 2026

Abstract: This research focuses on synthesis, characterization and machinability analysis of ultrasonic aided stir-squeeze cast Al7075/Fe-Cr slag (5 % wt.) nanocomposite and squeeze cast unreinforced Al 7075 as comparative assessment. Ultrasonic vibration facilitated bubble generation, dendrite breakup, and homogeneous grain structure, while squeeze casting minimized shrinkage defects and improved intermetallic phase distribution of nanocomposite. Al7075/Fe-Cr slag nanocomposite exhibited higher hardness of 148 HV than unreinforced Al7075 as 118 HV and XRD confirm the nanocrystalline nature of the sample. From machinability assessment, VBc, Ra, T, Pc range from 0.036–0.061 mm, 0.28–1.16 µm, 55.4–74.4 °C and 0.313–0.481 kW for Al7075 alloy and 0.038–0.07 mm, 0.52–1.6 µm, 60.9–106 °C and 0.326–0.545 kW for Al7075/Fe-Cr nanocomposite respectively using uncoated carbide insert under dry environment. VBc and Ra are within criteria limit. The growth of BUE is less in nanocomposite (0.01 mm) than Al7075 alloy (0.025 mm). Machining of Al705/Fe-Cr nanocomposite shows improvement of dimensional accuracy as circularity and cylindricity values are less i.e. 0.004 and 0.025 (well within the tolerance zone of 0.1) as compared to Al 7075 alloy. Analysis of variance shows significance of the parameters and models developed through regression analysis. The optimal cutting parameters for Al7075 alloy have been found to be v = 60 m/min, f = 0.05 mm/rev and d = 0.1492 mm whereas v = 60 m/min, f = 0.05 mm/rev and d = 0.1384 mm for nanocomposite using desirability approach and validated with errors less than 5 %. The research signifies improvement in mechanical properties and machinability characteristics of nanocomposite towards green and sustainable manufacturing.

URL: https://www.sciencedirect.com/science/article/pii/S0263224125031707

SCHOLARLY PUBLICATIONS
School of Mechanical Engineering
KIIT Deemed to be University

Journal Name: Journal of Field Robotics **IF: 5.2**

Title: Challenges and Advances in Underwater Sonar Systems and AI-Driven Signal Processing for Modern Naval Operations: A Systematic Review

Author: Das, S.; Malik, P.K.; Pandey, A.

Details: Volume 43, March 2026

Abstract: In the deep ocean, where light cannot penetrate and GPS coverage is unavailable, sonar remains the principal modality for underwater perception, navigation, and threat detection. In these acoustically complex environments, traditional sonar signal processing methods face critical limitations characterized by multipath propagation, Doppler shifts, ambient noise, and adversarial stealth. Reverberant littoral zones, low-observable platforms, and time-varying interference reduce the effectiveness of classical beamformers, matched filters, and deterministic classifiers. This paper presents a systematic review of recent advances in underwater sonar systems and artificial intelligence (AI)-driven signal processing for naval and autonomous applications. We trace the evolution from model-based frameworks to data-driven architectures, highlighting the growing role of convolutional and recurrent neural networks, deep Kalman filters, transformer-based classifiers, and multi-sensor fusion methods. These approaches are assessed in the context of GPS-denied navigation, constrained bandwidth, and dynamic acoustic conditions. Particular emphasis is placed on AI-driven motion estimation, where modern models increasingly surpass traditional methods in mitigating inertial drift, enhancing trajectory prediction, and improving operational resilience. This review synthesizes current capabilities and identifies unresolved challenges in model explainability, real-time adaptability, adversarial resilience, and energy-aware computation. Beyond summarizing recent developments, the paper offers a forward-looking perspective on intelligent sonar systems that seamlessly integrate sensing, inference, and decision-making positioning them as pivotal enablers in the future architecture of autonomous maritime operations.

URL: https://onlinelibrary.wiley.com/doi/10.1002/rob.70077

SCHOLARLY PUBLICATIONS
School of Mechanical Engineering
KIIT Deemed to be University

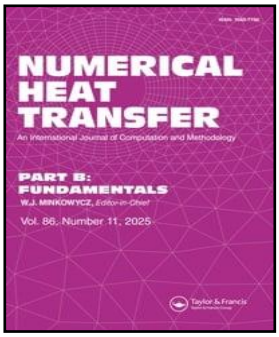
Journal Name: Numerical Heat Transfer, Part B: Fundamentals **IF: 3.8**

Title: Semi-analytical solution of influence of aspect ratio on heat transfer characteristic of flow of a Rivlin–Ericksen fluid of grade three through a rectangular channel

Author: Mohanty R.L.; Das M.; Mishra V.K.; Chaudhuri S.

Details: Volume 87, Issue 1, 2026

Abstract: Effect of aspect ratio on thermal characteristics, including viscous dissipation, in pressure-driven flow of a third-grade fluid through a rectangular channel is considered. The walls of the channel are assumed to be maintained at uniform temperatures (the special case of the same upper and lower wall temperatures is also discussed). Earlier reported studies on heat transfer characteristics of third-grade fluids considered flow through large parallel plates. In actual case, however, flow occurs in channels and the parallel plate approximation results are only applicable near the central core of the channel, where, influence of the lateral walls are less. In view of this, in the present study, effect of the lateral walls are included in the governing equations and the results obtained are realistic from practical considerations. The effect of viscous dissipation is included in the energy conservation equation, and the influence of the aspect ratio is considered in the momentum and energy conservation equations. Momentum and energy conservation equations are formulated and reduced to their dimensionless forms by introducing suitable dimensionless variables and parameters. Entropy generation equation, including aspect ratio effect is deduced. LSM is a semi-analytical technique which possesses a mixed characteristics of analytical and numerical methods and generates very accurate results. The results are validated with the results of least square homotopy perturbation method. It is important to note that heat transfer is reversed (from the upper wall to the surrounding cooling medium) at a distance of nearly 50% from the lateral walls) with rise in Brinkman number. In the region from lateral walls up to this limit (50% from the walls) heat is transferred from the upper wall to the flowing fluid. Results of the study can serve to be useful for design and analysis of heat exchangers in which lubricating oils, polymers flow takes place.



URL: https://www.tandfonline.com/doi/full/10.1080/10407790.2025.2530682