



SCHOLARLY PUBLICATIONS

School of Mechanical Engineering

KIIT Deemed to be University

Journal Name: Results in Engineering

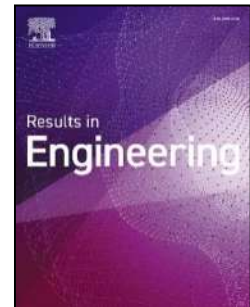
IF: 7.9

Title: Assessment of engine characteristics in dual-fuel mode using post-mixed biodiesel and coconut shell producer gas

Author: C., Satapathy, Chinmaya; S.K., Nayak, Swarup Kumar; P.C., Mishra, Purna Chandra; N., Kaliappan, Nandagopal; K.K., Priya, K&AumKamakshi K.

Details: Vol. 27, September 2025

Abstract: This study presents a detailed evaluation of a four-stroke compression ignition engine operating in a dual-fuel mode using biodiesel blends and producer gas. The biodiesel blends were formulated from mahua and karanja oil methyl esters, while the producer gas was derived from coconut shells. A Kirloskar TAF1 diesel engine was employed to analyze performance, combustion characteristics, and emission behavior under various load conditions, with a constant producer gas flow rate ensuring test consistency. The research compared the dual-fuel performance of biodiesel blends against conventional diesel. Among the tested configurations, the MBD20 blend (20 % biodiesel) with 1.6 kg/h of producer gas exhibited specific operational patterns. At higher engine loads, this combination led to a 13.95 % increase in brake-specific fuel consumption (BSFC) and a 20.89 % decrease in brake thermal efficiency (BTE) relative to neat diesel, indicating a trade-off in thermal performance and fuel economy. However, emission characteristics showed marked improvements. Smoke opacity decreased by 16.48 %, and nitrogen oxide (NO_x) emissions dropped by 18.95 %, highlighting the potential of cleaner combustion. Conversely, emissions of carbon monoxide (CO) and unburnt hydrocarbons (HC) rose by 44.45 % and 45.09 %, respectively, due to partial combustion under dual-fuel conditions. The integration of renewable biodiesel with producer gas in diesel engines demonstrates promising environmental benefits. While some compromises in efficiency exist, this dual-fuel strategy presents a sustainable and cleaner alternative to fossil diesel, aligning with energy diversification and emission reduction goals.



URL: <https://www.sciencedirect.com/science/article/pii/S2590123025030324?via%3Dihub>





SCHOLARLY PUBLICATIONS

School of Mechanical Engineering

KIIT Deemed to be University

Journal Name: Results in Engineering

IF: 7.9

Title: Experimental insights into injection timing effects upon VCR diesel engine fuelled with injected waste cooking oil ethyl ester-diesel blends and induced biogas operated in dual fuel mode

Author: Patra P.K.; Nayak S.K.; Mishra P.C.; Subbiah G.; Kaliappan N.; Priya K.

Details: Vol. 27, September 2025

Abstract: This study investigates the dual-fuel operation of a single-cylinder, four-stroke, 5.2 kW variable compression ratio (VCR) diesel engine fueled with a 20 % blend of waste cooking oil ethyl ester (WCOEE_20) and diesel as pilot fuel, and biogas (1.2 kg/h) as the inducted secondary fuel. The study aims to integrate renewable fuels into conventional diesel engines, promoting both efficiency and sustainability. Biogas was introduced through the intake manifold, while WCOEE_20 was directly injected into the combustion chamber. Experiments were performed at 1500 rpm and a compression ratio of 17.5:1, across varied injection timings (21°, 23°, 25°, and 27 °CA bTDC) to identify the optimal operating condition for enhanced combustion, performance, and emission behavior. Among all test cases, WCOEE_20+DFM25 °CA exhibited the best performance with a brake thermal efficiency (BTE) of 27.55 %—an improvement of 10.51 % over WCOEE_20+DFM23°, while 7.61 % lower than diesel operated in natural aspirated mode. Emission analysis showed reductions in CO (15.79 %), HC (16.0 %), NOx (17.41 %), and smoke opacity (28.49 %) relative to diesel fuel. Compared to WCOEE_20+DFM23°, smoke opacity decreased by 5.52 %, while NOx increased slightly by 9.67 %. Heat release rate (HRR) and cylinder pressure (CP) were found to be 3.58 % and 13.22 % higher than WCOEE_20+DFM23°, while 1.88 % lower and 10.02 % higher than normal diesel fuel in natural mode of aspiration. These findings demonstrate the potential of WCOEE_20+DFM25° as a cleaner and efficient alternative for diesel engine operation, supporting the United Nations Sustainable Development Goals (SDG) 7 (Affordable and Clean Energy) and SDG 13 (Climate Action).



URL: <https://www.sciencedirect.com/science/article/pii/S2590123025022686?via%3Dihub>





SCHOLARLY PUBLICATIONS

School of Mechanical Engineering

KIIT Deemed to be University

Journal Name: Fuel

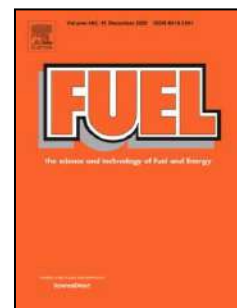
IF: 7.5

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 NO_x. 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: Global Challenges

IF: 6.4

Title: Towards Sustainable Development Goals: Application of Hydrogen-Enriched Mahua Biodiesel/Diesel Blend to Dual-Fuel Diesel Engine

Author: A.T., Hoang, Anh Tuan; S.K., Nayak, Swarup Kumar; M., Vujanović, Milan; M.O., Guerrero-Páez, M. Olga; E.R., Castellón, Enrique Rodríguez; M.C., López-Escalante, María Cruz; S.F., Ahmed, Shams Forruque; null; null; V.N., Nguyen, Van Nhanh

Details: September 2025

Abstract: This study investigates the influence of hydrogen (H_2) enrichment on the performance, combustion, and emission characteristics of a dual-fuel diesel engine operated with Mahua biodiesel/diesel blend (BDf20), in which H_2 is injected into the intake manifold at flow rates of 4, 6, 8, 10, and 12 L min⁻¹ under varying engine loads. As a result, the optimum engine performance is achieved at 10 L min⁻¹ H_2 . At a peak load of 5.02 kW, BDf20 + H_2 (10 L min⁻¹) improves brake thermal efficiency (BTE) by 16.75%, and reduces brake specific fuel consumption (BSFC) by 10.83% compared to conventional diesel. For emission characteristics, unburnt hydrocarbons (HC), carbon monoxide (CO), and carbon dioxide (CO₂) decrease by 42.65, 44.74, and 20.91%, respectively, although NO_x emissions increased by 17.1% due to higher combustion temperatures. Moreover, combustion characteristics show a 9.91% rise in peak in-cylinder pressure, a 20.82% increase in heat release rate, and an 8.26% longer ignition delay period. The results confirm the effectiveness of H_2 enrichment in improving combustion performance while significantly reducing pollutant emissions, showing that combining H_2 with biodiesel enhances the global Sustainable Development Goals (SDG) by advancing clean and renewable energy solutions.



URL: <https://onlinelibrary.wiley.com/doi/10.1002/gch2.202500260>





SCHOLARLY PUBLICATIONS

School of Mechanical Engineering

KIIT Deemed to be University

Journal Name: Case Studies in Thermal Engineering

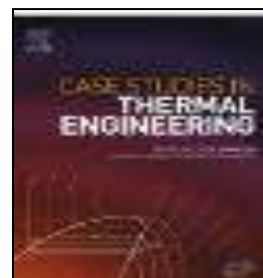
IF: 6.4

Title: Lanthanum oxide-enhanced botryococcus braunii biodiesel: A sustainable fuel for diesel engines

Author: Nayak, SK; Subbiah, G; Duraisamy, SK; Teja, NB; Yuvarajan, D

Details: Volume 73, September 2025

Abstract: The growing reliance on fossil fuels in diesel engines has led to serious environmental and energy sustainability concerns, necessitating the exploration of renewable biofuels. This study investigates the potential of Botryococcus braunii oil methyl ester (BBOME) as a biodiesel alternative and evaluates the influence of lanthanum oxide (La₂O₃) nanoparticles as a performance-enhancing additive. The novelty of this work lies in the integration of La₂O₃ nanoparticles into BBOME biodiesel to improve engine performance, combustion characteristics, and emission reduction, which remains an underexplored area in biofuel research. BBOME was synthesized via transesterification, and two concentrations of La₂O₃ nanoparticles (100 ppm and 200 ppm) were blended into a 30 % BBOME-diesel mix (BBOME_30). Performance, combustion, and emission characteristics were assessed using a single-cylinder, four-stroke, direct-injection diesel engine at 1500 rpm, a compression ratio of 17.5:1, and an injection timing of 21 degrees bTDC. The results demonstrated that the addition of 200 ppm La₂O₃ (BBOME_30+La₂O₃_200) enhanced brake thermal efficiency (BTE) by 6.5 %, while brake-specific fuel consumption (BSFC) was reduced, indicating improved fuel utilization. Emissions of carbon monoxide (CO), unburnt hydrocarbons (UBHC), and smoke opacity decreased by 12 %, 15 %, and 18 %, respectively. These findings establish that La₂O₃ nanoparticle-enhanced BBOME biodiesel offers a sustainable, highperformance alternative to conventional diesel, contributing to cleaner fuel technology. The study aligns with the United Nations Sustainable Development Goals (SDGs 7, 12, and 13) by promoting clean energy, responsible fuel consumption, and reduced environmental impact. The results indicate that La₂O₃-doped biodiesel could be a viable solution for improving diesel engine performance in transportation and industrial applications, thereby supporting global sustainability efforts.



URL: <https://www.sciencedirect.com/science/article/pii/S2214157X25008548?via%3Dihub>





SCHOLARLY PUBLICATIONS

School of Mechanical Engineering

KIIT Deemed to be University

Journal Name: International Communications in Heat and Mass Transfer

IF: 6.4

Title: Thermal synergy at the nanoscale: A review on hybrid nanofluids

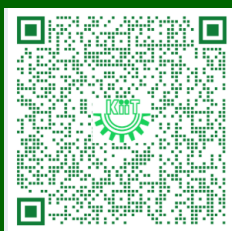
Author: Mukherjee, S.; WciÅ›lik, S.; Kotrys-DziaÅ›ak, D.; Khadanga, V.; Mishra, P.C.

Details: Volume 169, December 2025

Abstract: In recent years, hybrid nanofluids (HNFs)—suspensions of dissimilar nanoparticles in base fluids —have attracted significant research interest due to their potential to enhance thermal performance through synergistic effects between constituent nanoparticles. A comprehensive understanding of their thermophysical behavior is essential for successful integration in advanced heat transfer and energy systems. This review presents a detailed and up-to-date analysis of recent advancements in the characterization and modeling of HNFs, with a balanced emphasis on both theoretical approaches and experimental findings. The novelty of this work lies in its systematic comparison of classical models and modern formulations, as well as its synthesis of diverse experimental data into a coherent framework. Unlike previous reviews, this paper critically examines the role of particle composition, shape, concentration, and interaction mechanisms on thermal conductivity, viscosity, and stability. Key challenges such as nanoparticle agglomeration, measurement inconsistencies, and scale-dependent behavior are highlighted. In addition, limitations of existing predictive correlations are discussed. The review concludes by identifying current research gaps and outlining promising future directions, aiming to support the development of more accurate models and effective applications of HNFs in thermal management technologies.



URL: <https://www.sciencedirect.com/journal/international-communications-in-heat-and-mass-transfer>





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: S., Das, Subhashree; P.K., Malik, Pramod Kumar; A., Pandey, Anish

Details: September 2025

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: Journal of Inorganic and Organometallic Polymers and Materials

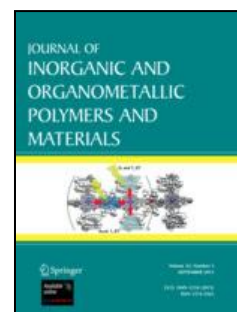
IF: 4.9

Title: Study on Machining Capabilities of Mg/Zn and Mg/Al Functionally Graded Materials Fabricated Using Liquid Processing Route

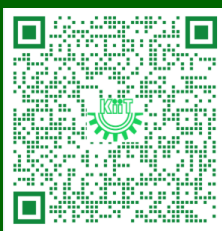
Author: Surekha, B.; Ranjan, R.; Ghadai, S.K.; Mohapatra, S.K.; Ravi Teja, T.; Samal, P.

Details: October 2025

Abstract: Functionally graded materials (FGMs) are a modern engineering material that allows for selective reinforcing for applications that demand high strength, modulus, and wear resistance. Because of their dimensional stability, low density, and machinability, alloys made of aluminum, magnesium, and zinc are suited for such types of investigations. This study uses gravity casting using Ag and lead foils as interface materials to study FGMs developed of Al7075, AZ91D, and ZnAl₄ alloys. A split die was used to make the samples, and their mechanical, microstructural, and machining characteristics were examined. According to the results, Al7075/AZ91D demonstrated the highest microhardness without an interface foil, which demonstrated the creation of intermetallic compounds. Additionally, the machining characteristics showed that ZnAl₄/AZ91D had faster material removal rates and Al7075/AZ91D had lower electrode wear rates.



URL: <https://link.springer.com/article/10.1007/s10904-025-04043-5>





SCHOLARLY PUBLICATIONS

School of Mechanical Engineering

KIIT Deemed to be University

Journal Name: Numerical Heat Transfer; Part A: Applications

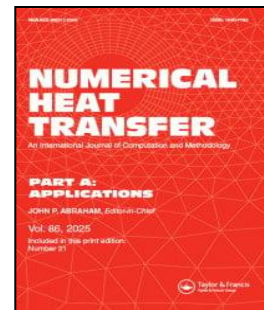
IF: 3.5

Title: Mixed convection flows from a revolving cylindrical cavity

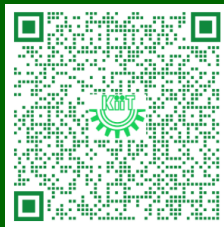
Author: Shah, A.; Kumar Rana, B.K.

Details: Volume 86, Issue 21, 2025

Abstract: Efforts are made to describe the thermofluidic behavior around a spinning hot cylindrical open cavity with negligible wall thickness suspended in air within the laminar regime. Several important input parameters, such as, Rayleigh number ($102 \leq Ra \leq 106$), aspect ratio ($0.5 \leq H/D \leq 10$), and Reynolds number ($0 \leq ReD \leq 300$) are considered to carry out the ongoing numerical analysis. Firstly, thermal plumes are provided to describe the pattern of flow and heat transfer around the heated surfaces of shell by considering the effect of Ra , H/D , and ReD . It is predicted that the heated plume is thrown radially due to the presence of swirling motion ($ReD \neq 0$) of the cylindrical shell unlike the pattern of thermal plume around the stationary vessel. Furthermore, the influence of ReD on behavior of cooling rate from inner (Q_{iw}) and outer (Q_{ow}) surfaces has also been predicted by considering both stationary and swirling conditions. A substantial growth in Q_{iw} is noticed with the growth of ReD for a constant H/D . This effect is substantially greater at lower H/D compared to higher H/D . Again, attempts are made to elucidate the influence of ReD on Nusselt number for cylindrical inner wall (N_{cyl-iw}), cylindrical outer wall (N_{cyl-ow}), base inner wall ($N_{base-iw}$), and base outer wall ($N_{base-ow}$). Fluid flow behavior around the stationary and revolving cylindrical open cavity is also explained by employing velocity vectors. Finally, an appropriate correlation demonstrating a reasonable agreement with numerical data is found for average Nusselt number in terms of Ra , H/D , and ReD .



URL: <https://www.tandfonline.com/doi/full/10.1080/10407782.2024.2353354#abstract>





SCHOLARLY PUBLICATIONS

School of Mechanical Engineering

KIIT Deemed to be University

Journal Name: International Journal of Structural Stability and Dynamics

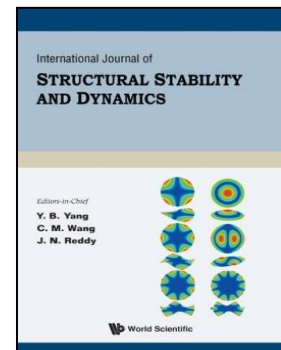
IF: 3.4

Title: Dynamic Stability Behavior Prediction of Initially Cracked Doubly Curved Laminated Composite Shell Structures-A Higher-Order FE Approach

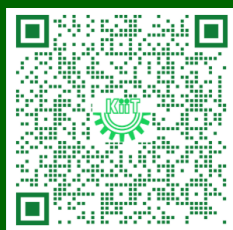
Author: Sahu, AK; Gangwar, A; Akkasali, NK; Kumar, V; Sharma, N; Srivastava, L; Panda, SK

Details: October 2025

Abstract: The current investigation explores the presence of cracks and their influence on the dynamic instability behavior of laminated composite curved (single/doubly) shell structures when subjected to in-plane loading. The numerical model is developed in a higher-order strain-displacement relation utilizing a nine-noded iso-parametric element possessing nine degrees of freedom per node. The mathematical model incorporates the crack type of damage to investigate the parametric excitation response. The final form of the equation of motion for a damaged layered structure is derived using Lagrangian equations under the parametric excitation. The instability zone and the eigenfrequencies are obtained by solving the Mathieu-type ordinary differential equations with a first-order approximation obtained through a Fourier series expansion. First, the mesh independence behavior of the predicted numerical solution is verified and extended to check the model accuracy by comparing the results with published data. The frequency responses obtained using the derived computational are close to the reference data and the deviations are close to a value within the accepted range (approximate to 10.31%). Additionally, a few examples are solved to evaluate the influence of varieties of input design parameters on the final responses while the structure is under parametric excitation.



URL: <https://www.worldscientific.com/doi/10.1142/S0219455427500787>





SCHOLARLY PUBLICATIONS

School of Mechanical Engineering

KIIT Deemed to be University

Journal Name: Progress in Nuclear Energy

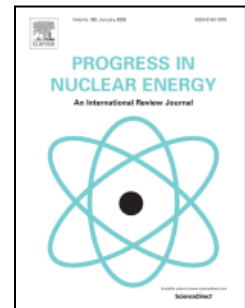
IF: 3.2

Title: A critical analysis of correlations for saturated nucleate pool-boiling heat transfer over vertical tubes and tube bundles: Development of improved models

Author: B.B., Sha, Bibhu Bhusan; R.L., Mohanty, Rajiva Lochan; M.K., Das, Mihir Kumar

Details: Volume 190, January 2026

Abstract: Pool boiling over vertical tubes is vastly experienced in the nuclear industry, where nucleate boiling plays a crucial role in transferring heat. In this context, many experiments have been done in the recent past and developed various correlations for boiling heat transfer. The correlations are influenced by system parameters and the geometrical configuration of the surfaces. Therefore, a wide range of experimental data for saturated pool boiling over vertical tubes and their bundles are taken into consideration to examine the prediction accuracy of various correlations. The prediction errors of various correlations are reported both in tabular and graphical forms. Keeping the most critical parameters in mind, this article proposes two new semi-empirical correlations for predicting the heat transfer coefficient over vertical tubes and their bundles. These developed correlations are able to predict saturated boiling heat transfer coefficients over the tube bundle and single tube data within $\pm 15\%$ and $\pm 20\%$, respectively.



URL: <https://www.sciencedirect.com/science/article/abs/pii/S0149197025002914?via%3Dihub>





SCHOLARLY PUBLICATIONS

School of Mechanical Engineering

KIIT Deemed to be University

Journal Name: Journal of Thermal Analysis and Calorimetry

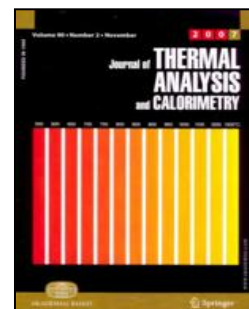
IF: 3.1

Title: Compartment heat flux measurement under elevated pool fires

Author: Tiwari, M.K.; Chaudhary, A.; Mishra, R.K.; Kumar, A.A.; Mohammad Tauseef, S.M.; Varghese, S.; Kumar, R.

Details: October 2025

Abstract: Unlike previous studies which primarily focused on burning rates and plume temperatures, the present work explicitly investigates how fuel pan elevation influences heat flux distribution within a compartment. The contribution of vitiated air to radiative heat transfer is quantified, and the impacts of both pan diameter and elevation are analyzed. To achieve this, twenty-four fire experiments were performed to measure the heat flux on the interior wall surfaces of the room. The test compartment is the size of 4 m × 4 m × 4 m with a door of 2 m in height (H_d) and 1 m in width (W). The fuel mass loss rate, heat release rate (measured using LSHR Calorimetry), maximum upper layer gas temperature, and heat flux on the walls, ceiling, and floor of the compartment were quantitatively analyzed for diesel pool fires with pan diameters of 0.2, 0.4, 0.6, and 0.8 m. These fires were conducted at six different pan elevations (i.e., $h/H_d = 15\%$, 30%, 45%, 60%, 75%, and 90%). It was observed that as the fuel pan elevation (h) increased, the burning rate consistently decreased, leading to a reduction in the heat release rate. Radiative heat flux by hot gas was obtained higher for poor burning of fuel or when oxygen concentration decreased. Hence, the percentage of hot gas heat flux increases with increasing pan height or poor combustion. These experimental results led to the conclusion that the impacts of pan diameter and the burning reaction to vitiated air should be considered when classifying the burning regime of a pool fire.



URL: <https://link.springer.com/article/10.1007/s10973-025-14808-2>

