Vel Tech
Rangarajan Dr. Sagunthala
R&D Institute of Science and Technology
(Deemed to be University Estd. u/s 3 of UGC Act, 1956)

DEPARTMENT OF MECHANICAL ENGINEERING

PRESENTS

VULCAN

(2022-2023)

"Vulcan is the Roman and Greek god of fire and the forge, and mythical inventor of smithing and metal working"

IN ASSOCIATION WITH

MESA
MECHANICAL ENGINEERING
STUDENTS ASSOCIATION

Department of Mechanical Engineering

Vision

To be a Centre of Excellence for education and research in the field of Mechanical Engineering to meet the national as well as global challenges.

Mission

M1: To educate and enrich effective and responsible engineers for national as well as global requirements by providing quality education.
M2: To maintain vital State-of-the-Art Research facilities to provide its students and faculty with opportunities to create, interpret, apply and disseminate knowledge.
M3: To develop linkages with world-class organizations and educational institutions in India and abroad for excellence in teaching, industry and research.
M4: To cultivate and promote entrepreneurship using the industry and R&D facilities of the institution.

Program Educational Objectives (PEOs)

PEO1: Apply modern analytical, computational, simulation tools and techniques on engineering materials, thermal sciences, applied mechanics and manufacturing methods to address the global challenges faced in mechanical and allied engineering streams.
PEO2: Adapt new and recent techniques of engineering science and their applications to conceive, organize and develop the design of engineering systems.
PEO3: Work as an individual and in teams on multidisciplinary assignments in industries, research organizations and academic institutions both at national and global levels through collaboration.
PEO4: Demonstrate techno-commercial skills such as research interest and entrepreneurial ability in students to cater the societal problems.

Program Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

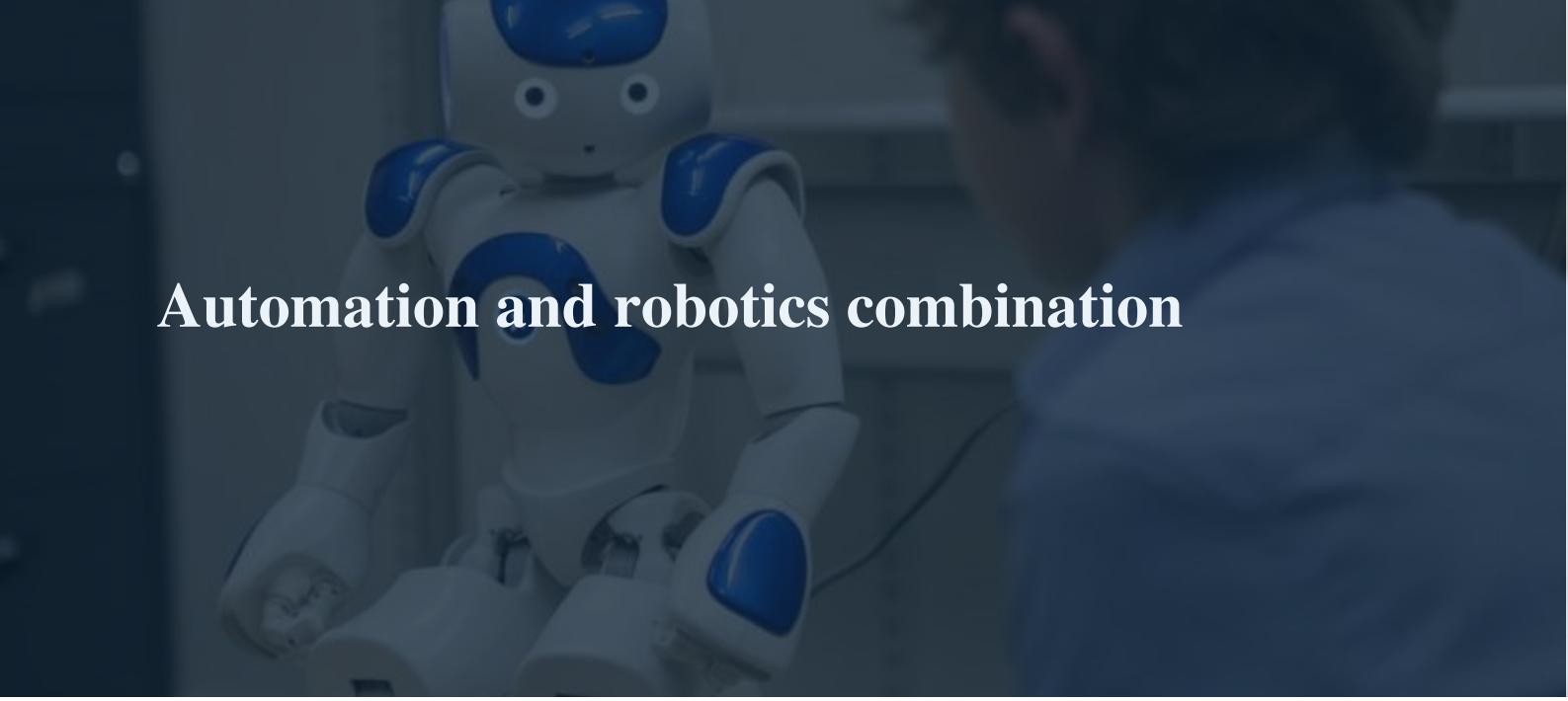
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (POs)

PSO1: Apply their knowledge in the domains of design, manufacturing and thermal sciences to solve engineering problems using advanced technology.

PSO2: Engage professionally in industries or as entrepreneurs by applying innovative ideas in design and manufacturing using modern CAD/CAE/CAM tools.



Automation and robotics combination

In 2023, mechanical engineering education will take a new turn as automation and robotics combine

The field of mechanical engineering became more established as a means of creating, managing, and maintaining equipment throughout the first two industrial revolutions. In general, its core field of knowledge expanded to encompass manufacturing, materials, mechanics, thermodynamics, fluid mechanics, and machine design. It is both the forerunner and the recipient of other engineering forms. They will keep enriching it by coming up with, designing, constructing, and operating increasingly advanced gear with increased complexity, flexibility, connectedness, and automation.

In comparison to prior industrial revolutions, the fourth industrial revolution is currently significantly increasing the multidisciplinary nature of this corpus of knowledge. These revolution's core technologies include AI and ML, IoT, Robots and Cobots, Big Data, 5G, Augmented and Virtual Reality, and 3D and 4D printing, among others.

K. Avinash, 3rd year
Mechanical Department

Advancing industrial automation

At Ford, the term automation was first used in 1953. Nowadays, the benefits of industrial automation go far beyond the reduction of labour costs and include several advantages like improved designs, simpler capacity expansion, decreased inventory, consistency in quality, improved downtime, decreased setup time and transition costs, improved preventive maintenance, extended equipment life, increased safety, simpler failure detection and rectification, flexible products, lower energy consumption, etc.

Automation engineers employ a variety of technologies to optimize, simplify, and automate manufacturing, mining, power generating, warehousing, and other activities. Robotics and industrial automation are anticipated to be embraced by more than 60% of businesses, according to the World Economic Forum's 2020 study on the Future of Jobs.

M.Madhusudhan,3rd year
Mechanical Department

Drain and Gutter Cleaner Machine

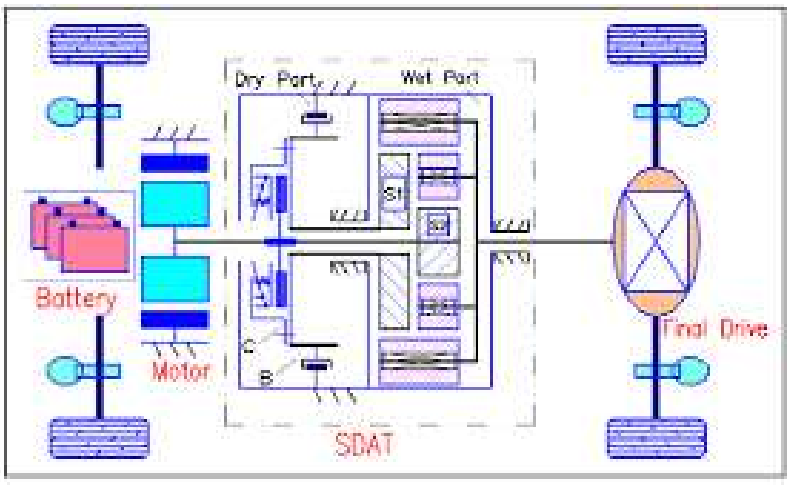
Cleaning of drains and gutters has always been giving a problem to the labor seems unethical and also leads to a high risk of them catching infections or poisoning due to large amounts of waste and chemicals in them. Also throwing of bottles/plastics and other such objects into the gutters lead to narrowing and eventually blockage in gutter flow. This leads to overflow in many cases. So here we provide a fully automated drain gutter cleaning mechanism to tackle these modern day gutter jamming issues.

Our system uses an automated gutter/drain cleaning system that lets fluids flow through it but catches large solid waste like bottles & plastic and accumulates it. So gutter cleaners need to just clean these gutter cleaning systems installed at points instead of cleaning entire gutter floors

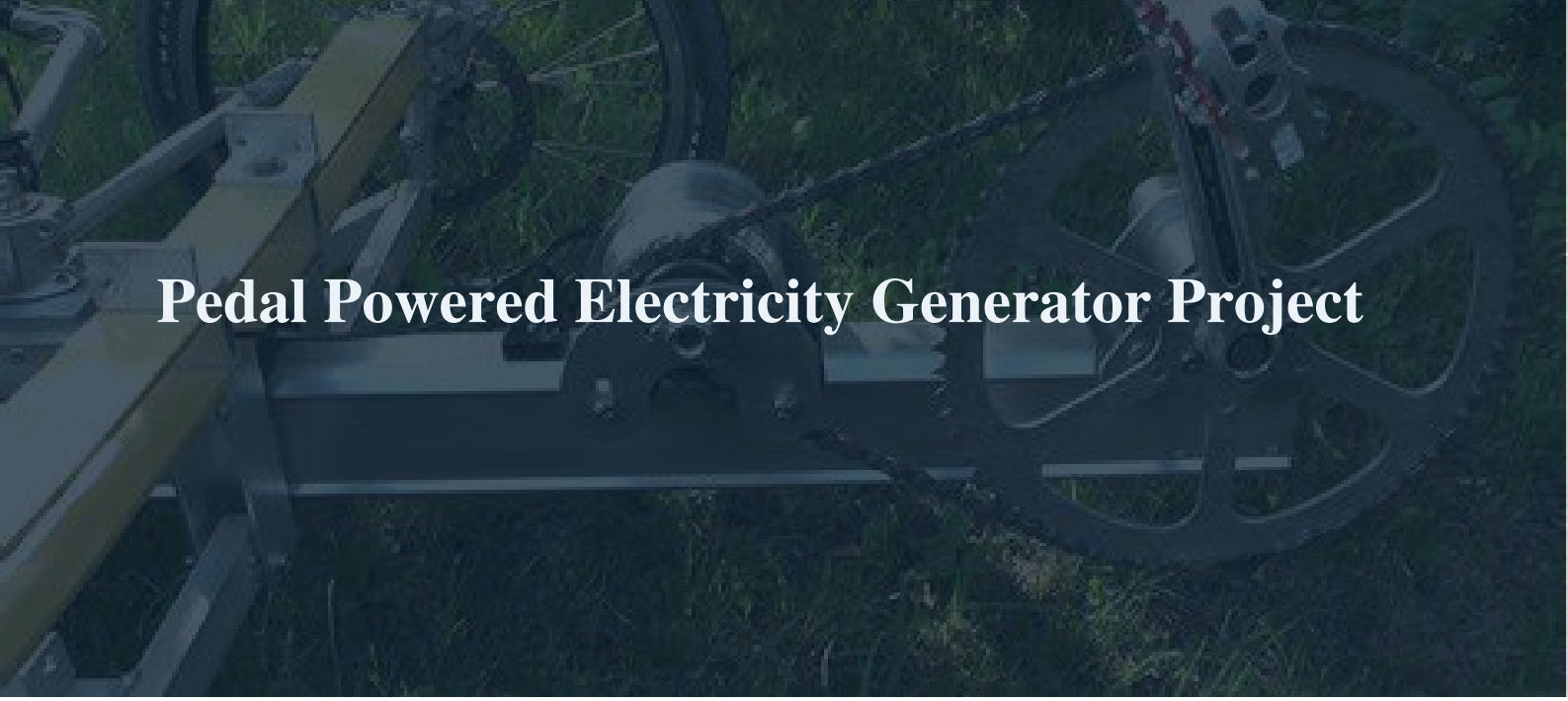
MSRK Manoj , 3rd year
Mechanical Department

Novel shift process control strategy for two-speed clutchless automatic mechanical transmission based on segmented speed regulation

Battery electric vehicles (BEV) equipped with two-speed automatic mechanical transmission (AMT) have gained increasing popularity owing to advantages of a widened high-efficiency operation zone and system costs. In this study, a combined gear shift control strategy including a segmented speed regulation control and torque recovery control was developed for a two-speed AMT in BEV. The switching point of proportional integral control and sliding mode control during speed regulation process is adaptively optimized to ensure minimization of the shift time, while the maximum vehicle jerk is controlled within a defined range. The effectiveness of proposed control strategy is verified by a test bench. Results show that proposed control strategy can not only ensure the impact degree fluctuates within a predetermined range, but also achieve fast and accurate speed regulation which can reduce the speed regulation time by 17%–33%.

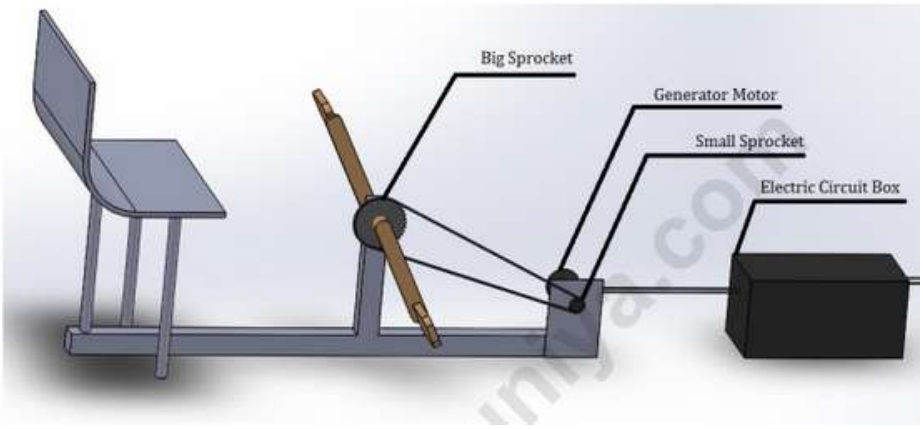


V. Uday, 3rd year
Mechanical Department



Pedal Powered Electricity Generator Project

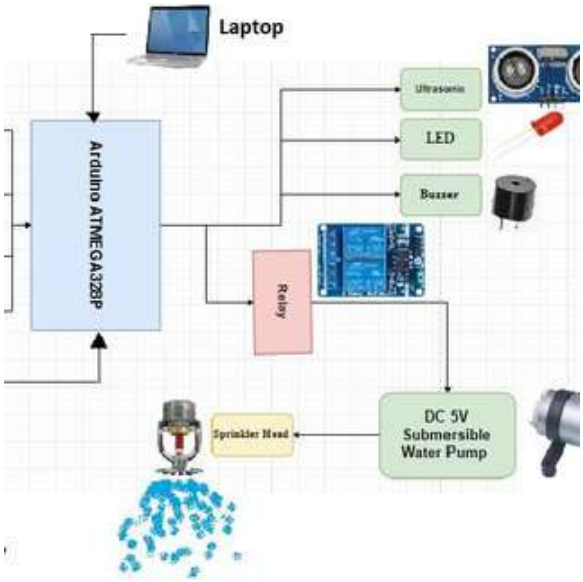
The designing and creating a system for a pedal-powered electricity generator. The most well-known sources of renewable energy are wind and solar energy. However, these energy sources rely on the sun and wind, which are very unpredictable and vary with the seasons, to produce energy. Therefore, we suggest a pedal-powered electricity generator system that can provide power as needed. Our suggested setup uses a chain sprocket configuration. To one section of the sprocket, we fasten the pedals. This enables circular motion powered by the pedals. Now we secure a generator motor with a sturdy support at a specified length.



K. Divyesh , 3rd year
Mechanical Department

Rapid Fire Detection & Suppression Using Advanced Heat Sensing Technique for Industrial Applications

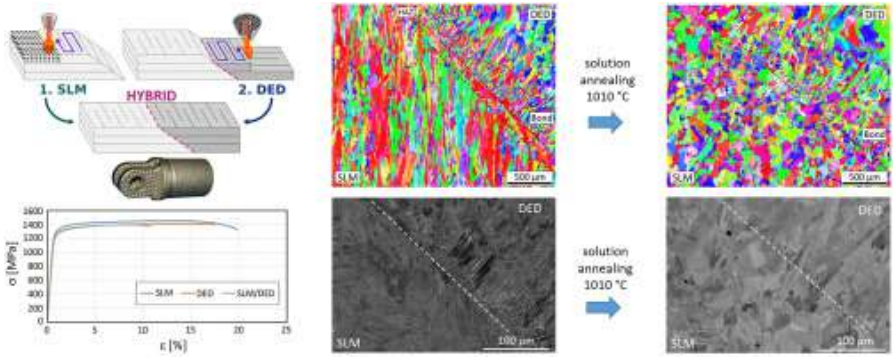
Alarm circuits and thermocouples are instances of detecting frameworks that help distinguish or defend gear from risk. In business structures like workplaces, cinemas, shopping centers, and other public spots, alarm frameworks and hotness sensors are required. Many are expensive and come as independent gadgets, but since we will use this framework in electrical machines, we've made five very fundamental Alarm Circuits using normal parts like thermocouples and temperature regulators. This is an essential alert circuit that utilizes a Thermocouple to identify and work a siphon framework that controls a fire alarm with a signal and manual delivery. An alarm framework's essential goal is to tell individuals to a fire when achievable. The region has been cleared, and move might be made straightaway to extinguish the fire.



Surrya Prakash D
Mechanical Department

Development of microstructure - processing correlations of Inconel718 through additive manufacturing

Processing of nickel based superalloy for high temperature applications developed through cast route is one of the most challenging tasks in the manufacturing industry. Since, nickel super alloys consists of good corrosion, oxidation, wear resistance and room / high temperature mechanical properties, it is widely used in rocket engines, launch vehicles, gas turbines, aeronautical and nuclear reactors, etc. Cast defects, post-processing through machining and design of complex structures are limited while manufacturing through conventional methods. To overcome these drawbacks, additive manufacturing technique is used to manufacture Inconel-718 (IN718) superalloy through direct metal laser sintering (DMLS). Microstructure, property and processing correlation of IN718 superalloy were carried out in the present study. Moreover, it is also compared with cast product to understand the effects of additive manufacturing on IN718 superalloy before post processing. The microstructures, property of as built IN718 superalloy were evaluated using optical microscopy (OM), scanning electron microscopy (SEM) and Vickers hardness tester. The additively manufactured sample IN718 (DMLS) showed higher hardness than cast Inconel718, because of fine grained microstructure.



Dr.Dharmalingam G
Mechanical Department

Experimentation and optimization of deep hole drilling parameters for SS316L

There has been a rapidly increasing demand for mechanical deep hole drilling processes to create small diameter holes in automobile fuel injector bodies, landing gear in aerospace vehicles, surgical instruments, etc. In line with these manufacturing requirements, extensive experimental analysis based on L16 orthogonal array has been carried out in this work to investigate the characteristics of deep holes made on stainless steel AISI316 L using the Abrasive Waterjet Machining. The significance of input machining process parameters including Water Pressure, Stand-off Distance, and Abrasive Mass Flow Rate, and their influence on Kerf Angle, and Surface Roughness have been investigated. Further, the multi-parametric Analysis of Variance has been performed to investigate the statistical significance of machining parameters. The quadratic multiple linear regression models have been designed for the Kerf Angle and Surface Roughness by correlating with machining parameters. The Multi-Verse Optimizer (MVO) algorithm has been introduced in this work to define the optimal combination of machining parameters for simultaneous minimization of kerf angle and surface roughness and the result has been compared with Genetic and Ant-Lion Optimization algorithms. The comparison shows that the MVO algorithm outperformed others. Furthermore, a confirmation test has been performed to check the output of MVO algorithm.

Dr. N. Lenin
Mechanical Department

Assessment of Noise Signature for a Cavitating Centrifugal Pump

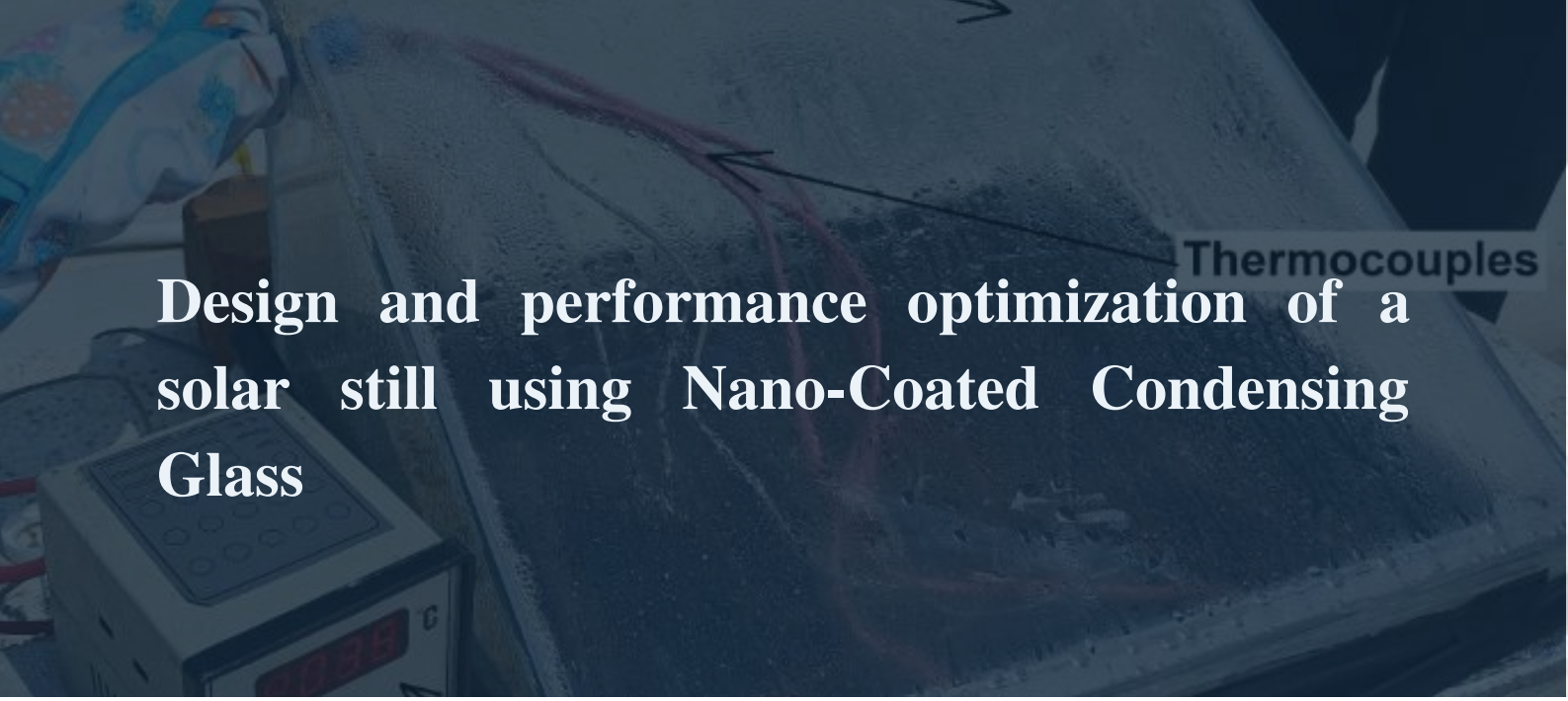
In recent days, sophisticated instruments have emerged to obtain an online measurement of performance parameters from centrifugal pump of different kinds and the signals can be directed to the hands of pump users through mobile applications. With this in mind, a centrifugal pump of low specific speed was chosen for cavitation studies from 80% to 120% of nominal flowrate and for three different speeds. An assessment was carried out for cavitation noise signature from those operating conditions of that pump. The result of cavitation noise based on peak magnitude as well as average revealed nature in relation to cavitation coefficient, and it greatly depends on the flowrate with respect to nominal flowrate. The noise envelope for the flowrate at best efficiency and above was having a similar trend whereas at flows less than the nominal, it was totally different. So the criteria for finding the deviation in noise cannot be uniform for all flowrates. In this paper, the method adapted was to impose a trend line to the measured cavitation noise information and to find out the deviation with respect to normal operating conditions. It was concluded that detection of abnormality in pumps due to cavitation effects requires the current operating condition to be diagnosed first and then proper criteria for deviation in noise has to be imposed.

Dr. S. Christopher
Mechanical Department

Assessment of Noise Signature for a Cavitating Centrifugal Pump

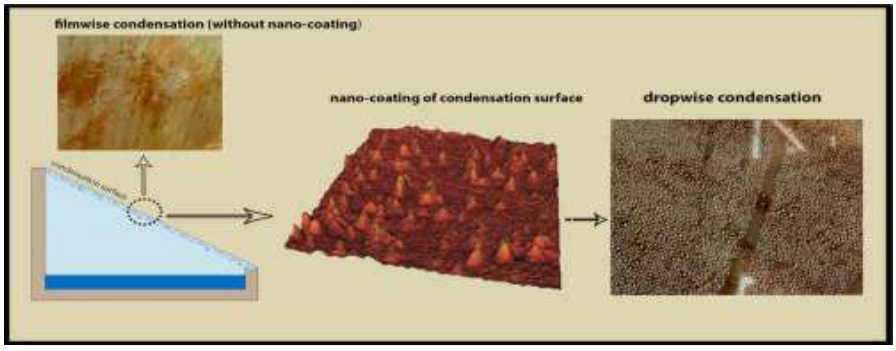
In recent days, sophisticated instruments have emerged to obtain an online measurement of performance parameters from centrifugal pump of different kinds and the signals can be directed to the hands of pump users through mobile applications. With this in mind, a centrifugal pump of low specific speed was chosen for cavitation studies from 80% to 120% of nominal flowrate and for three different speeds. An assessment was carried out for cavitation noise signature from those operating conditions of that pump. The result of cavitation noise based on peak magnitude as well as average revealed nature in relation to cavitation coefficient, and it greatly depends on the flowrate with respect to nominal flowrate. The noise envelope for the flowrate at best efficiency and above was having a similar trend whereas at flows less than the nominal, it was totally different. So the criteria for finding the deviation in noise cannot be uniform for all flowrates. In this paper, the method adapted was to impose a trend line to the measured cavitation noise information and to find out the deviation with respect to normal operating conditions. It was concluded that detection of abnormality in pumps due to cavitation effects requires the current operating condition to be diagnosed first and then proper criteria for deviation in noise has to be imposed.

Dr. S. Christopher
Mechanical Department



Design and performance optimization of a solar still using Nano-Coated Condensing Glass

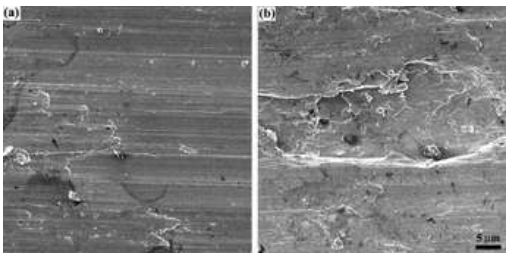
In recent years, the use of solar still has been anticipated to be a feasible solution for desalting the brackish water to alleviate the global water problems. Nonetheless, the productivity of such stills is low and the efforts are endeavoured by the researchers for improving it in possible ways. The current examination has dealt with the performance enhancement of a still through the wettability optimization of its condensing surface. The hydrophobic nano-CeO2 particles were deployed as the nano-coating over the condensing surface of the top cover glass for modifying its wettability. Two configurations of a single sloped ordinary solar still (SSOSS) were examined to assess the impact nano-coating on the productivity of the solar stills. In the first configuration, an ordinary glass cover was placed as the condensing surface (SSOSS-Plain), whereas in the second configuration, the condensing surface was modified with the nano-CeO2 coating (SSOSS-NC). It was found that the hydrophobic nano-coating had shifted the condensate forming phenomena from film wise condensation to drop wise condensation. The results evidenced that the application of nano-coating improved the productivity of the still to 2460 ml, which is 18.27% higher than the ordinary still for a fixed water depth.



Dr.B.Murali
Mechanical Department

Wear and Microstructural Characteristics of Colmonoy-4 and Stellite-6 Additive Layer Deposits on En19 Steel by Laser Cladding

The present study aims to produce an additive layer (cladding) on En19 steel using colmonoy-4 and stellite-6 alloys to create more complex surfaces for resisting wear and improving their physical properties. The microstructure of the deposited layer and the interface of the substrate to the clad surface were analyzed. The dilution of the En19 steel by cladding layers was studied to estimate the crack-free fusion boundaries. It was identified that even though the heat input was the same, the dilution percentage was different for both clad alloys. The dilution of 3.2% for Colmonoy-4 alloy and 4.1% for Stellite-6 alloy is due to the difference in their chemical composition. The interface microstructure of Colmonoy-4 was formed with a planar bonding line without any migration zones between the base metal and clad alloy.

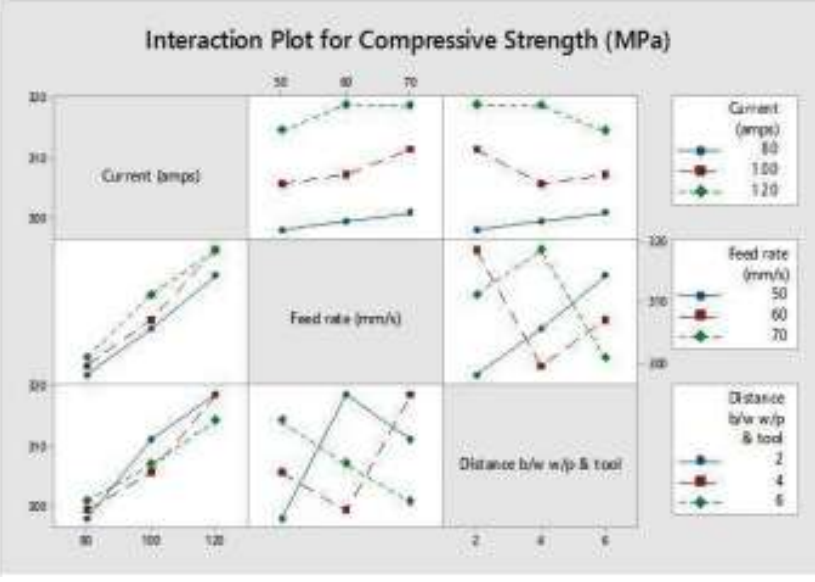


But the interface of stellite-6 alloy's clad layer was created with a river flow by a zig-zag surface. Both the clad deposits were found to have friction coefficients inside the range of 0.49–0.68. Colmonoy-4 alloy clad deposit achieved better wear resistance compared to Stellite-6-based clad deposits. This might be due to differences in the sample's interaction with the counter surface. In the case of colmonoy-4 cladding, Ni and Fe intermixing zone were formed at the interface up to 50 µm, whereas in stellite-6 clad alloy, it was 80 µm. The wear resistance of the colmonoy-4 cladding was better than the stellite-6 cladding. The wide and deep wear tracks were identified for the stellite-6 cladding surface.

Dr. Harisivasri Phanindra K
Mechanical Department

Study on TIG welding parameters for joining different kind of aluminium tube with a tube plate

Welding is a vital metal joining technique with a wide range of industrial uses. In this study, numerous process factors such as current, feed rate, and distance between tube and work piece, among others, were used to investigate in Tungsten Inert Gas (TIG) welding. We used Aluminum 6063 tube to Aluminum 6061 tube plate for this TIG welding. After the welding is finished, a radiographic test is performed to show any welding faults that might lead to defect-free welds. The most critical control factors that would result in better joint strength were identified to use a Taguchi L9 orthogonal matrix. Furthermore, the most relevant process parameter was determined using quantitative independent test (ANOVA). In addition, the mechanical tests were performed to determine the welding strength. The value of the best welded connection strength for tubes with holes welded at interference was found to be 318.716 MPa.



Dr.Sumathy Muniamuthu
Mechanical Department