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

(2021-2022)

"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.

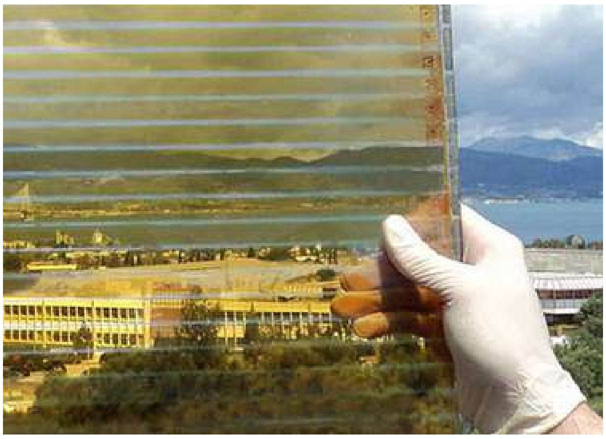
Program Specific Outcomes (POs)

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.

Windows Double as Solar Panels: fully transparent solar-power-generating windows

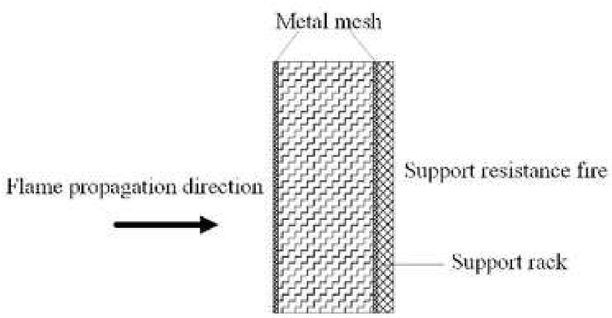
These windows are a great example of mechanical engineering innovations. They have solar cells installed in the edges at a specific angle, which allows the incoming solar light to be efficiently transformed into electricity. The windows could generate 8 to 10 watts of power, according to Grapperhaus."Right now, we are looking for iconic projects all over the world to show that a large glass building can be made energy neutral in an aesthetic way."



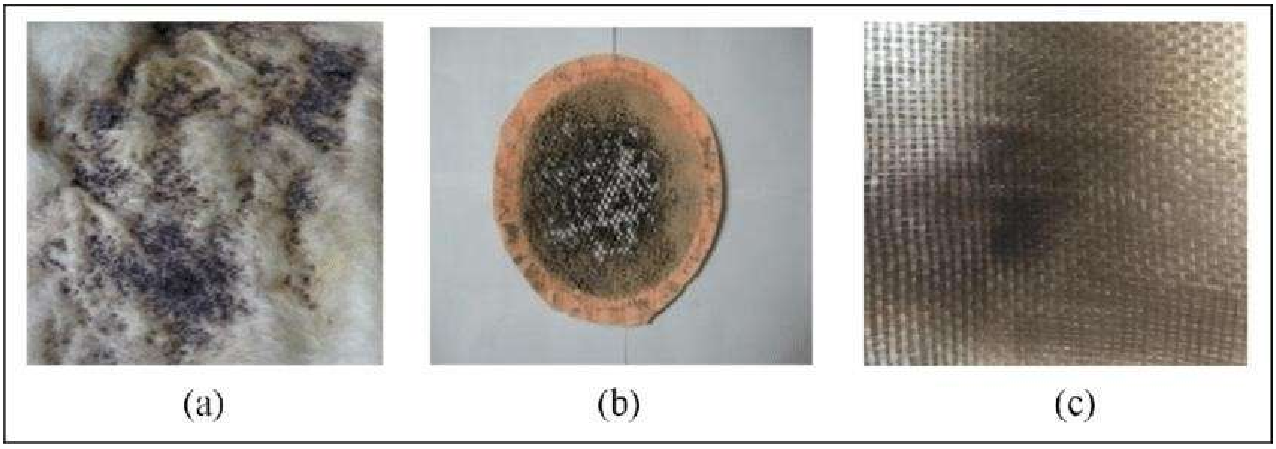
T.Teja (Vtu14031)
4th year, Mechanical Deptartment

Experimental investigation on the performance of non-metallic flexible fire-resistance materials in flameproof diesel engine locomotive

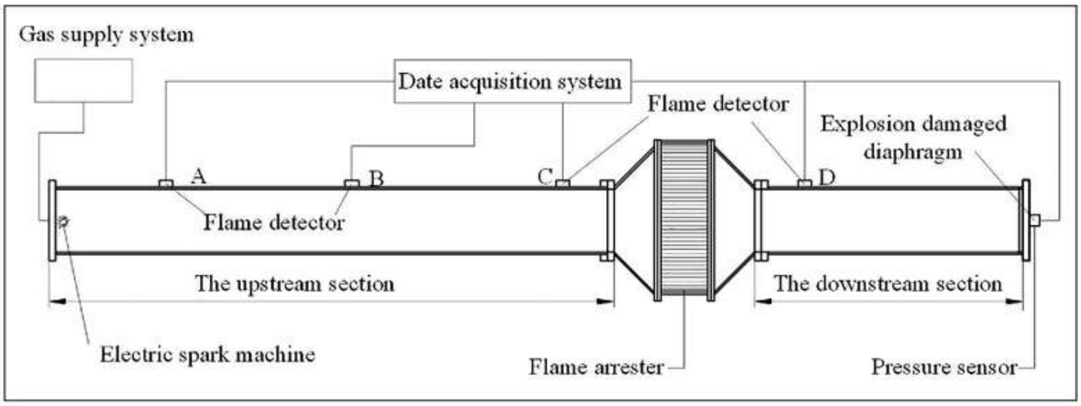
Three kinds of flexible refractory fiber materials were used to verify the performance of fire resistance, according to explosion-proof principle and test methods of flame arrests. Then, a comparison of transmission efficiency between flexible refractory fiber arresters and general arresters was given. The aim of this is to verify the properties of non-metallic flexible fiber materials in fire resistance and transmission efficiency so that we can apply it to the flameproof diesel engine locomotive



Theoretically, refractory fibers have good performances of air permeability and complex internal space, so it can provide with absorption area. First irregular porous structure increases the cooling area. The temperature of the flame can decrease under the ignition point and quench after the heat exchange. Tiny pores of the porous materials, moreover, increases the probability of absorbing free radicals during chain reaction so as to prevent the combination of free radicals and premixed gas. Then, the chain reaction will slow down and even terminate.



The investigation was aimed at testing the performances in fire-resistance and transmission efficiency of non-metallic flexible materials in flameproof diesel engine locomotive which may replace traditional metal flame arresters with low gas transmission efficiency. On the basis of the chain reaction mechanism, the mixed gas was burnt in the experiment, and the free radical which can be absorbed by tiny pores of flexible fiber materials and quenched was released (1School of Mechanical and Electrical Engineering, China University of Mining and Technology, Xuzhou, China2Jiangsu Collaborative Innovation Center of Intelligent Mining Equipment, Xuzhou, China-Kedi Chen, Baolin Li).



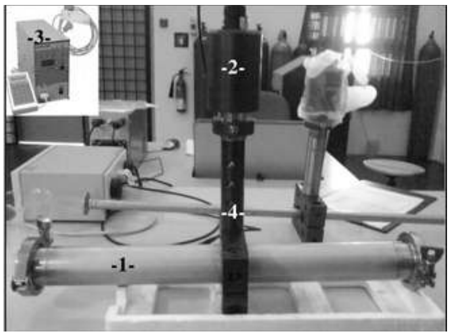
A. Jagadeesh (Vtu13963)
4th year, Mechanical Department

Biodiesel Production from Waste Cooking Oil by Using an Ultrasonic Tubular Reactor

The aim of this research is to find an optimum synthesis biodiesel from waste cooking oil (WCO) using an ultrasonic tubular reactor. The experimental studies explored the variations in:

- reaction time
- molar ratio WCO to methanol (MeOH)
- amount of catalyst
- the frequency of ultrasonic and output power ultrasonic on the ester contents.

Comparisons of type ultrasonic and also the mechanical stirring method based on time reaction were investigated.



The optimum results of the biodiesel process is the reaction time of 5 minute, NaOH catalyst 1%wt of WCO, molar ratio WCO to MeOH of 1:6, frequency ultrasonic of 20 kHz and output power ultrasonic of 650 W. The reaction time reduced 12-24 times compared to both of method and the yield of ester contents was obtained at 96.54%wt.

J. Hemanth Sai (Vtu14051)
4th year, Mechanical Department

Acoustic Wave Separation

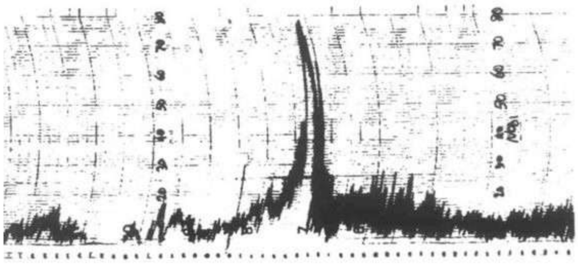
Their immediate goal was to be able to process 100,000 gallons a day for the gas and oil industry. This same technology could also be used to cleanse blood during surgery, to reclaim proteins from the cells of mammals, as well as many uses in gene and cell therapies. This groundbreaking AWS technology will have innumerable potential uses in the future.

S.Anill (Vtu15178)
4th year, Mechanical Department

Hybrid simulation of thunderstorm outflows and wind excited response of structures

Structural components such as buildings, bridges, and tunnels are often affected by actions of winds and thunderstorms outflows. The need to control their effects on structures has resulted in numerous researchers in the wind engineering field. The study by Professor Giovanni Solari and his team will help in gathering different data involving such structures which will thus be analysed to produce robust results that may be further used in understanding other effects such as those resulting from aerodynamic damping.

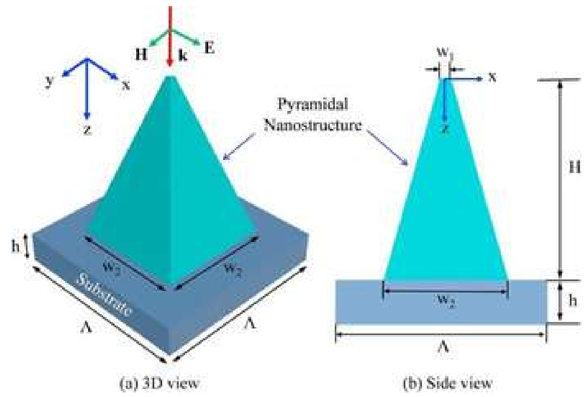
The authors successfully investigated wind-excited responses through modal analysis and time-domain approaches. In the simulation analysis, some parameters such as aerodynamic damping and transient aerodynamic effects were neglected. The obtained results also helped in getting the information about classic analysis. This was done about synoptic stationary cyclones. It was however observed that thunderstorms outflows often induce a major structural response as compared to synoptic stationary cyclones.[gallery columns="2" ids="15421,15423"]



However, both synoptic and thunderstorms events experience similar qualitative responses as far as the dynamic response and wind loading on the structures are concerned. The same similarities for the two cases are too witnessed with the aerodynamic admittance.

T.Seetharamaiah (Vtu13941)
4th year, Mechanical Department

An absorber design using a natural hyperbolic material for harvesting solar energy



Researchers led by Professor Ping Cheng, from Shanghai Jiao Tong University, in collaboration with Professor Zhuomin M. Zhang, from Georgia Institute of Technology, developed a perfect light absorption structure that utilizes an array of pyramidal nanostructures made of bismuth telluride (a natural hyperbolic material) over a thin substrate to absorb incident solar radiation.

We are looking for a system that uses the currently-installed hanging jibs so the window-cleaning can be done automatically or semi-automatically in buildings taller than 20m.
The solution must consider how the electricity supply and the water and cleaning products will be. Besides, it must be safe enough (prevent falling accidents) and be more efficient and sophisticated than the current systems.
The adaptability of the solution to the greatest number of façades and its simplicity when prototyping will be positively assessed.

T.Seetharamaiah (Vtu13941)
4th year, Mechanical Department

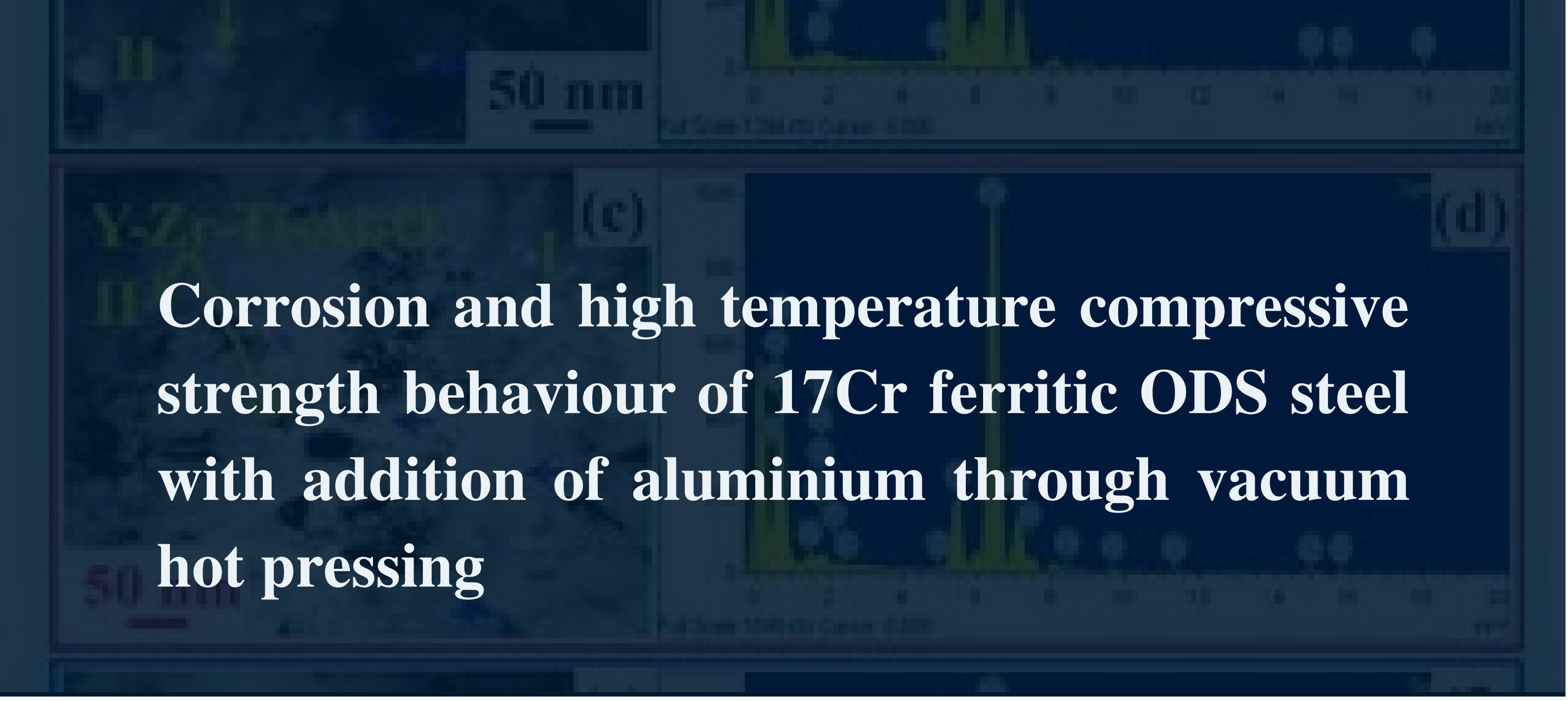
The Aeolipile was an early steam reaction turbine

The Aeolipile was the world's first rotating steam engine, or more technically correct, a steam reaction turbine. It was devised by the great Heron of Alexandria in the 1st Century AD and described it in great detail in his book Pneumatica. This relatively simple device works by heating a reservoir of water within the device to generate steam. The steam is then conducted through one of the copper supports to a pivoted brass sphere.

Once the steam reaches the sphere, it escapes through one of two nozzles at the ends of two, small, opposing pointing arms. The escaping steam generates thrust and causes the sphere to rotate. The basic principle is simple, but the device's real genius is that only one of the supporting arms pass steam to the sphere (via a sleeve bearing).

This pushes the sphere against the other, 'solid', supporting arm, which also has a thrust bearing. The solid arm includes a conical point that bears against a matching indentation on the surface of the sphere. This combination holds the sphere in place whilst it rotates.

G. Sai Nikhil(Vtu14025)
4th year, Mechanical Department

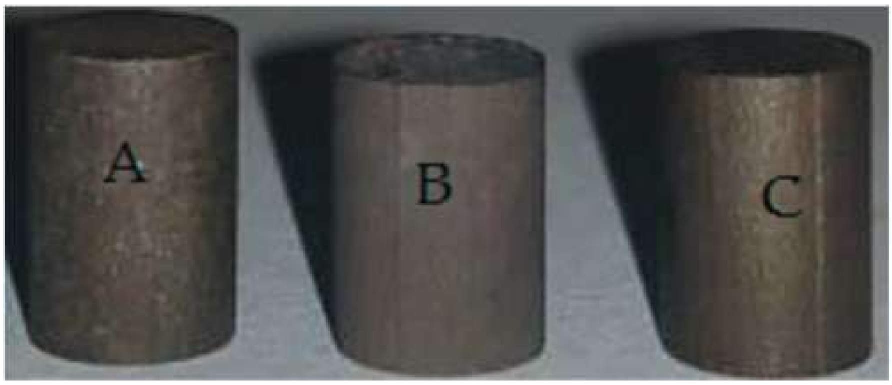


Corrosion and high temperature compressive strength behaviour of 17Cr ferritic ODS steel with addition of aluminium through vacuum hot pressing

The structural materials are essential for the present important advancements in economics, for reliability, safety, sustainability, etc., over presently operating reactor technologies of Generation IV reactors, advanced fast reactor core and fusion reactors. In order to avoid the release of radioactive fission products in the environment, the consistency of the cladding tube is necessary. Thus, increasing the operating temperature of these steels by oxide dispersion strengthening (ODS) makes them promising candidate materials. For the present study, the samples were prepared from the 430 L pre-alloyed powder using mechanical alloying through vacuum hot pressing.

Table 1. Chemical composition of ferritic steels and their mixtures [30].

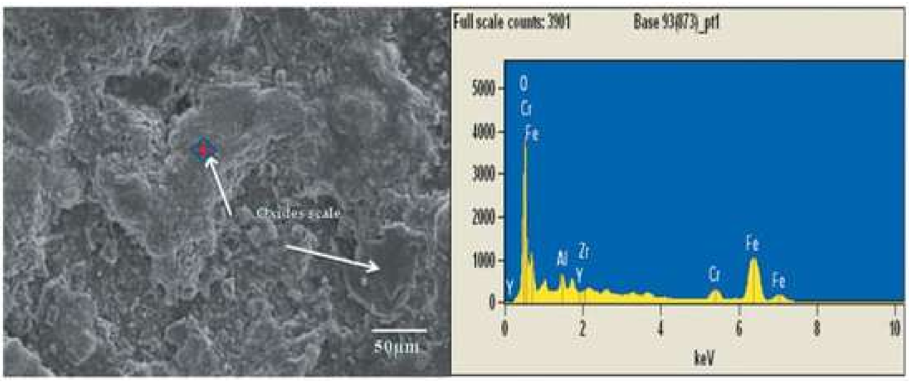
Powder grade	Cr (wt %)	Mn (wt %)	Si (wt %)	C (wt %)	P (wt %)	S (wt %)	Fe (wt %)	Theoretical density (g/cc)
430 L	17	0.89	0.89	0.02	0.01	0.01	Bal	7.70
Alloy A	(430 L + $0.3Y_2O_3$ + $0.5ZrO_2$ + 0.1Ti)wt%							7.67
Alloy B	(430 L + $0.3Y_2O_3$ + $0.5ZrO_2$ + 0.1Ti+1 W + 2Al)wt%							7.68
Alloy C	(430 L + $0.3Y_2O_3$ + $0.5ZrO_2$ + 0.1Ti+1 W + 4Al)wt%							7.59



Dr.G.Dharmalingam
Mechanical Department

Corrosion and high temperature compressive strength behaviour of 17Cr ferritic ODS steel with addition of aluminium through vacuum hot pressing

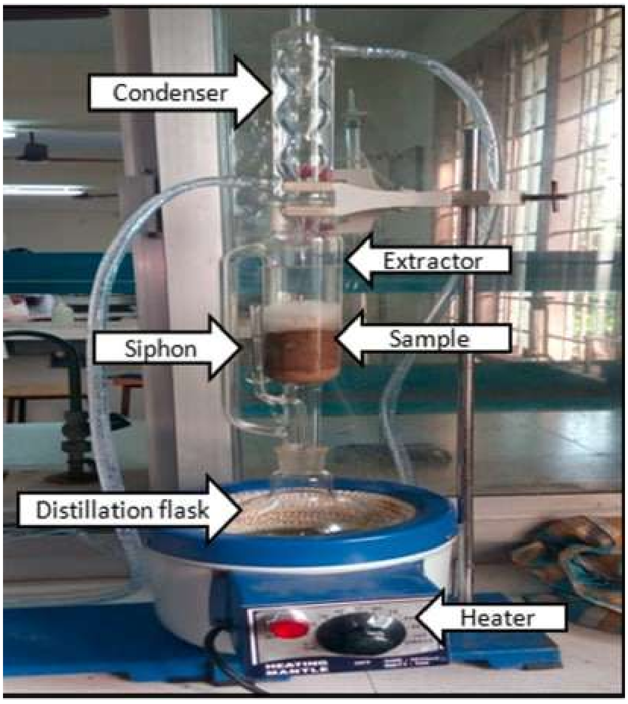
The hot-pressed alloys A, B, and C structural changes were examined through transmission electron microscope-energy dispersive spectroscopy (TEM-EDS) analysis and the mechanical properties, such as sintered density(g/cc), Vickers hardness (HV), compressive strength (650°C), and elongation (%) were measured. The corrosion resistance was measured through an electrochemical corrosion test of the alloys A, B, and C. From the TEM-EDS analysis, it was observed that the nano oxide particles and complex oxides particles were uniformly distributed. Alloy A has a higher compressive strength of 1307 MPa when compared to alloy Band alloy C. Moreover, alloy Chas higher corrosion resistance was observed than alloys A& B.



Dr.G.Dharmalingam
Mechanical Department

Production and characterization of biomixture fuels from raw oil feed stock and the effect of ionic liquid as an additive on biomixture fuels.

The present experimental investigation focuses on improving the properties of biomixture fuel samples by using a novel additive such as 1-butyl-1-methylpyrrolidinium chloride (ionic liquid). Biomixture fuel samples have been prepared from the waste cooking and soapnut biodiesels after the individual transesterification process of each raw oil. The transesterified biodiesels were blended together through a method of biomixture in various proportions such as SWME-1, SWME-2, SWME-3, SWME-4, and SWME-5 respectively. The compositions of fatty acids for individual prepared biomixture samples were investigated through gas chromatography and mass spectrometry (GC-MS) to identify the characterization of fuel samples.



Dr.K.Hari Phanindra
Mechanical Department

Mechanical properties and moisture behaviour of neem/banyan fibres reinforced with polymer matrix hybrid composite

In this research work, chopped neem fibre and woven banyan fibre were stacked into seven different sequences and fabricated by the hand lay-up technique. The laminates consist of 70% epoxy matrix, 25% natural fibre reinforcements and 5% sawdust filler material. The mechanical properties of the composite such as tensile strength, flexural strength, compression strength and impact strength were studied and also identify the water absorption capacity under different weight fractions of fibres. It is more effective by increasing the weight fraction of bi-directional woven banyan fibres which give better tensile strength of 25.55 MPa, flexural strength of 21.23 MPa, compression strength of 25.21 MPa and increasing of chopped neem fibre gave higher impact strength of 18 J in sample G was found in natural composite. Also, in sample G was given less moisture absorption capacity of 0.1% compared with other sample of hybrid composite. Therefore, the sample G sequence can replace to polycarbonate synthetic helmet and it is a potential alternate material for making natural composite helmet. The surface morphology was studied by SEM analysis before and after fracture of the hybrid composite to reveal the surface finish and failure mode of the epoxy composite laminates.

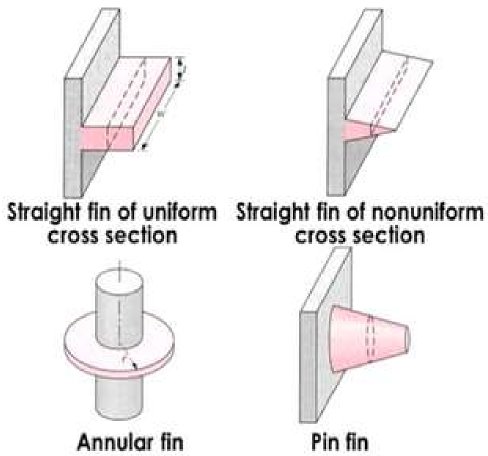
Flat shape Sample

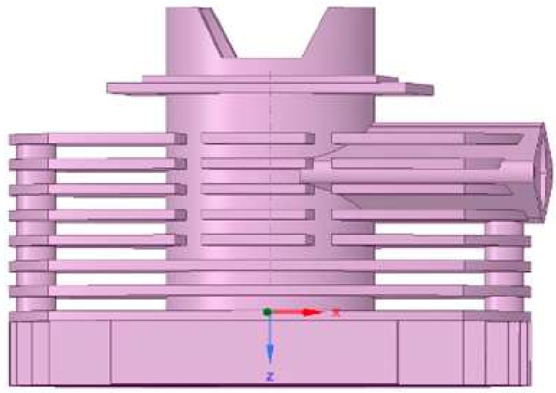
Dog bone shape Sample

Dr.K.Karthik
Mechanical Department

Computational investigation of heat transfer on the surface of engine cylinder with fins of different shapes and materials

In everyday life the use of vehicles has expanded immensely for some ventures and house hold applications, likewise the running time of engine cycle is exceptionally long. Thus because of the consistent running enormous measure of heat is produced. At the point when this heat isn't appropriately disseminated, the engine gets more fragile very soon and life of the engine declines because of the heat development. To build the life of the engine, heat dispersal is expanded by giving fins at external of engine chamber.





Dr.K.Raja
Mechanical Department

Computational investigation of heat transfer on the surface of engine cylinder with fins of different shapes and materials

The shape of the fins and the material used for the fin increases its heat dissipation capacity and in turn increases the cooling of the engine for proper functioning. The present work focuses on the design of fins of circular and tapered shapes for a 2-stroke engine. The temperature distribution and the heat dissipation along the fin surface of two shapes has been observed by a steady state thermal analysis. Alusil and Silumin has been selected as the fin materials and a computational evaluation has also been done using FEM. A better shape of the fin along with a suitable material has been selected based on the results observed by FEM and on comparison with the existing shape and material of the fin.

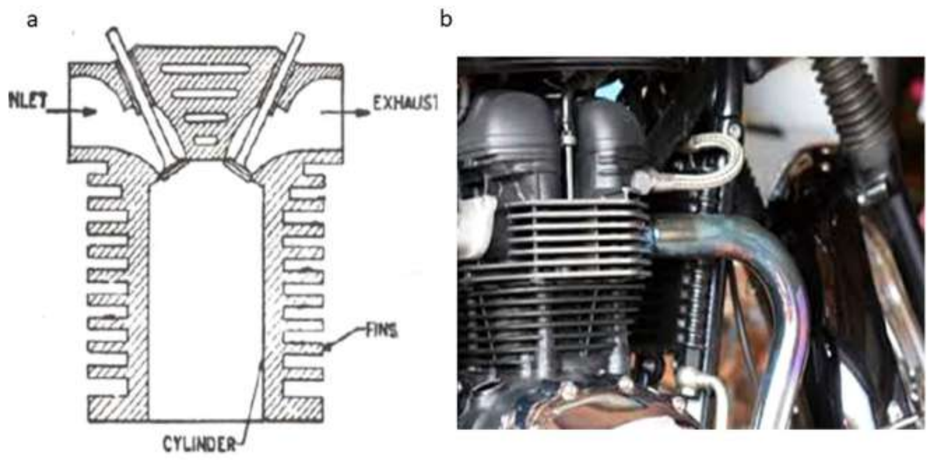


Fig. 1. Internal Combustion engine (a) schematic view; (b) real image.

Dr.K.Raja
Mechanical Department

Effect of doping on thermo-optical properties of vanadium oxide sputtered thin films .

In this development work an attempt has been made to investigate the effect of doping elements i.e. tungsten, molybdenum and titanium in vanadium oxide thin films. Various thin films have been developed by co-sputtering process. The phase and elemental analysis were studied by X-ray diffraction (XRD) and energy dispersive X-ray spectroscopy (EDX), respectively. The thermo-optical properties i.e. absorptance (as), solar reflectance (qs), solar transmittance (ss) and IR emittance (eir) were investigated and correlated the doping elements effect in vanadium oxide thin films.

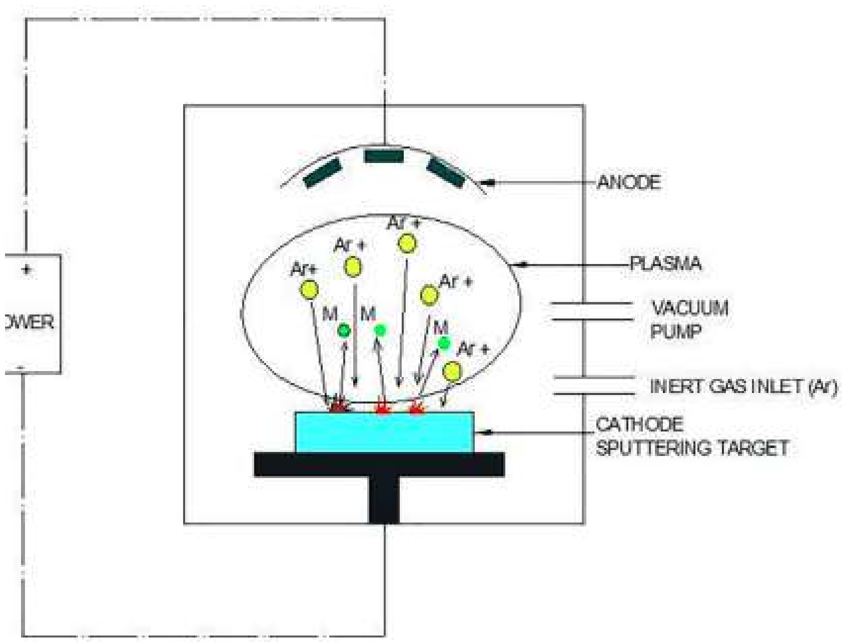


Fig. 1. Schematic diagram showing the principle of sputtering technique.

Dr Ankur Bansod
Mechanical Department