ROHINI

COLLEGE OF ENGINEERING & TECHNOLOGY

Approved by AICTE and Affiliated to Anna University, (An ISO Certified Institution)

MECHTRON - 2022

2021-2022

ANNUAL TECHNICAL MAGAZINE

DEPARTMENT OF MECHANICAL ENGINEERING

MECHTRON'22

2021-2022

Chief Patron

SHRI.K.NEELA MARTHANDAN

Chairman

Patrons

Dr.N.NEELA VISHNU

Pro Chairman

Dr.BLEESY JEO

Managing Director

Co-Patron

DR.R.RAJESH

PRINCIPAL

Editor in Chief

DR. A. SAGAI FRANCIS BRITTO

Associate Editor

Dr.K.K.AJITH KUMAR

Assistant Editor

AATHITHYA VALLUVAN

Editorial Board Members

Prof. T. JEBASINGH

Prof. R. DAVID

MECHTRON'22 is an annual magazine, brought out by Rohini College of Engineering & Technology, Kanyakumari. The articles published are copy-righted. If you have any queries or feedback, address them to machtron2k22@gmail.com

Address: ROHINI College of Engineering & Technology

Near Anjugramam Junction, Kanyakumari Main Road,

Palkulam, Kanyakumari - 629 401

Tamilnadu, India.

Phone: 04652 - 266665

Email: admin@rcet.org.in

Website: www.rcet.org.in

ABOUT DEPARTMENT

The Department of Mechanical Engineering started in the year 2012 with an initial intake of 60 students to the B.E Program and increased to an intake of 120 students from 2013 and 180 students from 2014. The Department offers ME - Thermal Engineering programme from 2015 with an intake of 24 students. The Department is a recognized research centre by Anna University Chennai from the year 2019. The department accomplish outcome Based Education which help the students to learn, develop and serve to the society. The Department has experienced and dedicated faculty with a wide range of specialization namely Thermal Engineering, Engineering Design, Manufacturing Engineering, Energy Engineering, CAD/CAM, Industrial Engineering and Mechatronics.

The faculty members have published more than 100 papers in National/International journals/Conference and had written books, filed patterns during the last 3 years and received many awards. The students were motivated by providing lot of opportunities like technical presentation in Symposium, conferences for skill development. The department provide value added knowledge to under graduates and post graduate students. Apart from curriculum students were motivated to participate in sports. The department has well established laboratory facilities to conduct research work on different specialized areas like Material Science, Renewable Energy, Thermal Science. The students of the department have received external research funding from Tamil Nadu State council for Science and technology in recent years. The students of the departments have joined in reputed industries through placements and some of them are turned to be an entrepreneur. The department has a good network of alumni.

VISION

To inculcate competence in the field of mechanical engineering for the students by providing quality education and learning opportunities to become ethically strong engineers for the development of society.

MISSION

- To provide fundamentals and technical skills in Mechanical Engineering through effective teaching-learning methodologies.
- To provide an ambience for research through collaborations with industry and academia.
- To inculcate the students' leadership quality through employability skills with ethical values.

PROGRAMME EDUCATIONAL OBJECTIVES [PEO'S]

PEO 1

Graduates will apply the knowledge of Mechanical Engineering concepts and innovative methods to solve real world Engineering problems.

PEO 2

Graduates will have the required qualities for a successful carrier in Mechanical Engineering and related fields.

PEO 3

Graduates will exhibit the professional skills with ethical values, Communication skills and team spirit.

PROGRAMME SPECIFIC OBJECTIVES [PSO'S]

PSO1:

Graduates of the program will achieve optimized design by utilizing their knowledge in thermal engineering, material science, manufacturing, fluid power and computer integrated manufacturing.

PSO2:

Graduates will be able to analyse and interpret by using modern tools and provide solutions to real time mechanical engineering and related problems.

PSO3:

Graduates will learn managerial skills to work effectively in a team and are aware of the impact of professional engineering solutions in human community, environmental context, ethics and be able to communicate effectively.

CHAIRMAN 'S MESSAGE

"Education is for improving the lives of others and for leaving your community and world better than you found it"

I deem it to be a matter of immense pleasure and honour for me to address you all through the website of ROHINI College of Engineering & Technology. It is indeed very heartening to witness that the college has carved a name for itself in the academic scenario of the region. Education is the most powerful tool to bring desirable changes in our personality and also to bring positive changes in our society. It is the only medium which enables you to move from darkness to brightness.

Dear friends, I strongly believe that, there can be no better way to drive and improve our nation's prosperity and social economic well-being than through its education system. I also believe that, technocrats are the key to continued economic and technological advancement of our country.

I would take this opportunity to urge you all to focus on all round development. You should always have your education laced with morality and ethics. This task has to be taken over by the academicians to provide value and ethic based education. You should all remember that, "honesty is the first chapter in the book of wisdom" and we should inculcate honesty and integrity in all what we do.

I earnestly hope and trust that, my esteemed academicians and budding technocrats will work with sincerity, honesty and dedication and thereby contribute to make this world a better place to live in.

Best Wishes,
Shri.K.NEELA MARTHANDAN
Chairman
ROHINI Groups.

PRINCIPAL'S MESSAGE

'We make technocrats, who proudly say 'I am an Engineer; I serve mankind, by making dreams come true.'

The major challenge for today's engineering educational institutions is to accommodate the ever varying aspirations of the younger generation because of increasingly changing demand and development in industries. We constantly put efforts to accommodate these aspirations by fine tuning the academics of college with innovative and practical oriented teaching - learning practices along with other developmental activities.

Our goal is to change the world through education. It may sound idealistic, but this is precisely our long term goal. It is what motivates the work of everyone at the ROHINI College of Engineering and Technology — from faculty and staff, to students and alumni. It inspires our teaching and research. It is this goal which fuels the faculty to excel.

Our approach reflects the educational needs of the 21st century. We focus on our students by providing them with a world-class outcome based education and hands-on experience through research, training, and student forum activities etc. The success of our undergraduate, postgraduate & research programs is supervised by our eminent faculty, who continue to set the standard for excellence. There is continuous check on the implementation of planned academic activities with desired results in grooming our future generation for employment and for higher studies in India and abroad. A research culture has taken shape in the institute through enhanced R & D activities. We believe in continuous development and strive to carry on the best efforts and endeavours towards the benefit of the students.

Our University results and placement speaks about our excellence with many of our students bringing laurel to the college by getting highest ranking in university exams and huge number of students are placed in national & multinational companies, moreover our students' creativity and determination is evident by this continuous success in various fields.

Our institute stands by its core values, mission of churning out well-rounded individuals and thorough professionals.

Best Wishes,
Dr.R.RAJESH, M.E., Ph.D.
Principal
Rohini College of Engineering & Technology.

HOD'S MESSAGE

Mechanical engineering is one of the oldest and broadest engineering discipline, and plays a significant role in enhancing safety, economic vitality, enjoyment and overall quality of life throughout the world. A prerequisite for development is growth and that is directly related to production or output of a country.

A warm and Green Greetings from the Department of Mechanical Engineering at RCET. The college has been simply unstoppable in its progress as it has been actively involved in various activities that have brought to light the hidden talents of the college students and staff. Mechanical Engineering is a professional Core engineering discipline that deals with the design, production and maintenance of any produce of any industry.

Our department has a team of highly qualified and experienced faculty, good infra structure and lab facilities. We are striving hard continuously to improve upon the quality of education and to maintain its position of leadership in engineering and technology. We always work with the motto "Nothing can be achieved without genuine effort." The core values of the department help the students to develop their overall personality and make them worthy to compete and work at global level. Our faculty are continuously attending various training programs, publishing research papers, books and filing patents. Many are pursuing research. Our department has been conducting seminar / conferences to keep the faculty and students abreast with the latest developments in the field of technical education. We are happy to share that many students are pursuing higher studies in leading universities in India and abroad. I am certain that our students will prove to be an invaluable asset to an organization. We , Mechanical engineers to build the nation.

Best Wishes,
Dr. D PRINCE SAHAYA SUDHERSON M.E, Ph.D
HOD / Mechanical Engineering / RCET.

EDITOR'S MESSAGE

It gives us great pleasure to bring you issue of MECHTRON 2021, the Mechanical department technical magazine of Rohini College of Engineering and Technology, Kanyakumari.

The objective of the magazine is to mainly focus on Achievement of the students from the Mechanical Engineering department in the Co-curricular and Extra-Curricular Activities.

The name and fame of an institute depends on the caliber and achievements of the students and teachers. The role of a teacher is to be a facilitator in nurturing the skills and talents of students. This magazine is a platform to exhibit the literary skills and innovative ideas of teachers and students MECHTRON 2022 presents the skills and innovative thinking of students and contributions of teachers.

We are also thankful to our Management and Principal for their support and encouragement.. Last but not the least we are thankful to all the authors who have sent their articles. We truly hope that the pages that follow will make an interesting read.

Dr. A SAGAI FRANCIS BRITTO
Editor of Department Magazine
ROHINI College of Engg. And Technology.

ABOUT COLLEGE

ROHINI COLLEGE OF ENGINEERING AND TECHNOLOGY

A temple of learning, is an ISO certified institution was founded by the great Industrialist and Philanthropist, Shri. K.Neela Marthandan. The main objective of our college is to advance the knowledge base of the engineering professions and to influence the future directions of engineering education and practice.

This is the best Engineering College in Nagercoil, Kanyakumari District. We believe not only in educating the students, but also in grooming characters, with moral and ethical values to build the nation. Since the beginning, the college has been providing world-class facilities & infrastructure in education and learning. The emphasis is on transformational leadership rather than directional leadership. We aim to establish new trends, introduce innovative training methodologies, and thus guide students towards the road to success.

RCET VISION: To be an academic institute of continuous excellence towards education, research in rural regime, and provide service to nation in terms of nurturing potentially higher social, ethical and engineering companion graduands.

RCET MISSION: To faster and promote technically competent graduands by imparting the state of art engineering education in rural regime.

To enunciate research assisted scientific learning by dissemination of knowledge towards science, agriculture, industry and national security.

FACULTY ARTICLES

Waste Heat Recovery from Domestic Refrigerator

Mr. Raja Kumar (AP/Mech)

I. INTRODUCTION:

Waste heat is heat, which is generated in a process by way of fuel combustion or chemical reaction, heat removed from thermal system by heat exchanger and then "dumped" into the environment even though it could still be reused for some useful and economic purpose. The essential quality of heat is not the amount but rather its "value". The strategy of how to recover this heat depends in part on the temperature of the waste heat gases and the economics involved.

Use of waste heat recovery is an important technique of reducing total energy costs in energy system design. Attachments need to be developed to recover waste heat energy from air conditioning or refrigeration systems. If the heat recovery system is designed optimally and implemented in residential and small-scale commercial systems, the cumulative benefits would be significant

Households need both refrigeration and water heating. Refrigeration at temperatures below 4°C is employed for food preservation, while hot water at temperatures around 55°C is used for bathing and showering. But it is common for refrigeration and water heating to be separated and unconnected, each consuming their own purchased energy

A more efficient use of this electrical energy would be to integrate the refrigeration and hot water systems. This would reduce the electrical power consumed by heating water, by making use of the heat rejected by refrigerators.

A home's single largest electricity expense is water heating, which typically accounts for about 40% of their electricity usage. The total energy consumption by geysers will continue to increase as the population grows. As electricity demand increases, the adverse environmental effects and the economic costs associated with electricity generation will also increase.

The vapour compression refrigeration cycle is a common method for transferring heat from a low temperature to a high temperature.

The figure shows the objectives of refrigerators and heat pumps. The purpose of a refrigerator is the removal of heat, called the cooling load, from a low-temperature medium. The purpose of a heat pump is the transfer of heat to a high-temperature medium, called the heating load. When we are interested in the heat energy removed from a low-temperature space, the device is called a refrigerator. When we are interested in the heat energy supplied to the high-temperature space, the device is called a heat pump

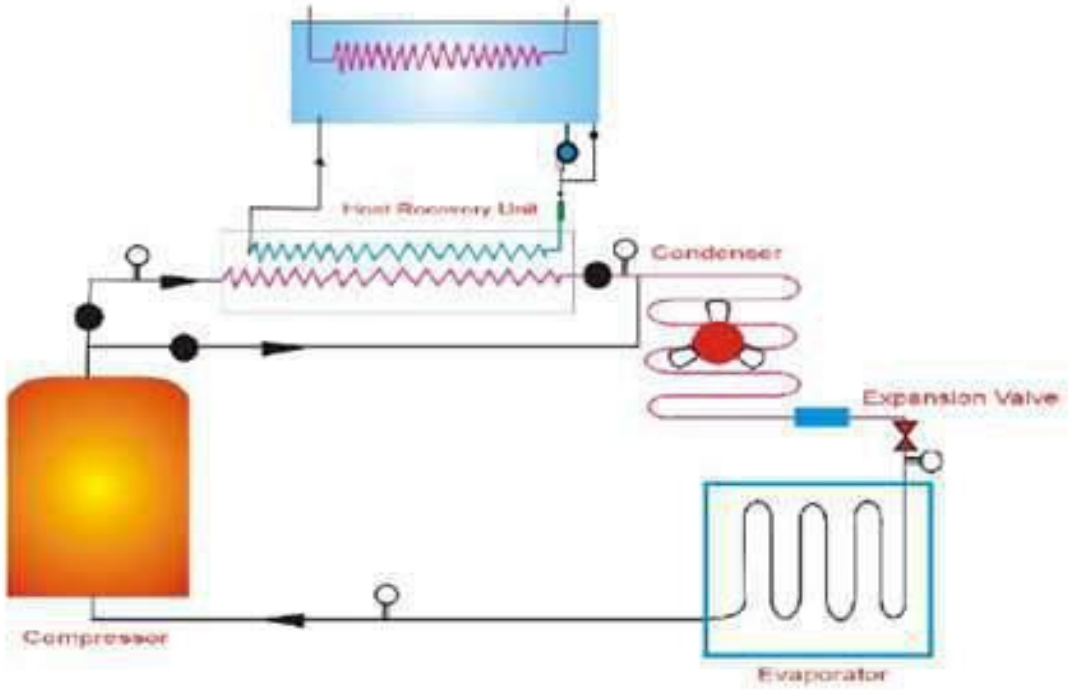
In general, the term heat pump is used to describe the cycle as heat energy is removed from the low-temperature space and rejected to the high-temperature space.

Both refrigerators and heat pumps move heat from a cold thermal reservoir to a warm thermal reservoir. The objective of refrigerators is to remove heat from a cold space whereas the objective of heat pumps is to put heat into a warm space. Both heat pumps and refrigerators use the same thermodynamic cycle and principles.

When a household refrigerator is operating, it rejects heat into the environment at the condenser and in warm climates that heat is usually wasted. In this paper, the feasibility of a new system which used the rejected heat at the condenser of the refrigerator to heat water in the geyser was investigated. Thus, a combined refrigerator/heat exchanger and geyser resulted in a single machine which maintained a certain physical space at cold temperature for storage of food and used the heat rejected by the refrigeration part for water heating.

The figure shows that a vapour compression cycle was used with the evaporator in the refrigerator and condenser in the heat exchanger which was connected to the geyser. Cold and low pressure refrigerant gas entered the compressor where its pressure (and temperature) increased. After the compressor, it then passed through the condenser where it gave up heat at approximately constant pressure to the water in the geyser so that the refrigerant’s temperature decreased sufficiently for it to condense into a sub cooled liquid.

After leaving the condenser it went through an expansion valve (which may be a capillary tube). The decrease in pressure in the expansion process caused the refrigerant to turn back into a mixture of liquid and vapour but at a much lower temperature. Then it went to the evaporator where it absorbed heat at approximately constant pressure from the food in the refrigerator.



A combined vapor-compression refrigeration system and geyser

II. LITERATURE REVIEW

Clark et al.1996, describe the design, construction, and testing of an integrated heat recovery system which has been designed both to enhance the performance of a residential refrigerator and simultaneously to provide preheated water for an electric hot water heater. A commercial, indirect-heated hot water tank was retrofitted with suitable tubing to permit it to serve as water cooled condenser for a residential refrigerator. This condenser operates in parallel with the air-cooled

condenser tubing of the refrigerator so that either one or the other is active when the refrigerator is running. The refrigerator was housed in a controlled-environment chamber, and it was instrumented so that its performance could be monitored carefully in conjunction with the water pre-heating system.

The system has been tested under a variety of hot water usage protocols, and the resulting data set has provided significant insight into issues associated with

commercial implementation of the concept. For the case of no water usage, the system was able to provide a 35 “C temperature rise in the storage tank after about 100 hours of continuous operation, with no detectable deterioration of the refrigerator performance. Preliminary tests with simulations of “high water usage,” “low water usage,’’ and “family water usage” indicate a possible 18-20% energy savings for hot water over a long period of operation. Although the economic viability for such a system in a residential environment would appear to be sub-marginal, the potential for such a system associated with commercial-scale refrigeration clearly warrants further study, particularly for climates for which air conditioning

heat rejection is highly seasonal

.

Stinson et al.1987, conducted research in dairy refrigeration by recovering the heat from condenser. A theoretical energy balance was conducted, from which the potential for recovery of refrigeration condenser heat was estimated to be up to 60% of the water heating energy requirements. Preliminary tests with heat exchangers led to the development and testing of a tube-in-tube, counter flow heat exchanger, with fins on the refrigerant side and cores on the water side to improve the heat transfer characteristics. The exchanger, designed to provide 300 1 of water at 60°C from a 2.25 kW refrigeration system which cooled 2100 1 of milk per day, had a surface area on the refrigerant side of 0.84, and an overall thermal conductance of 750 W m-2 C-1.

It was inserted between the compressor and the condenser of the refrigeration plant and tested with two condensing systems (air and water), together with varying conditions of condenser pressure and milk temperatures at inlet and final cooling. In addition, tests on the receiver pressure and suction superheat were performed to determine their effect on the overall system performance. Increasing the condenser pressure from 6.5 bar to 12 bar increased cooling times. In extreme circumstances the system failed to comply with the New Zealand milk cooling regulations. The average coefficient of performance (C.O.P.) of the refrigerator (with the heat exchanger in the circuit) decreased with increasing pressure, varying from 3.0 to 2.3 over this range of pressures for the water cooled condenser system. Values for the air cooled condenser

system were 0.3 to 0.4 lower due to fan power consumption.

Sanmati Mirji 2006, presented a multipurpose warming apparatus utilizing the waste heat of domestic refrigerator. The multipurpose apparatus was constructed as an additional part of the refrigerator. It used the waste heat generated by the refrigerator and has several possible household uses like food warming, domestic fermentation purposes such as curd making,

fermentation for Indian food. The maximum temperature of the chamber got as high as 50ºC and the average temperature was around 40 ºC. The main advantage of the invention was to keep cooked food warm for a sufficiently long duration before consumption as well as warming the food removed from the refrigerator before consumption. It makes use of the waste heat generated by the domestic refrigerator and does not need any additional power supply.

Mills 1986, investigated several methods of heat recovery as applied to a residence. One of the more interesting approaches involved the reclamation of heat from water after it has been utilized. Waste water is collected in a

454 litre holding tank, which also contains the evaporator for a 1.2 kW water-to-water heat pump. When the water temperature in the holding tank rises above a certain point, the heat pump is activated, transferring heat from the holding tank to the condenser which is mounted inside a 272 litre fresh hot water storage tank. An experimental prototype of this system was constructed and tested using a water usage pattern that was derived from an accepted standard hot water delivery schedule. The tests indicated that an energy savings of up to 60% over a typical 272 litre electric hot water heater was possible.

Analysis as a Tool for Vibration Measurement Signature

Mr.Navin Jass (AP/Mech)

INTRODUCTION:

The ability to plan and execute a repair schedule is extremely important in capital intensive industries. Unscheduled downtime is a bit like experiencing a major disaster' all hell breaks loose'. Therefore the condition monitoring is important to

detecting the fault in industrial machines. Condition monitoring is the measurement of various parameters related to the mechanical condition of the machinery, which makes it possible to determine whether the machinery is in good or bad mechanical condition. If the mechanical condition is bad, then condition monitoring makes it possible to determine the cause of the problem. Condition monitoring is used in conjunction with predictive maintenance, i.e., maintenance of machinery based on an indication that a problem is about to occur. In many plants predictive maintenance is replacing run-to-breakdown maintenance and preventive maintenance (in which mechanical parts are replaced periodically at fixed time intervals regardless of the machinery's mechanical condition).

TYPES OF CONDITION MONITORING SYSTEMS:

Condition monitoring systems are of two types: periodic and permanent. In a periodic monitoring system also called an off-line condition monitoring system, machinery vibration is measured or recorded and later analysed at selected time intervals in the field; then an analysis is made either in the field or in the laboratory. Advanced analysis techniques usually are required for fault diagnosis and trend analysis. Intermittent monitoring provides information at a very early stage about incipient failure and usually is used where

(1) very early warning of faults is required,

(2) advanced diagnostics are required,

(3) measurements must be made at many locations on a machine, and

(4) machines are complex.

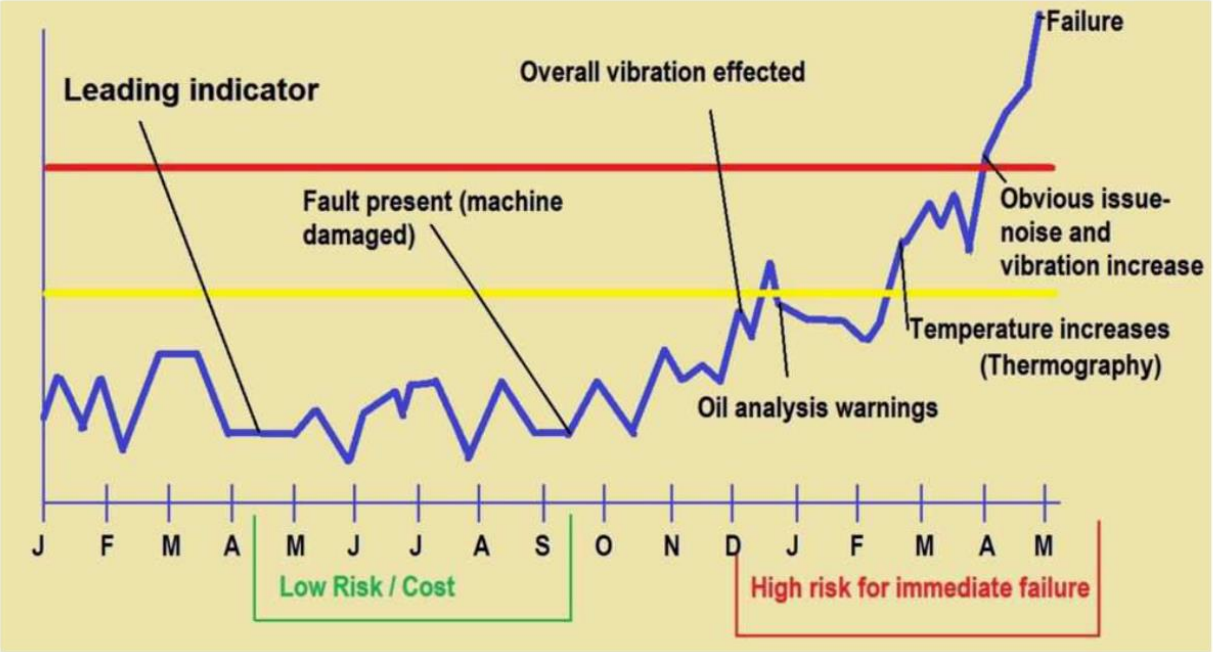
In a permanent monitoring system also called an on-line condition monitoring system, machinery vibration is measured continuously at selected points of the machine and is constantly compared with acceptable levels of vibration. The principal function of a permanent condition monitoring system is to protect one or more machines by providing a warning that the machine is operating improperly and/or to shut the machine down when a preset safety limit is exceeded, thereby avoiding catastrophic failure and destruction. The measurement system may be permanent (as in parallel acquisition systems where one transducer and one

measurement chain are used for each measurement point), or it may be quasi-permanent (as in multiplexed systems where one transducer is used for each measurement point but the rest of the measurement chain is shared between a few points with a multiplexing interval of a few seconds). In a permanent monitoring system, transducers are mounted permanently at each selected measurement point. For this reason, such a system can be very costly, so it is usually used only in critical applications where: (1) no personnel are available to perform measurements such as offshore, remote pumping stations, etc., (2) it is necessary to stop the machine before a breakdown occurs in order to avoid a catastrophic accident, (3) an instantaneous fault may occur that requires machine shutdown, and (4) explosive, toxic, or high-temperature environment does not permit the human involvement required by intermittent measurements. Before a permanent monitoring system is selected, preliminary measurements should be made periodically over a period of time to become acquainted with the vibration characteristics of the machine.

SIGNATURE ANALYSIS:

Fault detection of mechanical equipment based on vibration analysis consists in determine the relation between measured signals and fault model signals. Faults model signals are generated by simulation based on a-priori knowledge about mechanical dynamic behaviour of the process. If changes in these signals are related to faults in the mechanical equipment, a signature analysis procedure will be a further source of information. About machine vibration, sensors are used to detect for instance, imbalance and bearing faults. The extraction of fault-relevant signal characteristics can in many cases be restricted to the amplitudes or amplitude densities within a certain bandwidth of the signal.

In order to acquire some knowledge about qualitative aspects of faults, more information can be extracted by comparing the spectrum of vibration frequencies with a pattern of the faulty process. Resulting coincidences between measured signals and signal model of faulty process or faulty pattern spectrum are considered as deterministic faults.



TOOLS FOR SIGNATURE ANALYSIS:

ISO – 10816

ISO 10816-1 is the basic document which describes the general requirements for evaluating the vibration of various machine types when the vibration measurements are made on non – rotating parts. This part of ISO 10816 provides specific guidance for assessing the severity of vibration measured on bearings, bearing pedestals or housing of industrial machines.

MEASUREMENT QUANTITY

For the purposes of this part of ISO 10816, the following can be used:

(a) Vibration displacement, measured in micrometres;

(b) Vibration velocity, measured in millimetres per second;

(c) Vibration acceleration, measured in metres per square second.

VIBRATION MAGNITUDE

It is common practice, based on experience, when evaluating broad – band vibration of rotating machinery to consider the r.m.s value of vibration velocity, since thiscan be related to the vibration energy. However, other quantities such as displacement or acceleration and peak values instead of r.m.s values may be preferred. In this case, alternative criteria are required which are not necessarily simply related to criteria based on r.m.s values.

MEASURING POSITIONS

To define the vibration behaviour at each measuring position, it is necessary to take measurements at three mutually perpendicular directions. The requirement for operational monitoring is usually met by performing one or both measurements in the radial direction (i.e. normally in the horizontal transverse and / or vertical directions). These can be supplemented by a measurement by a measurement of axial dynamic force are transmitted.

WHY IS CONTINUING PROFESSIONAL DEVELOPMENT KEY FOR SUCCESS?

Mr. K. Rajasuthan (AP/Mech)

Employers want communications professionals who continue to develop key skills

Recruiters are actively seeking to place internal communications professionals who are developing good business judgment and skills. These are among the top 10 most important skills and competencies employers want in their new comms staff, according to feedback in interviews with 10 global leaders in employee communication Also, only about 7% of respondents -level communication professionals “need to improve their business skills and apply business acumen, including financial literacy, to their everyday job.

Better skills – higher employee retention

Continuing professional development (CPD) involves so much more than simply staying ‘on the ball’ professionally; it is also a vital means of employee retention. LinkedIn’s 2019 Workforce Learning Report showed that 94% of employees said they would stay at a company longer if it invested in further employee learning. The interest in continual education is particularly strong among millennials and Gen Zers. Around a fourth of the former and 27% of the latter said that the number one reason they would leave a job is the feeling that there were no opportunities to grow and learn.

Why is further learning key for people working in communications?

For those working in communications, social media, and public relations,

staying at the top of their game involves keeping up to date on the latest technological developments. The latter include but are not limited to artificial intelligence, virtual reality, and SEO software. Social media managers need not only worry about beautiful imagery and engaging content, but also about key SEO tools that enable them to conduct keyword searches, website audits, competitor analysis, back link monitoring, and the like. Software is continually being updated, and often, correct utilization isn't a matter of instinct. Rather, it requires training and, therefore, an investment of time and money.

Differences in earnings

Further study can make a big impact on your earnings. With a Master's degree in Communications, you can look forward to earning a median salary of $99,532 per year though top firms may pay even more. If you are already working, you may worry about not having enough time to study. These days, however, there are various options that can save you significant time and money. Some graduate and postgraduate degree programs are intensive; others can be studied part-time. The fastest way to get a bachelor's degree is to opt for an accelerated distance course that is focused on subjects such as marketing, communications, or computer science. These will all count as credits if you wish to complete a Master's further down the line.

Broadening your career opportunities

If you decide to pursue a postgraduate degree in communications, you will have a wider range of career paths to choose from. The tools and skills you learn will serve you well in a host of professions, including those of event planner, reporter, advertising executive, and communications manager. If in the past you were producing social media content or specializing in graphic design, a Master's degree will show you have the key requirements you need to manage a team, oversee all communications between departments in a large company, and even set up an internal media hub. Further learning opportunities are highly valued by younger generations of employees. Many would leave a company quickly, or simply not apply for a job at a company whose reputation for staff training and development is poor. In the past, completing a Master's degree while studying was almost impossible owing

to the need to attend courses in person. Today, however, online tools and accelerated programs have made it easier to get where you want to, faster.

Bring the joy of learning to your job

An interesting short item on "bringing the joy of learning to your job" was published recently as the Harvard Business Review's "Management Tip of the Day." Adapted from the 27 March 2020 HBR article, The Simple Joy of Learning, by Marc Zao-Sanders and Catalina Schvenger, the item offers several suggestions for people to consistently enjoy learning in their professional life: We all know that thrilling feeling of learning something new — a new recipe, a new word in a foreign language, a new chord on the guitar. And yet, so many of us go through our workdays on autopilot without setting aside time to learn something new. How can you introduce the joy of learning into your professional life? Start by taking control of what you read to better yourself and your career. Pay attention to what genuinely interests you, rather than relying on a website's algorithm for recommendations. Have an open mind about what "counts" as learning — you can find unexpected opportunities in movies, conversations with friends, speeches, or social media feeds.

Deep drone acrobatics

Mr. R. David (AP/Mech)

Since the dawn of flight, pilots have used acrobatic maneuvers to test the limits of their airplanes. The same goes for flying drones: Professional pilots often gage the limits of their drones and measure their level of mastery by flying such maneuvers in competitions.

Greater efficiency, full speed

Working together with microprocessor company Intel, a team of researchers at the University of Zurich has now developed a quadrotor helicopter, or quadcopter, that can learn to fly acrobatic maneuvers. While a power loop or a barrel role might not be needed in conventional drone operations, a drone capable of performing such maneuvers is likely to be much more efficient. It can be pushed to its physical limits, make full use of its agility and speed, and cover more distance within its battery life.

The researchers have developed a navigation algorithm that enables drones to autonomously perform various maneuvers -- using nothing more than onboard sensor measurements. To demonstrate the efficiency of their algorithm, the researchers flew maneuvers such as a power loop, a barrel roll or a matty flip, during which the drone is subject to very high thrust and extreme angular acceleration. "This navigation is another step towards integrating autonomous drones in our daily lives," says Davide Scaramuzza, robotics professor and head of the robotics and perception group at the University of Zurich.

Trained in simulation

At the core of the novel algorithm lies an artificial neural network that combines input from the onboard camera and sensors and translates this information directly into control commands. The neural network is trained exclusively through simulated acrobatic maneuvers. This has several advantages: Maneuvers can easily be simulated through reference trajectories and do not require expensive demonstrations by a human pilot. Training can scale to a large number of diverse maneuvers and does not pose any physical risk to the quadcopter. Only a few hours of simulation training are enough and the quadcopter is ready for use, without requiring additional fine-tuning using real data. The algorithm uses abstraction of the sensory input from the simulations and transfers it to the physical world. "Our algorithm learns how to perform acrobatic maneuvers that are challenging even for the best human pilots," says Scaramuzza.

Fast drones for fast missions

However, the researchers acknowledge that human pilots are still better than

autonomous drones. "Human pilots can quickly process unexpected situations and changes in the surroundings, and are faster to adjust," says Scaramuzza. Nevertheless, the robotics professor is convinced that drones used for search and rescue missions or for delivery services will benefit from being able to cover long distances quickly and efficiently.

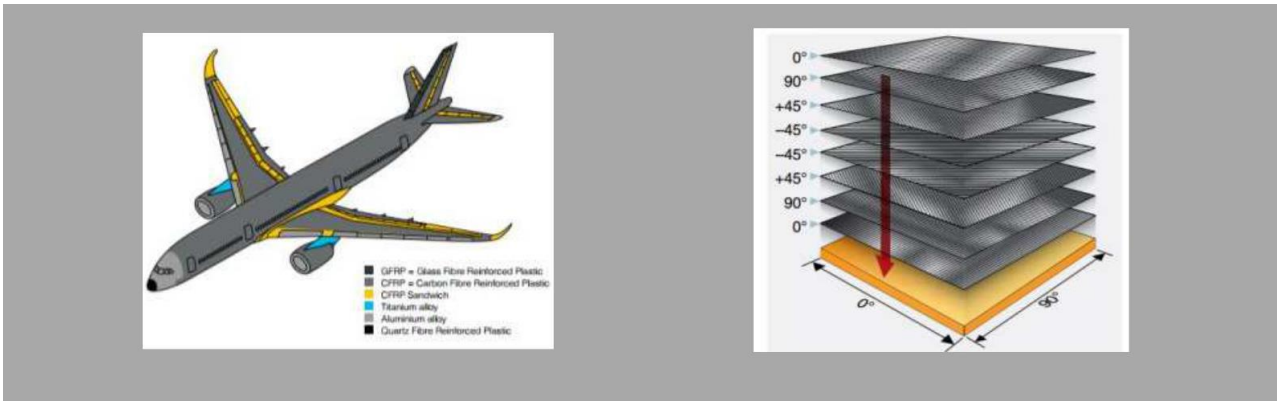
STUDENTS PAGE

Advanced Composite Materials in Aircrafts

Jude V J (IV Mech)

Advanced Composite Materials came in to existence to modify the existing materials In a way that it will enhance the physical and chemical properties of the material. ACMs are necessary in aircraft manufacturing since ACMs are light weight, more strong then conventional materials such as aluminum and fiberglass.

The aerospace industry and the manufacturers' unrelenting passion to enhance the performance of commercial and military aircraft is constantly driving the development of improved high performance structural materials. Composite materials are one such class of materials that play a significant role in current and future aerospace components. Composite materials are particularly attractive to aviation and aerospace applications because of their exceptional strength- and stiffness-to-density ratios and superior physical properties.



Composite materials in aviation came into existence about 60 years ago when boron-reinforced epoxy composite was used for the skins of the empennages of the U.S. F14 and F15 fighters. Although it was only 2% and was used in secondary structures but as development improved its use in primary structures such as fuselage and wings has increased widely.For example – The Airbus A350 XWB (Extra Wide Body) is the first aircraft whose primary structures (wings and fuselage) are completely made out

of carbon-fiber-reinforced polymer. A350 consists of 53% composites, 19% Al/Al-Li, 14% titanium, 6% steel, and 8% miscellaneous. Not only has this structure improved the aircraft's performance (weight), but also its maintenance and repair procedures. It has been designed to fulfill in-service requirements with benefits such as increased resistance to accidental ground service impacts, simplified damage assessment processes and proven repair solutions.

Advantages of using composite is that they can be formed into more complex shapes then their metallic counterparts, weight reduction, formability, better corrosion resistance and good resistance to fatigue.

The B2 stealth bomber requires a radar-absorbing material to be added to the exterior of the aircraft with a concomitant weight penalty.

Composite materials are therefore used in the primary structure to offset this penalty.

The strength and stiffness of a composite buildup depends on the orientation sequence of the plies. The practical range of strength and stiffness of carbon fiber extends from values as low as those provided by fiberglass to as high as those provided by titanium. This range of values is determined by the orientation of the plies to the applied load. Proper selection of ply orientation in advanced composite materials is necessary to provide a structurally efficient design. The part might require 0° plies to react to axial loads, ±45° plies to react to shear loads, and 90° plies to react to side loads. Because the strength design requirements are a function of the applied load direction, ply orientation and ply sequence have to be correct. It is critical during a repair to replace each damaged ply with a ply of the same material and ply orientation. This is makes carbon fiber quasi-isotropic in nature.

Underwater Turbine

Abdullah (IV Mech)

There are a lot of renewable energy resources sources which are used to obtain energy such as the solar energy obtained by placing solar panels, wind energy obtained by placing windmills on fields so that by wind energy it will give rise to rotation of

blades and producing electricity further.

Similarly this new technique has been coming into practice to the coastal areas where the turbine blades which are used for the wind energy purpose are placed underwater near the coastal areas. Because the coastal area receives the high and low tides due to the gravitational effect by sun and moon and the rotation of earth.

Ocean currents have the tendency to produce more currents as oceans are more dense than air(they are 832 times more dense than air),due to which it applies greater force on turbines .

Tidal energy can be produced by many technologies, the major ones are:

1) Tidal barrages

2) Tidal fences

3) Tidal turbines.

Hence tidal has one very distinct benefit it is virtually 100 predictable as unlike windmills which are criticized for spoiling the views on land. With underwater turbines you cannot hear it or see it and hence they are very environmentally beloved and does not produce any noise.

Hydrogen: Future's Fuel

Aathithya Valluvan (III Mech)

Hydrogen is one of the most abundant and promising fuel source available in the air. It is lighter than air and incredibly pure. When used in the fuel cell it is highly efficient and leaves no carbon emission behind. And best of air it is virtually everywhere. It is found everywhere in the plants, water, manure etc. But the Problem arises before it can be used it has to be separated.

There are a lot of ways to produce hydrogen:-

I. Steam reforming:

Steam reforming of methane Is the most common method for the hydrogen production. It combines methane with the high temperature steam to trigger a reaction and separate the hydrogen. At high temperatures (700 – 1100 °C) and in the presence of a metal-based catalyst (nickel), steam reacts with methane to yield carbon monoxide and hydrogen.

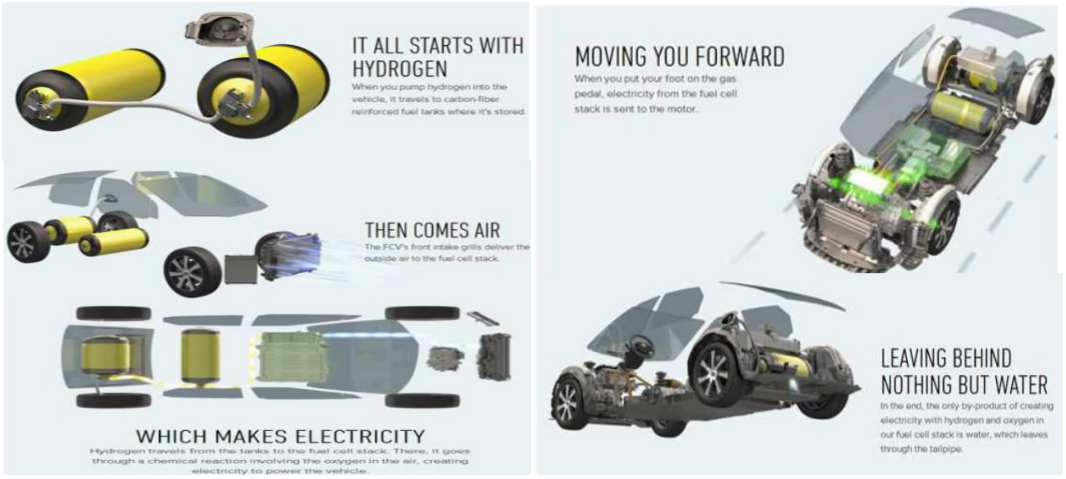
$$CH_4 + H_2O \rightleftharpoons CO + 3H_2$$

II. Gasification:

Gasification is a process that converts organic or fossil fuel based carbonaceous materials into carbon monoxide, hydrogen and carbon dioxide. This is achieved by reacting the material at high temperatures (>700 °C), without combustion, with a controlled amount of oxygen and/or steam.

III. Electrolysis:

Hydrogen can also be produced by separating water into its two primary elements—hydrogen (H2) and oxygen (O2). This process, known as electrolysis, passes an electrical current through the water to extract hydrogen. The electricity can be sourced from clean, renewable energysuch as wind, solar, or hydro.



ROHINI COLLEGE OF ENGINEERING & TECHNOLOGY
Near Anjugramam Junction, Kanyakumari Main Road, Palkulam, Variyoor P.O - 629401
Kanyakumari Dist, Tamilnadu., E-mail : admin@rcet.org.in, Website : www.rcet.org.in
DEPARTMENT OF MECHANICAL ENGINEERING

THANK YOU