



# ROHINI

COLLEGE OF ENGINEERING AND TECHNOLOGY

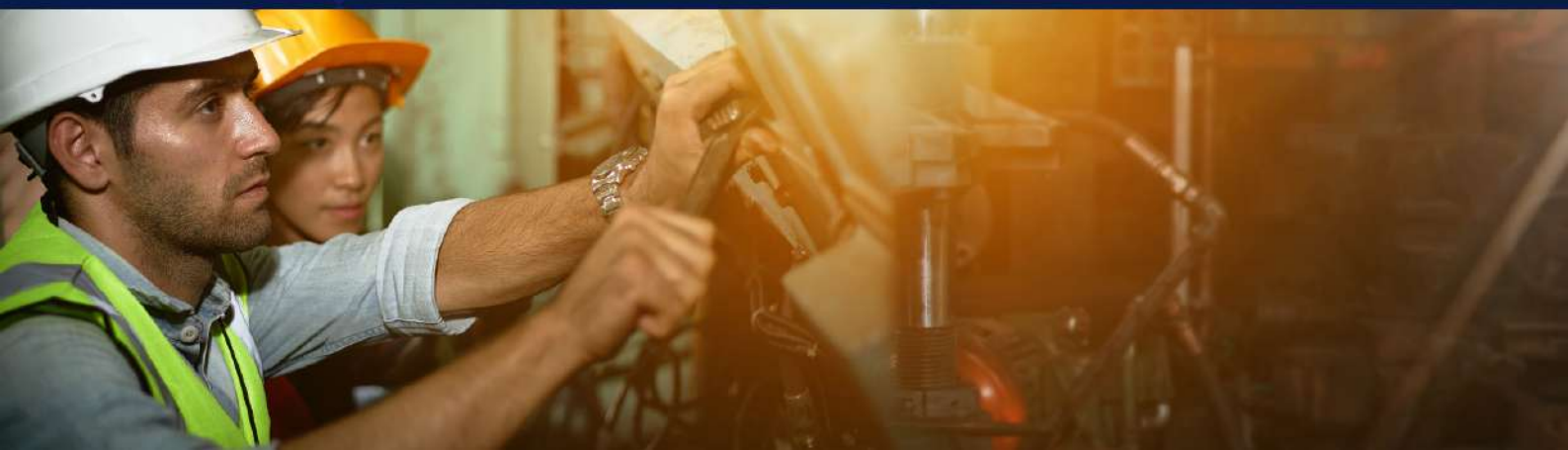
Approved by AICTE and affiliated to Anna University, (An ISO Certified Institution)

# INTERNATIONAL CONFERENCE ON MODERN TRENDS IN ENGINEERING (ICMTE-2021)



Organized By

Department of Mechanical Engineering  
Rohini College of Engineering and Technology



## **ABOUT THE COLLEGE**

**Rohini College of Engineering and Technology (RCET)** - a temple of learning, is an ISO certified institution was founded in the year 2012 by the great Industrialist and Philanthropist, Shri. K.Neela Marthandan and now managing by his son Dr.N.NeelaVishnu. It is located at Palkulam near Anjugramam junction & Kanyakumari, the southernmost town in India. RCET is about 5 km from the Kanyakumari railway station and 14 km from Nagercoil junction. RCET is approved by All India Council for Technical Education (AICTE), New Delhi & affiliated to ANNA University, Chennai since 2012. The main feature of the college comprises world-class infrastructure with experienced and talented faculties, excellent pass percentage, good placement records and society-oriented products/projects developed by the students. 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.

**RCET** - 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.

## **ABOUT THE 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 accomplishes outcome Based Education which helps 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 a lot of opportunities like a technical presentation in Symposium, conferences for skill development. The department provides value-added knowledge to undergraduates and postgraduate 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.

## **ABOUT THE CONFERENCE**

Engineering as a major innovative and creative area for the necessary of the nation. every day to day life becomes a challenge due to technology development availability of resources and its utilisation. mechanical engineering please a vital role in the present scenario due to design fabrication and Research it motivates the researches and Industrial Estate for developed efficient Technologies to reduce time cost and increases the efficiency to sustain the world for better excellence.

The objective of International Conference on Modern Trends in Engineering (ICMTE) is to provide an intellectual forum for the professionals and exports of different environments to expose its and Emphasis the application of science in tutorial practical existence of human life. the conference offers a chance for leading researchers, engineers and scientist to exchange their thoughts and its relations with the latest technology and to find Global experts to work together for the betterment of society.

## CONFERENCE MESSAGE BY A PATRON

Warm and Happy greeting to all. I am immensely happy that the department of Mechanical engineering of our college is organizing an International Conference on Modern Trends in Engineering (ICMTE) presented collection of various technical papers in the proceedings.

Under the able guidance of our management, RCET continues to march on the way of success with confidence. The sharp, clear-sighted vision and precise decisionmaking powers of our management have benefited our college to say competitive.

The dedicated faculty members and disciplined students of RCET are the added features of our college. I also congratulate the faculty members, students of Mechanical departments, Participants from our colleges and other colleges for their efforts in organizing and participating in this conference and wish the conference all the success.

*Best Wishes,*

**Dr.R.RAJESH, M.E., Ph.D.,**

Principal

Rohini College of Engineering and Technology,  
Kanyakumari, Tamilnadu, India.



## CONFERENCE MESSAGE BY THE CONVENER

This International Conference on Modern Trends in Engineering (ICMTE), organized by ROHINI College of Engineering and Technology, Kanyakumari, Tamilnadu, India. is an attempt to focus the attention of all concerned professionals to discuss at length concerned with the Emerging trends in engineering & technology, to seek solutions wherever possible and identify areas, where further are research, are needed. Invited contributions from experts on various topics with separate divisions on Energy, Aerospace, Marine, Composite Materials, Material Science & Alternative Fuels are presented in the proceedings.

Around 50 participants have confirmed their registration and presentation at the conference. The issue of the proceedings contains 35 papers accepted and presented in the conference. New materials with fascinating possibilities are being explored. Conducting polymers to smart materials would offer enormous shortly. Micro and Nanomaterials are likely to change our lifestyle and become part of our daily life and not just the subject of seminar or talks.

Information provided in various papers and reproduced in the proceedings is aimed at benefiting the Engineers and professionals. It is expected that the purpose would be served satisfactorily through in-depth discussion and interaction among participants during the conference. I take this opportunity to record my heartfelt appreciation and gratitude to all the authors, delegates, and all others participating.

*Best Wishes,*

**Dr.D.PRINCE SAHAYA SUDHERSON, M.E., Ph.D.,**  
Professor/Head,  
Department of Mechanical Engineering, Rohini College  
of Engineering and Technology, Kanyakumari,  
Tamilnadu, India.





## CONFERENCE MESSAGE BY THE ORGANIZING SECRETARY

As the Research Director of RCET the International Conference on Modern Trends in Engineering (ICMTE), I would like to cordially welcome all interested academicians, researchers and engineers in the broad disciplines of Mechanical Engineering to attend and/or present at this conference. The topics cover research in the area of solid mechanics, fluid mechanics, thermodynamics and heat transfer, aeronautical engineering, automotive engineering, material science, marine and ocean engineering, manufacturing engineering, control and automation, industrial and systems engineering and also mechanical design as well as other related topics. Originally, this international conference is intended to boost the publication of our Mechanical Engineering staff as well as becoming a platform for UG/PG students and research scholars to learn some experience in presenting technical articles in an international virtual conference. However, this virtual conference is also open to all postgraduate students, faculties and researchers throughout the world to share their research findings. It will be a good research findings forum and is expected to be an annual event of the mechanical department in the future.

The conference will be held on 25th June 2020 at Imperial Hall, Rohini College of Engineering and Technology, Kanyakumari, Tamilnadu, India. I hope you all will have a good deliberation in the virtual conference during this COVID-19 pandemic period and wish you all success in your research. Looking forward to your participation in International Conference on Modern Trends in Engineering (ICMTE)

*Best Wishes,*

**Dr. S. INDRAN, M.E., Ph.D.,**

Director - Research,

Rohini College of Engineering and Technology, Kanyakumari,  
Tamilnadu, India.



## CONFERENCE MESSAGE BY PUBLICATION CHAIR

On behalf of the organising committee of this International Conference on International Conference on Modern Trends in Engineering (ICMTE), We would like to extend our warm welcome to all the presenters and participants, in particular. We would like to express my sincere gratitude to our plenary and invited speaker. The highlight of the conference was the keynote address given by **Dr.K.SUDHAKAR, Senior Lecturer, Faculty of Mechanical and Automotive Engg & Technology, Universiti Malaysia Pahang, Malaysia** on Advancement of Solar Technologies.

The International Conference (ICMTE), organized by the Department of Mechanical Engineering, Rohini College of Engineering and Technology is an ISO certified organization, affiliated to Anna University Chennai, approved by AICTE, is intended to be the first step toward their top-class Conference on Mechanical Engineering and its research. We believe that the International Conference will give opportunities for sharing and exchanging original research ideas and opinions come on gaining inspiration for future Research and broadening knowledge about various fields in advances in mechanical engineering

The proceedings of this conference (ICMTE), contains a total number of 36 papers which have been selected from a total of 70. The selected papers will be presented during the conference by virtual mode, because of pandemic COVID-19. We like to express our sincere appreciation to the members of the program committee for their critical review of the submitted papers as well as the organizing committee for the time and energy they have devoted to editing the proceedings and arranging this conference. We also like to give appreciation to the others who have submitted their excellent works at the conference. Last but not least, We would like to extend our gratitude to the Managing Director, Chief Financial Officer, Principal, Research Director, Head of the mechanical department, my dear colleagues of Rohini College of Engineering and Technology.

*Best wishes,*

**MANOJ.J.K**

Assistant Professor

Department of Mechanical Engineering,

Rohini College of Engineering and Technology,

Kanyakumari, Tamilnadu, India



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## **HEAT TRANSFER ENHANCEMENT OF DOUBLE PIPED HEATEXCHANGER USING DIFFERENT INSERTS**

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### **ABSTRACT**

Heat transfer enhancement is an active and important field of engineering research since increase in the effectiveness of heat exchangers through suitable heat transfer augmentation techniques can result in considerable technical advantages and savings of costs .Considerable enhancement were demonstrated in the present work by using small shape of pins on surface of heat exchangers. Analysis is done by placing different twisted tapes such as normal twisted tape; W-Shaped cut twisted tape, Rhombus cut twisted tape, Rectangular cut twisted tape, Triangular cut twisted tape at different mass flow rate 2.2 kg/s, 2.75 kg/s, 3 kg/s for cold water and 2.4 kg/s, 2.8 kg/s, 3.2 kg/s for hot water. The result shows that Triangular cut twisted tape is 33% more efficient than Rhombus cut twisted tape of heat transferring.

**Keywords:** Heat transfer enhancement, Inserts, CFD, Analysis, Parallel and counter flow.

## **EXPERIMENTAL INVESTIGATION OF SOLAR WATER HEATER CONTAINING TWISTED TAPE INSERTS**

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### **ABSTRACT**

Heat transfer in a solar water heater could be enhanced by means of twisted tapes, inserted inside the fluid flow tubes. Which induce swirl flow and act as turbulence promoters. Experimental investigation for a solar water heater with twisted tape inserts having twist pitch to tube diameter ratio range assume 3 have been carried out for varying mass flow rates. Solar water heaters having twisted tape inserts inside the flow tubes perform better than the plane ones. It has been observed that heat losses are reduced (due to the lower value of plate temperature) consequently increasing the thermal performance. The solar water heaters of (SWHs) of 100-300 litres capacity are suited for domestic use. A 100 liters capacity SWH can replace an electric geyser for residential use and may save approximately 1500 units of electricity annually. The use of 1000 SWHs of 100 liters capacity each can contribute to a peak load saving of approximately 1 MW. A SWH of 100 liters capacity can prevent emission of 1.5 tones of carbon dioxide per year.

**Keywords:** Solar water heater, twisted tape inserts and thermal performance.



## **INVESTIGATION ON MECHANICAL AND TRIBOLOGICAL PROPERTIES OF ALUMINIUM MATRIX COMPOSITES PREPARED BY STIR CASTING ROUTE**

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### **ABSTRACT**

Aluminium-based metal matrix composites are continuously replacing traditional engineering materials, which have drawn the attention of automotive, aerospace, structural, transportation and marine industries due to their outstanding combination of high specific strength, high elastic modulus, lightweight, high stiffness, and improved wear resistance compared with non-reinforced alloy matrix. Aluminum matrix composites (AMCs) have become more potential in engineering applications such as brake disc, driveshaft and cylinder liner, owing to their excellent strength to weight ratio and resistance to high-temperature operations. This research study's foremost objective is to evaluate the mechanical and tribological characterization of composite materials were synthesized by a stir casting technique. Novel ceramic particles were included in several percentages by weight in the aluminum alloy. This research study concentrates on introducing lightweight aluminum with novel ceramic particulates reinforced aluminum matrix composites using a liquid metallurgy process. The base alloy and proposed composite specimens were subjected to hardness, tensile and wear test. Metallurgical characterization of parent material and synthesized material were investigated by a scanning electron microscope (SEM). The tribological behavior of the composites was investigated by a pin-on-disc machine. Mechanical properties like hardness, impact, fatigue and ultimate tensile strength (UTS) of the developed composite materials were examined. Finally, the synthesized composite materials are sound and strong and effective for transportation, airplane, structural, and non-structural applications. Lightweight materials are mainly extensively employed in automobile applications like vehicle structure, piston, body frame, drive shaft, and connecting rod.

**Keywords:** Aluminum matrix composites, reinforced aluminum matrix composites and automobile applications.

## **EXPERIMENTAL STUDIES ON THE EFFECT OF HARDNESS ON METAL INERT GAS WELDING PROCESS PARAMETERS ON AISI 1018 MATERIAL**

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### **ABSTRACT**

The quality of the welding process is vital for the industrial sector to satisfy customer requirements. Welded joints generally have superior mechanical properties, especially when compared to screwed joints. Heat energy is play crucial role in the joining of materials with (or) without the use of filler rod. The Metal Inert Gas (MIG) welding is used to join similar/dissimilar material combinations by using filler rod. The AISI 1018 material is used as the test specimen for the welding process, and it has many applications in the automotive, aerospace, nuclear, and manufacturing industries. The input parameters are considered as voltage, current and flow rate and the output response as hardness of the weldment which is determined by using Rockwell hardness testing machine, Taguchi Design of Experiments (DOE) of L9 orthogonal array has beenused with three levels and three factors for experimentation. The weldment's quality is determinedby the input process parameters selected based on customer requirements and satisfaction. So after the experimentation, the S/N ratio is optimized and ANOVA is used to identify that current is a major dominating parameter in welding of AISI 1018 material.

**Keywords:** Metal Inert Gas welding, AISI 1018, Hardness, Taguchi Design, ANOVA Analysis.

## **PERFORMANCE, COMBUSTION AND EMISSION ANALYSIS OF HCCI ENGINE FUELED WITH MTBE BLENDED GASOLINE**

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### **ABSTRACT**

The development of HCCI combustion technology has been drawing a great deal of attention from researchers. This survey explains ongoing research methodologies and results. HCCI combustion, other than conventional combustion, is purely based on chemical kinetics. At present the automobile sector faces the problem of emissions and needs to develop clean technologies. However, HCCI operation still has issues such as ignition control, combustion phasing control, operating range control, cold start, and UHC (unburned hydrocarbon) and CO (carbon monoxide) emissions. Compared to conventional compression ignition and spark ignition combustion methods, the HCCI combustion mode is noticeably faster and also provides better thermal efficiency. The main objective of this review paper is to study the engine performance and emission characteristics of HCCI engines operating in various conditions. This paper will go through a detailed discussion of all the above conditions.

**Keywords:** HCCI, Combustion, engine performance, emission, additive fuel.

## **EXPERIMENTAL INVESTIGATION OF FIBER MATERIAL COMPOSITE IN LEAF SPRING**

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### **ABSTRACT**

Composite materials are extensively used in many engineering applications due to high strength and stiffness to weight ratio. The objective is to compare the stresses deformations and weight saving of composite leaf spring with that of steel leaf spring. The design constraint is stiffness. The Automobile Industry has great interest for replacement of steel leaf spring with that of composite leaf spring since the composite materials has high strength to weight ratio good corrosion resistance. The material selected was glass fiber reinforced polymer (epoxy resin) is used against conventional fiber. The design parameters were selected and analyzed with the objective of minimizing weight of the composite leaf spring as compared to the fiber leaf spring. The sample availability of natural fibers such as Bamboo and Coconut fiber. Common matrix materials include epoxy phenol polyester polyurethane vinyl ester etc. The composites formed by fiber gained attention due to their low cost light weight renewability low density high specific strength non abrasively non toxicity and biodegradability etc. In this project discussed the Composite material Plate by using Bamboo and Coconut Fiber with Epoxy composite and to evaluate the Mechanical properties of leaf spring (Tensile strength, Hardness, Toughness Examination).

**Keywords:** Leaf spring, glass fiber, Bamboo and Coconut Fiber.

## **OPTIMIZATION OF CUTTING PARAMETERS OF EN-31 ALLOY STEEL IN END MILLING OPERATION**

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### **ABSTRACT**

This project work investigates the effects of various milling parameters such as spindle speed, feed rate, depth of cut and coolant flow on the surface roughness (Ra) of finished products. The experimental plan is based on Taguchi's technique including L9 orthogonal array with four factors and four levels for each variable and studying the contribution of each factor on surface roughness. The experiments will be conducted on EN-31 material on CNC vertical milling machine under minimum quantity lubrication. The rice bran oil will be used as lubricant. The study will find the influences of three cutting parameters Spindle Speed, Depth of cut, Feed rate and coolant flow affecting surface roughness while milling of EN-31 alloy steel. The influence of cutting parameters on surface roughness will be studied. The analysis of mean and variance technique will be employed to study the significance of each machining parameter on the surface roughness. The optimum set of cutting parameter for minimum surface will be suggested.

**Keywords:** EN-31 Alloy Steel, Cutting parameter, L9 Orthogonal array

## **VIBRATION FREE SHEET METAL HOLE PRODUCING ATTACHMENT IN DRILLING MACHINE**

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### **ABSTRACT**

“Diamond cuts Diamond”, says the adage. This is the philosophical statement. This is the underlying idea that underpins the machining of material from a solid. The use of a punching machine in sheet metal punching is a highly expensive and time-consuming procedure. Instead of utilizing a punching machine to solve the aforementioned difficulty, we are using our vibration- free sheet metal hole generating attachment to do so. The primary focus of this research was to minimize vibrations in the work material. Specifically designed spring and ball attachments are employed to accomplish this task. Using this sheet metal hole creating attachment, you may create holes with precise proportions. Sheet metal hole generating attachment is used to cut arcs in sheet metal, which is accomplished by the use of sheet metal hole creating attachment. Designing and modelling the attachment, as well as identifying the advantages and disadvantages of this drilling method, are the primary goals of this project. Another goal is to increase the machining rate of this machine.

**Key words:** Sheet metal, Drilling, Vibration



## DESIGN AND ANALYSIS OF PNEUMATIC GRINDING MACHINE

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### ABSTRACT

We have pleasure in introducing our new project “**Design And Analysis Of Pneumatic Grinding Machine**” “is the process of removing metal by the application of abrasives which are bonded to form a rotating wheel. When the moving abrasive particles contact the work piece, they act as tiny cutting tools, each particle cutting a tiny chip from the work piece. It is a common error to believe that grinding abrasive wheels remove material by a rubbing action; actually, the process is as much a cutting action as drilling, milling, and lathe turning. The grinding machine supports and rotates the grinding abrasive wheel and often supports and positions the work piece in proper relation to the wheel. A grinding section with spring and lock arrangement is used to attach the grinding tool with the rotating wheel. Thus simultaneously the cutting/grinding section will be rotated and the speed of rotation is depending upon the velocity of wind flow. This equipment has a good efficiency compared to other and also forward and reverse speed is constant, so good finishing is obtained by using this machine. This project is developed for the users to grind and cut objects and also provide a hole using air pressure. The vanes are rotated by wind energy. A set of gears is connected with the axle to reduce the speed and to increase the power. A chain drive mechanism is connected with the gear to extend the rotation at the bottom. When the axle is rotated, the cutting section will be rotated.

**Keywords:** Abrasives, grinding, air pressure and rotating wheel.

## **OPTIMIZATION OF CUTTING PARAMETERS OF EN-31 ALLOY STEEL IN END MILLING OPERATION**

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### **ABSTARCT**

This project work investigates the effects of various milling parameters such as spindle speed, feed rate, depth of cut and coolant flow on the surface roughness (Ra) of finished products. The experimental plan is based on Taguchi's technique including L9 orthogonal array with four factors and four levels for each variable and studying the contribution of each factor on surface roughness.

The experiments will be conducted on EN- 31 material on CNC vertical milling machine under minimum quantity lubrication. The rice bran oil will be used as lubricant. The study will find the influences of Four cutting parameters Spindle Speed, Depth of cut, Feed rate and coolant flow affecting surface roughness while milling of EN-31 alloy steel. The influence of cutting parameters on surface roughness will be studied. The analysis of mean and variance technique will be employed to study the significance of each machining parameter on the surface roughness. The optimum set of cutting parameter for minimum surface will be suggested.

**Keywords:** Taguchi's technique, EN- 31 material, surface roughness and machining parameter.

## **MULTI AXIS ROTATING TILTING TIPPER**

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### **ABSTRACT**

Multi Axis Rotating Tilting Tipper is nothing but one of the Lifting system in automobile at the time of emergency. In this Lifting system pneumatically operated one. Here the additional pneumatic cylinder DC Motor with gear and Control Valve is provided in the automobile itself. In this project, Tipper rotates our required Position using DC Motor and the Control Valve is used to activate/deactivate the Air input. The Valve is ON at the time of emergency; the compressed air goes to the pneumatic cylinder. Then the compressed air passes through the tube, and then pushes the pneumatic cylinder, so that the Tipper Lifting is applied at the time of Valve in ON position (i.e.-Emergency time). The speed of the pneumatic cylinder is varied by using flow control valve. This is the way of controlling Lifting speed of the Trailer at the time of emergency. In our project, we have to apply this Multi Axis Rotating Tilting Tipper Mechanism in Load lifting materials.

**Keywords:** Lifting system, pneumatic cylinder, DC Motor and flow control valve.

## **A SAFETY IMPACT OF SPEED LIMITER FOR TWO WHEELER**

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### **ABSTRACT**

Over speeding vehicle make lot of nuisance sometimes also leading to loss of lives and other damages. Also imposing speed restrictions through sign boards have been rendered fruitless where in the vehicle drivers do not comply with it and resulting catastrophic. Vehicle Speed Limit Controller Project is a great solution to this problem as it not only provides speed limitations it also implements it through a controlling mechanism. The project works with RF communication between the speed sign post and the vehicle controller system. A motor is used here to depict as a vehicle. Whenever a vehicle comes in range of the RF speed sign post the sign post transmits the speed limit for that particular road to the vehicle system. The vehicle controller system receives this signal through RF receiver and further perceived by the microcontroller. The speed of the vehicle can be incremented / decremented manually with the help of push buttons. If the system was at lower speed than the limit received from the sign post than there will be no changes made to the speed of the system. However if the speed of the vehicle was manually incremented to a higher value then the controller will impose the speed restriction and bring back the speed value to the value specified by the limit. Now if the user tries to increase the speed the system does not allow it to do so till it is in range of the RF speed sign post. The speed of the vehicle and the limits are displayed on an LCD. Thus this system greatly helps in curbing the speed of over speeding vehicles ensuring safety of vehicles on accident prone road ways.

**Keyword:** Limit Controller, vehicle controller system and safety of vehicles.

# **INVESTIGATION ON MECHANICAL AND TRIBOLOGICAL CHARACTERISTICS OF MEDICAL GRADE Ti6AL4V TITANIUM ALLOY IN ADDITION WITH CORROSION STUDY FOR WIRE EDM PROCESS**

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## **ABSTRACT**

Industries must respond to the changing demand and modifications in order to survive in a dynamic and competitive environment. Titanium materials have been extensively utilised in biomedical and aerospace industry components due to their enhanced mechanical characteristics. The analysis utilized RSM-based computational technique to evaluate the WEDM characteristics (MRR, SR, and TWR) of Ti6Al4V Titanium Alloy in biomedical applications. The biggest drawback of the material in the biomedical industry, which including orthopedic applications and dental implants, would be that it releases harmful atoms such as iron, chromium and nickel into the bodily fluid environment. To combat the problems, a hydroxyapatite layer applied to the metal implant improves biocompatibility, osteocompatibility, and antimicrobial properties. The modified differential evolution (MDE) optimization technique was introduced and afterwards used to find the most likely reaction conditions for a given combination of coating technologies. By comparing the MDE approach to the basic differential evolution (DE) optimization strategy, the effectiveness of the MDE approach has been established. According to the cyclic polarized test, the HAp coated Titanium material had better corrosion resistance than the pure sample. The HAp coated titanium material has a higher zone of inhibition than the pure sample.

**Key words:** Titanium Ti6AL4V, Wire Electric Discharge Machine, hydroxyapatite, RSM

## **EFFECT OF HYBRID NANOFLUIDS ON CONJUGATE HEAT TRANSFER INSIDE A PARTIALLY HEATED ENCLOSURE**

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### **ABSTRACT**

This paper presents the results of conjugate heat transfer inside a partially heated enclosure with hybrid nanofluids. The left wall of the enclosure is an isothermally hot wall possessing a thick baffle on it. The length of the heating on the left isothermal wall is varied from 20% to 100%. A detailed parametric study has been carried out to analyze the effect of Rayleigh number ( $104 < Ra < 106$ ), volume fraction and thermal conductivity ratio on heat transfer. The presence of the baffle affects the heat transfer significantly. The average Nusselt number is found to be an increasing function of Rayleigh number, volume fraction of the hybrid nanofluid and thermal conductivity ratio. Al<sub>2</sub>O<sub>3</sub>-Cu hybrid nanofluid is observed to provide highest heat transfer among all the hybrid nanofluids considered in the present study.

**Keywords:** Conjugate heat transfer, Enclosure, Hybrid nanofluid.

## **DEVELOPMENT OF COMPUTERISED SHELL AND TUBE HEAT EXCHANGER SYSTEM IN CO-CURRENT, COUNTER CURRENT MODE AND CROSS FLOW TYPE**

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### **ABSTRACT**

In the current scenario, the application of heat exchanger plays a pivotal role. Over the past few years, computerized heat exchanger has been developed to effectively study the changes occurring on the fluid within the heat exchanger under different conditions. As we know that when the heat transfers surface is large, the shell and tube heat exchanger will be recommended. The setup consists of double pipe type/shell and tube heat exchangers, heating tank, rotameter for flow measurements and SSR for heater temperature control. Temperature transmitter senses temperatures of inlet and outlet water and transmits signals. These units along with necessary piping and fitting are mounted in support housing designed for standalone setup. The interfacing unit is used for computer interface. The process parameter is controlled through computer by manipulating hot water temperature to the heat exchanger through solid state relay. The heat transfer rate and effectiveness of heat transfer under co-current and counter current mode can be calculated at different flow rates and heat loads. Performance parameters of heat exchanger like Logarithmic mean temperature difference and overall heat transfer co-efficient is analyzed under different conditions using computerized software. The controller is connected to computer through USB for monitoring and controlling the process. User friendly software is utilized along with the hardware to perform different set of experiments.

**Keywords:** Heat Exchanger; Co-current; counter current; Logarithmic Mean temperature difference; Heat transfer coefficient

## **DESIGN AND FABRICATION OF DRONE AMBULANCE FOR EMERGENCY MEDICATION**

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### **ABSTRACT**

The emergency medication or the first aid medication is achieved as earlier through the ariel transportation via ambulance drones it will be act as the virtual interface between the doctors in the hospital and the patient want to be treated immediately, this drone contains with the first aidtool kid which will be act as the essential emergency medication vehicle. It is also helps for the servicing in the medical field as transporting medical equipment for testing and pharmaceutical drugs delivery. This drone is specially made for reducing the time wasting for Emergency medication at the golden hour without any traffic delays made from the Regular ambulance. Camera and Monitor, Mic and Speaker will be used for Visual and audio interface between the doctor and the patient. The system is designed to have the short distance flying with more accuracy at less time which carrying a pay load of 3kg this will be helpful to achieve fastest medication at the earlier time. GPS system is used for tracking the location of the patient.

**Keywords :** Drone ambulance, Ariel ambulance, Drone Medicine Delivery, Medical communication drone



## **DESIGN AND DEVELOPMENT DRONE OPERATIONS IN SEA BOARDING TASKS**

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### **ABSTRACT**

An unmanned aerial vehicle (UAV), commonly known as a drone, is an aircraft without any human pilot, crew, or passengers on board. UAVs are a component of an unmanned aircraft system (UAS), which includes adding a ground-based controller and a system of communications with the UAV. The flight of UAVs may operate under remote control by a human operator, as remotely-piloted aircraft (RPA), or with various degrees of autonomy, such as autopilot assistance up to fully autonomous aircraft that have no provision for human intervention. UAVs were originally developed through the twentieth century for military missions too "dull, dirty or dangerous" for humans, and by the twenty-first, they had become essential assets to most militaries. To begin, the specifications for the drone are collected and put down in the form of a 2D schematic. Using SOLIDWORKS commands and constraints conditions, the sophisticated combined 3D solid view will be constructed. The CAD file in IGES format will be imported into the ANSYS workbench software. Following the import, the parameters for the materials will be determined by choosing suitable materials for the military use. We will now build a mesh and add boundary conditions to it. The structural analysis will be carried out under different loading scenarios to produce stress, strain distributions and deformations in the drone that will be used to investigate the design. As control technologies improved and costs fell, their use expanded to many non-military applications. These include forest fire monitoring, aerial photography, product deliveries, agriculture, policing and surveillance, infrastructure inspections, science, smuggling, and drone racing.

**Keywords:** UAV, Drone, RPA,

## **DESIGN AND FABRICATION OF LIGHT WEIGHT MULTI-PURPOSE ORNITHOPTER**

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### **ABSTRACT**

This paper written about the construction of an ornithopter which imitates the flapping motion of a bird's flight and the characteristics of lift and thrust generations of various wing designs are studied. This project focuses on the spar arrangement and the materials used for the wings that can achieve efficient performance. Different wing types of insects and birds were analyzed for understanding the production of lift created by the natural flyers by flapping the wings. Various experiments were conducted on different wing designs and materials and a design was developed for this ornithopter. The prototype comprises of a length of 50 cm and a wing span of 1.3m and weighs around 540 g. The mechanism which was to be used for the flapping motion of the wing was designed and fabricated. This was achieved with the use of a brushless motor and a flexible and light wing structure. The tail of the ornithopter has a design concept like the elevators of an aircraft. The tail is divided into two parts controlled by 2 servo motors which can move in opposite directions or the same directions at the same time. In this report we have applied an idea where we could use a pollution sensor in it and using giving a fpv camera to feed a live information when the ornithopter in flight.

**Keywords:** Ornithopter, Lift and Thrust, design, Flapping motion, Wing structure.

## **THE COMBUSTION CONTROL IN HOMOGENEOUS CHARGE COMPRESSION IGNITION ENGINES**

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### **ABSTRACT**

The Homogeneous charge compression ignition engine is renowned because of its high efficiency and ultra low emission. The combustion occurring in an HCCI engine is fundamentally different from the combustion in a SI Engine or in a CI Engine. In HCCI Engines the heat release occurs as a global auto ignition process, which differs from the turbulent flame propagation or mixing controlled combustion used in current engines. The advantage of this global auto ignition is that the temperatures within the cylinder are uniformly low, yielding very low emissions of Nox. The inherent features of HCCI combustion allows for design of engines with efficiency comparable to or potentially higher than diesel engines. While HCCI engines have great potential, several technical barriers exist which currently prevent widespread commercialization of this technology. The most significant challenge is that the combustion timing cannot be controlled by typical in-cylinder means. This paper focuses on understanding basic characteristics of controlling and operating HCCI engines.

**Keywords:** HCCI engine, auto ignition and combustion.

## **Die Sinker Electrical Discharge Machining Process - A Review**

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### **ABSTRACT**

The process of removing excess material from a work piece in order to attain the result, as well as the product's required shape and structure, is described as machining. A variety of machining processes are available to remove unwanted materials in the form of chips for achieving the required quality and dimensions. However, it has some disadvantages like tool wear, friction losses and drive train losses. In order to overcome these difficulties, Die Sinker Electrical Discharge Machining is one of the most significant machining processes that is generally applicable to machine the materials. During this machining process, heat energy is produced by the electrical spark discharge between tool and the work piece, a dielectric medium is used to remove material in the size of micro craters. This paper discusses the work carried out by the previous researchers on Die Sinker Electrical Discharge Machining for different work piece materials and its performance based on Material Removal Rate, Machining Time and Surface Integrity. Based on the review of literature, it is clearly addressed that the main difficulties during Die Sinker EDM process on various parts and also to evaluate the influence of machining parameters during the Die Sinking EDM process.

**Keywords:** Die Sinker Electrical Discharge Machining Process, Input Process Parameters, Pulse ON Time, Pulse OFF Time, Mechanical Properties, Output Responses.

## **ROTARY FRICTION WELDING OF METALS: A REVIEW**

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### **ABSTRACT**

Rotary Friction Welding is preferred over conventional processes because of low cost, highly precise operations, repeatability and reliability. Rotary friction welding being the most popular variant it can be classified into Continuous Drive Friction welding and Inertial Drive Friction Welding. Friction welding is a solid-state joining process that produces coalescence of materials under compressive force contact of work pieces rotating or moving relative to one another to produce heat and plastically displace material from the faying surfaces. Under normal conditions, the faying surfaces do not melt. Filler metal, flux, and shielding gas are not required with this process. Measurements with thermocouples show that this difference could amount to several hundred degrees in the initial phase of welding process. But as the heating progresses, the temperature on the welding surfaces level off, primarily because of heat conduction and because of redistribution of heat liberation. Metal surface heated to a high temperature becomes plastic before other others and under the influence of axial force are deformed and flatten out. They ceaseto resist axial force and the latter is now transmitted by cooler portions of the friction surface whereheat liberation is then increased, the temperature being continuously evened out across the specimen. This becomes evident while reviewing micrographs of the cross-section of the samples where the duration of heating varies in the course of welding process. If after a short heating periodthe heat-affected zone in the centre portion of the specimen does not extend into depththen, in sampling requires a long heating time the exterior boundary of the zone of thermal influence is located almost parallel to the surface of the weld. Thus, plastic deformation of heated portion of themetal plays an important role in friction welding process, on other hand contribution to the destruction and elimination and destruction surface oxide films.

**Keywords:** Heat-affected zone, plastic deformation and joining process.

## **MECHANICAL AND METALLOGRAPHIC CHARACTERISTICS OF DIFFUSION BONDED AA6061/AA7075 ALUMINUM ALLOY JOINTS**

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### **ABSTRACT**

Diffusion bonding is a solid-state joining process that is well suited for uniting different metals. In order to produce high-quality bonding, it is crucial that the process parameters be optimised. It has also been shown that the amount of atomic diffusion, as measured by the thickness of the interface layer, is substantially connected to the mechanical strength of the joints. In this study, AA6061/AA7075 aluminium alloys were used, and the shear strength and ramtensile strength of diffusion bonded joints were evaluated and analysed. The joint strength increases with increasing interface thickness up to 6 metres, but then decreases due to the formation of brittle intermetallics when interface thickness is raised further.

**Key words:** Mechanical strength, Metallographic characteristics.

## **A REVIEW OF HYDROGEN AS AN ALTERNATE FUEL FOR IC ENGINES**

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### **ABSTRACT**

The world's energy needs are met in large part by the extraction of fossil fuels like oil, natural gas, and coal. Coal is responsible for a major portion of the world's electrical energy production, primarily in India, and this holds true everywhere else on the planet as well. The production of greenhouse gases such as carbon dioxide, nitrous oxide, and sulphur dioxide, amongst others, into the atmosphere is one of the many factors that contribute to the greenhouse effect. This effect poses a threat to the environment and casts a shadow over the future of fossil fuels in general and coal in particular. One of the prospective methods that is now being investigated and developed to assist decrease emissions of greenhouse gases is the usage of hydrogen energy. This is one of the alternative technologies that are currently being researched and developed. Hydrogen has the prospective to become an environmentally friendly, reliable, and cost-effective source of energy for India in the future, which would enable the nation to satisfy its growing energy needs. This study will offer an overview of the technological options that are presently being researched for the production and storage of hydrogen energy. The objective of the study is to fulfill this purpose. This article contains not only the road map for main areas of research and development in hydrogen energy but also presents that road map in a phased way for easier comprehension.

**Key words:** Hydrogen Energy, IC engines

## **UTILIZATION OF CASHEW NUT SHELL LIQUID DIESEL BLEND BY VARYING FUEL INJECTION PRESSURE IN DIESEL ENGINE**

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### **ABSTRACT**

The GDP growth of any country in the world mainly depends on Energy, Environment & Economy. Especially for countries like India depends heavily on oil import to meet their growing energy needs. Use of edible bio-oil for biodiesel production may not be a viable option due to its high demand for cooking purpose. Biodiesel is biodegradable, non-toxic and has the capacity for sustainable development, energy conservation and environmental preservation. However, non edible and discarded oils like cashew nut shell oil (CNSO) or cashew nut shell liquid (CNSL) can be harnessed to supplement the increasing need for automobile fuels. The direct usage of CNSO as a fuel in direct injection diesel engine suffers from the problem of incomplete combustion due to high viscosity. To overcome this raw oil is thermally cracked in thereactor which makes the fuel properties closer to diesel fuel. The experiments were conducted on a four stroke, single cylinder, water cooled diesel engine at a rated speed of 1500rpm, with different fuel injection pressures of 200 bar, 220 bar & 240 bar for CNSL20 (20% cashew shell liquid and 80% diesel). The experimental study reveals CNSL20 at an injection pressure of 220bar was found to manifest better engine performance compared to diesel fuel. The CO & HC emission decreased for blend of CNSL, a slight increase in NO was noticed. The rate of pressure raise and heat release rate is increased at full load conditions due to higher fuel mass injection.

**Keyword:** edible bio-oil, Biodiesel, HC emission and diesel engine.



## **PROCESSING AND CHARACTERIZATION OF STRYCHNOS - NUX VOMICA FIBER REINFORCED EPOXY BASED COMPOSITE MATERIAL**

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### **ABSTRACT**

Polymer Matrix Composites (PMC) consist of thermoset or thermoplastic matrix resins reinforced by fibers which can be used in various sectors such as Automotive, Aircraft and aerospace, Marine, Sports goods, Biomedical, Electrical, Protective equipment, Industrial and Structural application. Because PMC exhibit lightweight, high stiffness and their high strength along the direction of their reinforcements. The synthetic fibre material is used in polymer composite which causes to environmental pollution and its material cost is high. In this study, natural fibre is identified and nux-vomica fiber reinforced composite is fabricated using compression moulding process. It can be also used as alternative reinforcement for FRP (Fiber Reinforced Polymer) composite material. The composition of epoxy and nux-vomica fiber in wt% are varied as 70:30, 60:40 and 50:50. The mechanical properties such as tensile strength, flexural load and impact energy are measured for nux-vomica fiber reinforced composite. From the results, it is found that the maximum mechanical properties such as tensile strength (14.93 MPa), flexural load (1.76 kN) and impact energy (6 Joules) are obtained at composition of 50:50 in wt%.

**Keywords:** Polymer Matrix Composites, polymer composite and mechanical properties.

## **COMPUTER AIDED DESIGN AND DEVELOPMENT OF FIRE PROOF LIFE SAVING ROBOT**

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### **ABSTRACT**

Fire incident is a disaster that can potentially cause the loss of life, property damage and permanent disability to the affected victim. Robots are incorporated into the production systems to boost the automation of manufacturing operations as part of the Fourth Industrial Revolution.

Robotic fire fighting systems are designed with certain tasks in mind. These include analyzing and locating fires, conducting search and rescue, monitoring hazardous variables and the primary task of fire control and suppression. Our proposed robot is designed to be able to work on its own or be controlled remotely. We have come up with a solution such that the proposed Fire Extinguisher Robotic System which will be more cost effective thereby making it more easily accessible to the users. By using these robots, fire identification and rescue activities can be done with higher security without placing fire fighters at high risk and dangerous conditions. In other words, robots can reduce the need for fire fighters to get into dangerous situations. The proposed system will be more easy to operate so that it will be convenient to operate the system to make the fire extinguishing process. Additionally, having a compact size and automatic control also allows the robot to be used when fire occurs in small and narrow spaces with hazardous environments such as tunnels or nuclear power plants. In addition due to its compact size, it is easily portable and can be installed in each and every house of our nation.

**Key words:** Disaster Management, Fire Fighting robot

## **EXPERIMENTAL STUDIES ON WEDM OF INCOLOY 925 SUPER ALLOY WITH DEEP CRYOGENICALLY TREATED AND TEMPERED**

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### **ABSTRACT**

As a hard material, Incoloy 925 super alloy is highly utilized in various industries due to its excellent mechanical properties. Therefore, the EDM process of this alloy provides some technical benefits. Wire electrical discharge machining (WEDM) is a non-traditional machining process that is widely used in precision manufacturing. Cryogenic treatment is generally used as secondary treatment to enhance the hardness and wear properties of tool steels. Cryogenic heat treatment was applied at two different temperatures for 24 soaking periods. The microstructure of the cryogenic heat-treated cutting tool was investigated as micro hardness. As a result of microstructure analysis, heat treatment soaking period was found to be more effective than heat treatment temperature. This paper presents the investigation on surface roughness and metal removal rate of stainless steel using the wire-cut EDM process. Process input parameters wirefeed (WF), wire tension (WT), servo voltage (SV), pulse on time (TON) and pulse off time (Tuff), and the output parameters surface roughness and metal removal rate. The experimental results revealed that the most important machining parameter of the pulse of time has the most influence on the metal removal rate and the surface roughness. The experimental result shows that the model is suitable for improving the surface quality by reducing the surface roughness. The scanning electron microscopy (SEM) is used to identify the microstructure of the machined work piece. A scanning electron microscope (SEM) is used to scan a surface of machined nickel alloys and show information of surface composition. XRD is used to analysis the structure of crystalline material and chemical composition information of nickel alloys material. (EDX) is an x-ray technique used to identify the elemental composition of nickel alloys.

**Key words:** Incoloy 925 super alloy, Wire electrical discharge machining and XRD.

## **ANALYSIS OF MECHANICAL AND METALLURGICAL CHARACTERISTICS OF CRYOGENICALLY TREATED INCONEL 800H IN MACHINING WITH WEDM**

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### **ABSTRACT**

Inconel is mainly a super alloy which is mixture of nickel and chromium. Inconel is a conductive material. Super alloy are suitable for WEDM. Wire EDM is a non conventional machining process. WEDM is mainly used for machining very hard and tough material like super alloys, Inconel alloy is a corrosion oxidation resistant nickel alloy that is used both for its high strength and outstanding aqueous corrosion resistance. Inconel 800H alloy high corrosionfatigue strength, resistance to chloride- ion stress- corrosion. WEDM is used making industries, automobiles, aerospace, nuclear, computer and electronics industries. Increase in the usage of nickel-based superalloys in the field of aviation, marine industry, nuclear reactor due to its excellent mechanical properties like corrosive resistance, carburization resistance especially at elevated temperature. Nickel based superalloys are very tedious to machine in conventionalbecause of high strength, less conductivity of thermal, strain hardening property. In this study, oneof the best Unconventional machining processes i.e., Wire electric discharge machining is used for machining of Inconel 800H (Incoloy).The present investigation focuses the effect of process parameters on Material Removal Rate (MRR), Surface Roughness (Ra) and Wire Wear Ratio (WWR) in wire EDM of Inconel 800H. Machining was done by using a cryogenic treatedmolybdenum wire. The experiments were performed by considering different process parameters viz. tool electrode, current density, pulse on time, pulse off time, wire feed, wire tension and waterpressure

**Key words:** EDM, Wire electrical discharge machining and XRD.

## **PERFORMANCE ENHANCEMENT DEHUMIDIFIER WITH DOUBLE PIPE HEAT EXCHANGER**

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### **ABSTRACT**

In the present study, a new design improvement of conventional smooth tubes by inserting. Double pipe heat exchanger are devices that provide the transfer of thermal energy between two fluids at different temperature. The major use of these heat exchangers is the sensible heating or cooling process of fluids where small heat transfer areas are required. Heat exchanger works via conduction, where the heat from one flow is transferred through inner pipe wall, which is made of a conductive material such as steel or aluminum. The double pipe heat exchanger is often used in counterflow, where its fluids move in opposite directions. Double pipe heat exchangers have one of the most straight forward designs, and as a result, they are easy to be fabricated and repaired. All the devices have some advantages and disadvantages and here we will show you if the double pipe heat exchangers are suitable for your application or not.

**Key words:** Double pipe heat exchanger, heat transfer and aluminium.

## **MACHINABILITY TO STUDY OF CRYOGENICALLY TREATED INCONEL 925 ALLOY USING WEDM PROCESS**

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### **ABSTRACT**

INCONEL 925 is an age hardenable nickel-iron-chromium alloy with additions of molybdenum, copper, titanium and aluminum. The alloy's chemical composition is designed to provide a combination of high strength and excellent corrosion resistance. The nickel content is sufficient for protection against chloride-ion stress corrosion cracking. The nickel, in conjunction with the molybdenum and copper, also gives outstanding resistance to reducing chemicals. The molybdenum aids resistance to pitting and crevice corrosion. The alloy's chromium content provides resistance to oxidizing environments. The titanium and aluminum additions cause a strengthening reaction during heat treatment. INCOLOY alloy 925 is used in various applications requiring a combination of high strength and corrosion resistance. Because of the alloy's resistance to sulfide stress cracking and stress-corrosion cracking in "sour" (H<sub>2</sub>S containing) crude oil and natural gas, it is used for down-hole and surface gas well components including tubular products, valves, hangers, landing nipples, tool joints and packers. The alloy is also useful for fasteners, marine and pumps hafting and high-strength piping systems. The effect on material removal rate has been evaluated by using two different cryogenically treated wires. Then the results for two wires have been compared.

**Key words:** INCONEL 925, titanium and aluminum additions and cryogenically treated wires.

## **MACHINABILITY STUDY OF CRYOGENICALLY TREATED AND TEMPERED WITH INCONEL 925 12HRS FURNACE COOL**

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### **ABSTRACT**

In our present work, Precipitation strengthened Ni based alloy, Incoloy 925 is widely used in the H<sub>2</sub>S-containing hot sour environments because of its excellent properties. Metallurgical properties, which is known to affect the performance of this alloy greatly depends on the welding technique adopted, ageing condition, formation of inter-metallic phases and hardness. Hence, in this research work, the joints of Incoloy 925 are accomplished in a single pass with the use of nano-SiO<sub>2</sub> activated flux tungsten inert gas (A-TIG) welding process. Further, the A-TIG welded joints were subjected to direct ageing for 4 h and 12 h at 732 °C and air-cooled. Recrystallized grains were observed in the fusion region in the as-welded (AW) condition. The grain boundaries of the weld seams were precipitated with M<sub>7</sub>C<sub>3</sub> carbides, discrete amounts of  $\eta$  (Eta) and  $\sigma$  (Sigma) phases after subjecting to DA. The tensile strength of the weld seams was increased to ~41 % and 31 % after having exposed to DA for 4 and 12 h respectively. The failures due to tension occurred in the fusion zone of Incoloy 925 irrespective of the DA conditions. The formation of  $\eta$  phase and high angle grain boundaries (HAGBs) resulted in a lower percentage of elongation and impact toughness when aged for 12 h.

**Key words:** Incoloy 925, Recrystallized grains, A-TIG welded joints and toughness.

## **EXPERIMENTAL AND PERFORMANCE ANALYSIS OF A SOLAR STILL WITH AN EXTERNAL CONDENSER**

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### **ABSTRACT**

The purpose of this project is to design a water distillation system that can purify water from nearly any source, a system that is relatively cheap, portable, and depends only on renewable solar energy. The motivation for this project is the limited availability of clean water resources and the abundance of impure water available for potential conversion into potable water. In addition, there are many coastal locations where seawater is abundant but potable water is not available. Our project goal is to efficiently produce clean drinkable water from solar energy conversion. In this paper, the performance of a solar still depends on the water mass inside the basin. The yield of still is increased by integrating a solar still with condenser. The condenser is used to increase the efficiency of the solar still. Analytically, the water mass inside the basin is increased from 20kg to 100 kg. Theoretically it shows an increase in water mass and decrease yield from 6% to 46% a day. The use of solar thermal energy in seawater desalination applications has so far been restricted to small-scale systems in rural areas. The reason for this has mainly been explained by the relatively low productivity rate compared to the high capital cost. However, the coming shortage in fossil fuel supply and the growing need for fresh water in order to support increasing water and irrigation needs, have motivated further development of water desalination and purification by renewable energies.

**Key words:** Water distillation system, solar energy conversion and renewable energies.



## **CRYOGENICALLY TREATED AND AIR COOLED INCONAL 925 ALLOY USING WITH WEDM PROCESS**

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### **ABSTRACT**

In our project Inconel Alloy 925 is used for cryogenic treatment to increase the machinability and hardness of the material. Inconel materials are difficult to machine by conventional process because of hard in nature so we use wire electrical discharge machining (WEDM) cutting process is for machining is hard material Inconel 925, complex shapes with higher dimensional accuracy and surface finish is possible. A thin molybdenum wire of 0.25mm standard diameter is taken for this machining process. Due to their high temperature mechanical strength and high corrosion resistance properties, medical and mechanical industry. Inconel alloy is a nickel base super alloy having a property of corrosion resistances to oxidation and their ability to maintain integrity in high temperature. The having a Property of high corrosion fatigue strength, high tensile strength, chloride-ion stress corrosion cracking, high creep and oxidation resistance. It can be strengthened by solid-solution hardening, work hardening and precipitation hardening. It is precipitation hardenable nickel-iron-chromium alloy and age hardened by adding aluminium and titanium. It can be used in environments with high temperatures and mechanical stress, and also where high surface stability. The super alloys are nowadays used in marine, space, and other applications. Modern machining techniques such as WEDM are increasingly being used for machining such hard materials. Hence, this study focused on machining of Inconel 925 using WEDM in order to satisfy production and quality requirement.

**Key words:** Wire electrical discharge machining, Inconel 925 using WEDM and hard materials.

## PERFORMANCE TEST ON MIXED REFRIGERANT IN DOMESTIC REFRIGERATOR

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### ABSTRACT

A chassis Refrigerator is a household appliance used to preserve the foods, vegetables, beverages at low temperature. Refrigerant is the blood of the refrigerator and it changes its phase to transfer heat for giving cooling effect inside the refrigerator. Generally many refrigerator works under the vapour compression cycle and it uses only one refrigerant. This work presents the development process of Refrigerator test ring and then carries out the performance analysis of domestic refrigerator. The experiment platform which is called refrigerator test ring will be developed from refrigerator model. Performance of refrigerator also depends on inlet and outlet condition of each component. So in this research work refrigerator test ring will be developed and obtain performance of domestic refrigerator in term of Refrigeration Capacity, Compressor Work and Coefficient of Performance (COP) by determining two important parameter during operating condition which are temperature and pressure. In this project combination of R600a (isobutene) and R134a (1, 1, 1, 2-tetrafluroethane) is selected as a mixed refrigerant. R600a have some good properties like zero ODP, zero GWP and high latent heat of vapourization and R134a is non-toxic, non-flammable, and non-corrosive and zero ODP.

**Key words:** Coefficient of Performance, domestic refrigerator, temperature and pressure.

## **FINITE ELEMENT ANALYSIS OF ISO2062 MATERIAL FOR DEEP DRAWING WITH TWO STAGE FORMING**

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### **ABSTRACT**

In our present work low carbon structural steel (IS2062, Carbon 0.17 to 0.19 wt %) is used for deep drawing application, investigated with required consideration of forming load and thickness reduction. Initially 3 stage forming process was taken and values are compared with the fem analysis and design of experiments using response surface method (RSM).Regression model is generated and analysis is carried out using ANASYS software and values are compared with experimental values. Factors mainly influencing the deformation behavior of the sheet metal process parameters namely die nose radius, blank holder force and friction coefficient on the deep-drawing characteristics of a low carbon structural Steel axis-symmetric cup was determined shape is formed. In the present study, deep drawing process of steel metal used to cup shape forming was investigated from the required forming pressure and load increased to point of view. Firstly, the process was simulated using finite element method and then was verified using experimental data. For investigation of different process parameters since the implementation of fully experimental or simulation design is impossible, the design of experiments using response surface method (RSM) was carried out.

**Keywords:** Deep drawing, RSM, FEM, ANASYS, Sheet metal.

## **PERFORMANCE ANALYSIS OF HUMIDIFIER USING WITH PAPYRUS AS PACKING MATERIAL**

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### **ABSTRACT**

A humidifier is a device that increases humidity (moisture) in a single room or an entire building. In the home, point-of-use humidifiers are commonly used to humidify a single room, while whole-house or furnace humidifiers, which connect to a home's HVAC system, provide humidity to the entire house. Medical ventilators often include humidifiers for increased patient comfort. Large humidifiers are used in commercial, institutional, or industrial contexts, often as part of a larger HVAC system.

**Keywords:** HVAC system, Medical ventilators, humidifiers and patient comfort.

## **SIMULATION AND EXPERIMENTAL DETAILS OF DEEP DRAWING PROCESS OF IS2062 MS PLATES BY USING ANSYS SIMULATION**

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### **ABSTRACT**

In our present work low carbon structural steel (IS2062, carbon 0.17 to 0.19 WT %) is used for deep drawing application, investigated with required consideration of forming load and thickness reduction. Initially 2 stage forming process was taken and values are computed with the fem analysis and design of experiments using response surface method (RSM). The six parameters are taken into consideration for finding required forming load and thickness reduction. Regression model is generated and analysis is carried out using ANSYS software and values are compared with experimental values. Optimization of sheet metal forming process parameters was an important assignment to reduce cost of manufacturing to product. Factors mainly influencing the deformation behaviour of the sheet metal process parameters namely Die nose radius, Blank holder force and Friction coefficient on the deep drawing characteristics of low carbon structural steel axi-symmetric cup was determined. In experiment radial clearance between the die and the punch is taken as 0.15mm each side for reducing the earring effect and stretcher strain defect, due to that flange thickness of cup shaped component is increased up to maximum of 0.5mm due to ironing effect in the deep drawing process, Both steel friction coefficient and die clearance is play a main role in forming operation. Deep drawing operation is carried out in 1200-Ton hydraulic press with servo controlled mechanism, finite element model result showed good agreement with experimental result. Experimentally, a cylindrical cup with LDR of 1.8 has been successfully achieved.

**Keywords:** ANSYS software, Deep drawing operation and servo controlled mechanism.

## **DESIGN AND ANALYSIS OF HEAT TRANSFER ENHANCEMENT OF DOUBLE PIPED HEATEXCHANGER USING DIFFERENT INSERTS**

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### **ABSTRACT**

Heat transfer enhancement is an active and important field of engineering research since increase in the effectiveness of heat exchangers through suitable heat transfer augmentation techniques can result in considerable technical advantages and savings of costs .Considerable enhancement were demonstrated in the present work by using small shape of pins on surface of heat exchangers. Analysis is done by placing different twisted tapes such as normal twisted tape; W-Shaped cut twisted tape, Rhombus cut twisted tape, Rectangular cut twisted tape, Triangular cut twisted tape at different mass flow rate 2.2 kg/s, 2.75 kg/s, 3 kg/s for cold water and 2.4 kg/s, 2.8 kg/s, 3.2 kg/s for hot water. The result shows that Triangular cut twisted tape is 33% more efficient than Rhombus cut twisted tape of heat transferring.

**Keywords:** Hot water pipe, Cold water pipe, Normal twisted tape, Twisted tape with Rhombus cut, Twisted tape with W-shaped cut, Twisted tape with Rectangular cut, Twisted tape with Triangular cut

## VENTILATED STEERING WHEEL

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### ABSTRACT

Our body temperature differs from the atmospheric temperature to the car cabin's temperature. Heat inside the cabin can be cooled by using A/C which already exists in all cars, that only cools the cabin of the car by that our body comes to normal temperature. But the driver holds the steering wheel all the time, where that holding area cannot get ventilation. That makes the driver's hand wet. Whenever the driver's hand gets sweated, the thermal sensor detects that and makes the conditioned air flow to the hands of the driver through the several pores made in the steering wheel. This system also reduces the unnecessary friction between hands and steering wheel. Steering wheels are used to steer a vehicle by the driver. They are shaped like wheels and move in a circular motion. Although all steering wheels are not the same, most are circular and revolve around a central hub. It is common for these steering wheels to be half-circles, also known as butterfly steering wheels. The steering wheel transmits the driver's direction to the steering shaft, which moves the wheels left and right. The wheels of the car do not move in the same direction as they move in one direction at a time. This periodic motion occurs under the steering system, which controls the vehicle's movement. During rotation, the steering column, thrust bearing, and other steering system components transmit movement to the steering wheel. There are different steering wheel types, but rack and pinion steering wheel systems and recirculating-ball steering systems are the most common.

**Keywords:** Steering wheels, vehicle's movement, rack and pinion and recirculating-ball.

## **PERFORMANCE OF SOLAR AIR HEATER WITH TRIANGLE SHAPED ARTIFICIAL ROUGHNESS**

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### **ABSTRACT**

Solar air heater is one of the best methods to convert solar energy into heat energy. Solar heating technologies use only free, renewable and clean energy. Large number of experimental investigations, Involving different types of artificial roughness element have been carried out to improve the heat transfer from the absorber plate to air flowing in solar air heaters. In this project glazed solar air heater is used to achieve higher temperatures. In this experimental setup, triangle shaped artificial roughness is placed above the absorber plate in the solar air heater to improve thermal efficiency. Two solar air heaters has been constructed with same dimensions and materials, except the artificial roughness, the first one is with quatrefoil shaped artificial roughness and another model is without artificial roughness. The results has been taken from both the solar air heaters and then compared to find the thermal efficiency of the solar air heater.

**Keywords:** Solar air heater, quatrefoil shaped artificial roughness and thermal efficiency.



## **STUDY OF INVESTIGATION OF MECHANICAL AND METROLOGICAL PROPERTIES OF CRYOGENICALLY TREATED CUTTING INSERTS**

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### **ABSTRACT**

High-strength materials are hard to machine with ordinary tools and necessitates tool Inserts of high strength and hardness to machine them. One of the methods to improve the Physical properties of an insert material is cryogenic treatment which involves the treating of Materials at low temperatures. In the current experiments, two multilayer carbide tool inserts WS40PM and F40M were analyzed by cryogenically treating them. Three class of cutting tool Inserts were taken for comparison: untreated, cryogenically treated and cryogenically treated and Tempered (CTT). The microstructural changes were observed through scanning electron Microscopy, and the change in microstructure of all classes of tool inserts was compared and Contrasted. Hardness of the tool inserts was measured using Vickers microhardness tester, and The variation of crystallite size in tool inserts was examined through X-ray diffraction studies. Rate of tool wear (through flank wear) was observed by performing shoulder milling operation Onthe mild steel EN8 grade steel at constant velocity in a CNC vertical machining center using Treated and untreated tool inserts. The results showcased the increase in insert hardness, Microstructure and tool life of treated tools when compared with untreated tool inserts. Highest hardness was achieved for CTT tool inserts and was found to be 1142 HV for WS40PM and 1483 for F40M inserts, respectively. From the flank wear studies, F40M inserts experienced a wear of 203 um and WS40PM inserts experienced 269 upon machining.

**Keywords:** Carbide tool inserts, mild steel EN8, X-ray diffraction and crystallite size.

## **SIMULATION AND ANALYSIS OF DEEP DRAWING PROCESS ON SHEET METAL USING ANSYS SOFTWARE**

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### **ABSTRACT**

Deep drawing is one of the most important forming process is used in sheet metal forming industries it conversion of sheet metal formed into desired shape and size by subjecting the sample to a plastic deformation. This process costly and widely used manufacturing process in this technique is difficult, in many industrial applications. The aim is to analysis the influence of the forming parameter in deep drawing process on outcomes like drawing force and thinning ratio in cylindrical cub forming it simulated using for finite element method, this work the deep drawing process is simulated with analysis 17.0 software.

**Keywords:** Deep drawing, ANSYS, Finite element analysis.

## **SIMULATION OF SINGLE STAGE DEEP DRAWING FORMING PROCESS OF SHEET METAL MATERIAL USING FEM ANALYSIS**

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### **ABSTRACT**

To avoid the expensive and difficult experiments, modern manufacturing is based on the analysis forming processes in numeral atmosphere before the actual production set-up. In the presented work the single stage deep drawing process of thin walled, mild steel, conical back plate of radial impeller of blowers is approached by means of a finite element analysis. Simulation of the drawing process for determining stress distribution in the drawn component for a particular displacement is explained in the presented work. The distribution of stress in the drawn component is obtained. The study was conducted by using ANSYS12.0, in which, two models have been tested. Both models constructed solely out of axisymmetric, quad 4 node, PLANE 42 elements which have been used to simulate the drawing process of drawing quality mild steel IS2062 grade. This study will be beneficial to the tool designer and the manufacturers doing work in this field. Initially single stage forming process was taken and values are compared with the FEM analysis and design of experiments using response surface method RSM. The 6 parameters are taken into consideration for finding required forming load and thickness reduction. Regression model is generated and analysis carried out using ANSYS software and values are compared with experimental values. Optimisation of sheet metal forming process parameters was an important assignment to reduce cost of manufacturing to product. Deep drawing operation is carried out in 1200-Ton hydraulic press with servo controlled mechanism, finite element model result showed good agreement with experimental result.

**Key words:** Deep drawing, Finite element simulation, Forming, Manufacturing, Sheet metal, Tool Designer.

## **MACHINABILITY STUDY AND ANALYSIS OF CRYOGENIC TREATED INCONEL 718**

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### **ABSTRACT**

In our present work, Machinability comparisons have been made between super alloys such as Inconel 718, using wire cut electrical discharge machining based on surface roughness and material removal rate. The machining has been cut out on different super alloys as per the L9 orthogonal array. Pulse duration, voltage, pulse interval, wire feed and mean current consisting of levels have been selected as input factors for wire cut electrical discharge machining. Analysis of mechanical and metallurgical characteristics of the nickel alloy with Deep Cryogenically Treated (DCT) work piece, surfaces has been carried out in machining with Wire Cut Electrical Discharge Machining (WEDM) and cutting electrode wire chosen as molybdenum for machining such hard materials. Hence, this study focused on machining of super alloy materials using WEDM in order to satisfy production and quality requirement. A scanning electron microscope (SEM) is used to scan a surface of machined nickel alloys and show information of surface composition and topography. XRD is used to analysis the structure of crystalline material and chemical composition information of nickel alloys material. (EDX) is an x-ray technique used to identify the elemental composition of nickel alloys. Peak current ( $I_p$ ) ; pulse on time ( $t_{on}$ ) Effect of cooling rate (soaking temperature) during cryogenic treatment cycle of the work piece was also examined. Moreover effect of cryogenic treatment of work piece was discussed.

**Key words:** WEDM, XRD, cryogenic treatment and X-ray technique.

## **DIFFUSION BONDING IN DISSIMILIAR MATERIALS**

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### **ABSTRACT**

The major problem in combining aluminum alloy (Al) and magnesium alloy (Mg) is that fragile oxide and inter metallic films are formed in the bond's region. The diffusion bond, however, is used to be a component of these alloys, although there are not many problems. This work aims to better understand and characterize the Bonding diffusion of comparable and different metals. In addition, optimum parameters for diffusion bonding of the aluminum coating to magnesium alloy with aluminum alloy should be obtained. It also aimed to obtain optimum parameters for diffusion bonding of aluminum coating over magnesium alloy with aluminum alloy. These two metals are jointed inside the die after finishing surface treatment.

**Key words:** metallic films, diffusion bonding of aluminum and surface treatment.





## **THE PERFORMANCE OF STEEL PRODUCT FABRICATION CLUSTER,**

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### **ABSTRACT**

40 Micro and Small Steel Products manufacturing enterprises in Salem faced problem in value addition of the Steel Products (Window, Grill gate, Truss work and panel board) manufactured by them. The Special Purpose Vehicle (SPV) approached Government of Tamil Nadu (GoTN) and Government of India (GoI) through Tamil Nadu Small Industries Development Corporation (TANSIDCO) and formed M/s Salem Steel Cluster Pvt Limited; Salem formed during 2012 at Salem, Tamil Nadu. The objective is to find the physical and financial the performance of Steel Product Fabrication Cluster (SPFC), Salem before and after Cluster Development Approach (CDA), to find the Productivity of the cluster by taking independent variable like No. of Units, Employment and Production and dependent variable like Turnover and to find performance of SPFC before and after Cluster Development Approach. The methodology adopted by collecting the primary data like no of units [Un], employment in no's [En], production in crores [Pcr] and turnover in crores [Tcr] from the Madurai Jewellery Cluster before and after cluster development approach and analysing using Compound Annual Growth Rate (CAGR), Descriptive Analysis, Correlation Analysis, Trend Analysis, Regression Analysis, Structural Equation Modelling and T-Test. There is increase in no. of units, employment, production and turnover after Cluster Development Approach when compared to before CDA and which leads to increase in productivity.



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## ROBOTIC AUTO-SOLDERING

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### ABSTRACT

Automation is a science and technology by which task can be accomplished without human intervention or with minimal human intervention. Industrial automation is use of control systems such as information technologies and robots or computer systems to handle different process and different machineries to reduce or replace human. For the modern industries to develop automation in production are the basics. The main aspect of automation in manufacturing is to improve the efficiency of labour, increase productivity, to maintain quality of all the manufactured products and optimum utilization of all the production resources. Manual soldering process frequent changes lead to increased training and management costs. Hand-made-causing quality fluctuations, high failure rate, poor consistency, and difficult quality control. Hence robotic auto soldering was introduced which is to automate the process of soldering for different references and different points. The process is designed to solder on printed circuit boards. the operator loads the parts and starts the cycle manually using the finger print anti-tie-button. a reading system by proximity for detecting the presence and proper loading of the product on to the loading fixture. The cycle time was drastically reduced, Fatigue to Operator removed due to continues sitting Operation. Head count of the operator reduces from 10 operators per day to 8 Overall automation played a key role in improving the productivity and increasing the labor efficiency.

**Keywords:** Automation, Robot, PCB, SCARA, KPI

## **DESIGN AND DEVELOPMENT OF A ROBOTIC WORK CELL TO REDUCE HUMAN INTERVENTION AND INCREASE PRODUCTIVITY**

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### **ABSTRACT**

The work station consists of two CNC turning centers and they are handled by two workers separately. These machines are used for various lathe operations such as turning, facing and chamfering. The parts loading, unloading, handling and inspection is carried out by manual workers each and every time which makes him fatigue and in turn cause failure in loading the component properly. This may result in breakage of the tool or the component. Also, if the labor become fatigue he will take more time to load the component to machine and also for inspecting the component. This will result in increased cycle time. With manual work station, it is difficult to meet the demand and also machine idle time is more. This work is an attempt to solve an industrial problem where an ergonomically unsound manual work station is to be automated. This problem can be addressed by developing a robotic work cell with flexibility and accuracy. Initially robotic work cell was developed as a prototype using software and later it was introduced into real production. Automating the cell resulted in saving cycle time and also reduction in manpower, which in turn results in increased productivity and saving the labor cost.

**Keywords:** Ergonomically, Productivity, Fatigue, Turning center, Prototype.

## **INTEGRATION OF ROBOT FOR VERTICAL INJECTION MOLDING MACHINE TO HANDLE HOT INSERTS**

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### **ABSTRACT**

Automation is a technology which is used to reduce human intervention in processes like predetermining decision criteria, sub process relationships, and related actions. Industrial automation and robotics refers to use of control systems, computer and information technology. Automation is widely used in different applications such as pick and place, welding, soldering, assembly, inspection, quality. In this project automation is adopted for pick and place application in vertical injection molding machine for handling medical parts. Before implementing automation the loading and unloading of inserts were done manually by operator, tool damage occurred frequently due to wrong orientation of inserts on the machine fixture, constant cycle time couldn't be achieved which leads to less production rate. After over molding process, the inserts are at 45°C to 50°C resulting operator faced difficulty in unloading these inserts. In order to achieve present day requirements and overcome all these manual errors in loading and unloading of inserts robot, vision system and other automation elements are interfaced for this project. FANUC 6 axis robot along with grippers to handle inserts, camera for inspecting correct orientation of inserts during loading, double decker shuttle mechanism table is used as input system. Robot picks inserts from the pallet and loads in to the machine fixture then molding process begins, after completion of the process robot unloads the hot inserts into the gravity chute. By implementing this process reduction in inserts handling time, increase in production rate, less man power involvement and elimination tool breakage achieved

**Keywords :** Automation, Robot, Molding, Hot Inserts

## **A REVIEW ON LPG, JATROPHA BIODIESEL AND RUBBER SEED BIODIESEL**

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### **ABSTRACT**

Biodiesel fuel is growing interest recently and has been strongly recommended as a substitute for petroleum diesel. Liquefied petroleum gas (LPG) is also considered as a promising alternative fuel and has been widely used in transportation due to its environmental and economic benefits. Smoke emission can be largely reduced if diesel vehicles are changed to liquefied petroleum gas (LPG) – diesel as its fuel. Jatropha oil biodiesel has higher cetane number compared to diesel which makes it a good alternative fuel. Rubber Seed Oil is a second-generation feedstock which is mostly used in paint industry. Rubber Seed Oil biodiesel is also considered as a good alternative to conventional diesel.

**Keywords:** Biofuel, Jatropha, Rubber Seed, Biodiesel, Liquefied Petroleum Gas

## COMPUTATIONAL ANALYSIS OF AERODYNAMIC DRAG

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### ABSTRACT

This work proposes an effective numerical model based on the Computational Fluid Dynamics (CFD) approach to obtain the flow structure around a passenger car with Spoiler. The focus of the project is to expose such aspects using a CFD packages. Our project is to study and investigate the aerodynamics characteristics of a sedan car with rear spoiler, without rear spoiler and with body profiles and its impaction Lift i.e. vehicle stability and moderate impact on Drag i.e. Fuel consumption. Three different velocities are chosen for this analysis. It is found that the installation of a spoiler with an appropriate angle of attack affect the coefficient of lift and coefficient of drag. It will results in increasing stability of the car and decrease the fuel consumption.

**Keywords:** Spoiler, coefficient of lift, coefficient of drag, stability

## PERFORMANCE ANALYSIS OF THERMAL BARRIER COATING ON PISTON

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### ABSTRACT

Within the last few years there has been a rapid increase in the utilization of aluminum-silicon alloys, particularly in the automobile industries, due to their high strength to weight ratio, high wear resistance, low density and low coefficient of thermal expansion. The advancements in the field of application make the study of their wear and tensile behavior of utmost importance. In this present investigation, Aluminum based alloys containing 7%, 12% and 14% weight of Silicon were synthesized using casting method. Compositional analysis and tensile studies of different samples of same composition have shown near uniform distribution of Si in the prepared alloys. Study of microstructure has showed the presence of primary silicon. Tensile tests were carried out with universal testing machine. Yield strength and ultimate tensile strength has increased with increase in silicon percentage. Wear behavior was studied by using computerized pin on disc wear testing machine. Resistance to wear has increased with increase in silicon amount. The worn surfaces were analyzed using scanning electron micros.

**Keywords:** Thermal Barrier Coating, Aluminium alloy, Piston

## **PROPERTIES AND CHARACTERIZATION OF HYBRID COMPOSITE WITH FILLER MATERIAL FOR AEROSPACE**

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### **ABSTRACT**

Composite material is a combination of two or more distinct materials, having a recognizable interface between them. Composites are being utilized as alternatives to metallic materials in structures where weight is a major consideration, e.g., aerospace structures, high speed boats and trains. Strength of materials to accommodate the load in a system plays an important role in everyday life. Fiber reinforcement plastic (FRP) materials are widely used in various engineering industries because of their superior performance. FRP composites are widely used in various fields. The high modulus to density ratio, leads to the research in composite materials where an attempt is made to study the properties of composite materials by composing the different materials together to obtain the desired properties by reducing the weight as much as possible. Advantages of composite are corrosion resistance, design flexibility, high performance at elevated temperatures etc. In this present work attempt is made to carry out characterization of E-Glass fiber Hybrid polymer composite material with Graphite powder as a filler material with epoxy resin Lapox L-12 for different volume fraction, Notch size and fiber orientation, Specimens were prepared by using Hand layup technique as per ASTM Standards. Result revealed that the properties are significantly dependent on percentage of E-Glass fiber reinforcement, fiber orientation and varying Graphite powder. The results also indicated that strength is also dependent on Notch and Hole sizes for Aerospace.

**Keywords:** E-Glass fiber, Composite Material, Fiber Reinforcement



## DESIGN AND ANALYSIS OF F1 CAR MODEL FOR 2022

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### ABSTRACT

Two chassis frames (Model 2020 and Model 2022) of F1 race car have been designed and developed according to the specifications of Formula 1 Standards of 2020. Commercial computer aided design (CAD) software (Fusion 360) is used in design and analysis stages. Once the results of the analysis are desirable, actual chassis frame fabrication is performed using available materials Information. Chassis is the supporting member for all the load operator, engine, brake system, fuel system and steering mechanism thus it should have adequate strength to protect the driver in the event of on impact. There are four types of chassis Frame Ladder Chassis, Tabular Space Frame, Monocoque and Backbone. We choose space frame in this study. In design of a chassis different modes of analysis are done like finite element analysis, static and dynamic analysis, forces acting on truss, torsional vibration, etc. The aim of this Study is gauge the transpose of Design and specs that are brought by the new F1 Car model of the year 2022 in the counter of the model of the year 2020. The load / force act on front, back, side, top. The safety of the driver is achieved either by using high strength chassis against the applied load. The chassis is constructed by carbon fibre tubing with minimum dimensional and maximum strength. Circular cross-section is employed for the chassis development as it helps to overcome difficulties as increment in dimension rise in the overall weight decrease in the performance due to reduction in acceleration.

**Keywords:** Carbon Fibre Tubing, Chassis Frames, F1 race car, CAD

## APPLICATION OF CHEMICAL MACHINING TECHNIQUES IN METAL WORKING INDUSTRIES

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### ABSTRACT

Chemical machining is a type of material removal process for the production of desired shapes and dimensions through selective or overall removal of material by controlled chemical attack with acids or alkalis called as etchant solutions. Chemical Milling is one of the chemical machining processes, otherwise called as Chemilling or Contour machining or etching. Chemical milling is used in the aerospace industry to remove shallow layers of material from large aircraft components, missile skin panels, and extruded parts for airframes. Chemical blanking is similar to the blanking of sheet metals in that it is used to produce features which penetrate through the thickness of the material, with the exception that the material is removed by chemical dissolution rather than by shearing. Typical applications for chemical blanking are the burr-free etching of printed-circuit boards, decorative panels, and thin sheet metal stampings, as well as the production of complex or small shapes. Photochemical blanking is otherwise called as photo etching process. It is a modification of chemical milling. Material is removed usually from a flat thin sheet by photographic techniques. Typical applications for photochemical blanking are fine screens, printed circuit boards, electric motor laminations, flat springs, and masks for color televisions. Electrochemical machining is one of the newest and most useful machining processes of metal removal by the controlled dissolution of the anode of an electrolytic cell. This process is particularly suited to metals and alloys which are difficult or impossible to machine by mechanical machining. The main applications of ECM process are in machining of hard-heat-resisting alloys, for cutting cavities in forging dies, for drilling holes, machining of complex external shapes like that of turbine blades, aerospace components, machining of tungsten carbide and that of nozzles in alloy steels. In this review paper, the above mentioned nontraditional machining processes like chemical milling, chemical blanking, photochemical blanking and electrochemical machining are discussed. Besides, process parameters involved in the above chemical machining techniques and applications are explained.

**Keywords:** chemical machining, chemical milling, chemical blanking, photochemical blanking, electrochemical machining, process parameters, applications

## DESIGN OF LOW-COST POWER GENERATION FROM PLAYGROUND SEE-SAW

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### ABSTRACT

Power is defined as the rate at which work is performed. In this planet, electricity is the primary source of energy for emerging countries. Numerous nations are keen to generate electricity using a variety of power plants, including nuclear power plants, steam power plants, and hydraulic power plants. All nations are now focused their efforts on alternate energy sources. In this project, energy is created from waste energy, specifically waste energy generated by see-saws. We can see youngsters playing on the see-saw at the park. A see-saw is a balanced plank or board that is made to move alternately up and down by two people at opposing ends. It is also known as a teeter. The oscillating motion of the balanced plank is utilized to generate electricity in this instance. The weight pressing on both ends of the balanced plank generates this oscillating motion. By use of a separate arrangement, this oscillating motion is translated to rotational motion. This rotating motion is what generates electricity.

**Key words:** Alternate Energy, Electricity, See-Saw

## **DUAL MODE CONTROLLED SMART WHEELCHAIR FOR PHYSICALLY DISABLED**

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### **ABSTRACT**

There are many different types of wheel chairs on the market, some of which are manual, some of which are semi-automatic, and some of which are totally automatic. The development of the wheel chair system is carried out on a daily basis in order to provide support to differently abled people. In this regard, our smart wheel chair system is likewise a work in progress, provide assistance to this group of people. The goal of this project is to create a Smart Wheel Chair System for the physically challenged, handicapped persons at a reasonable price. An Android messenger application controls the system, which consists of For navigating aid, use the HC-06 Bluetooth module and proximity sensor. Our wheel chair system is linked to a Bluetooth module, which allows it to automatically move to the desired horizontal position. The system is controlled by an Android application. We used G-chat to link the Wheel Chair to the Bluetooth module at work, but any Bluetooth messenger application can be utilised. Two proximity sensors are installed at the back and front of the system to safeguard it from collisions. Our wheel chair assembly has a dual password security system, with the first password needed to connect the Bluetooth device and the second password used to control the wheel chair's movement.

**Keyword:** Mind control, quadriplegic, cerebral palsy, multiple sclerosis,

## **ENERGY CONSERVATION THROUGH PHASE CHANGE MATERIAL -BUILDING THERMAL ENERGY STORAGE**

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### **ABSTRACT**

In the modern day's scenario environmental conditioning is a critical factor for keeping the temperature inside the buildings in a safe state using the air-conditioner. Phase change materials promise innovative materials that are used for the construction of building to construct a wall which should have a property of maintaining a cool atmosphere inside the building. Development of parametric study of heat transfer across the insulated panel by numerical simulation and to develop an empirical model to predict the heat transfer characteristics of wall panel. The current work is aimed at managing the heat transfer characteristics in buildings using PCM materials and controlling the transfer of heat from various states to store the energy for future use. This paper proposed a simulated parametric study to investigate the thermal management of the roof panel using phase change materials (PCM). The heat absorption and releasing nature of PCM is used to control the heat generated inside the room. A single- and double-layer method of PCM was kept between the roof and concrete. The energy saving level has noted on particular time without PCM materials, the same method has been performed after the installation of single layer PCM and double layer PCM. It is necessary to improve the thermal performance to achieve the goal of energy saving. So, the thermal EnergyStorage (TES) is one of the best ways to improve thermal performance of the building.

**Keywords:** PCM, Thermal Energy Storage, Insulated panel

## **EXPERIMENTAL INVESTIGATION OF HEAT TRANSFER RATE IN LITHIUM ION BATTERY USING HEAT PIPE WITH FREON R22 AS PHASE CHANGE MATERIALS (PCM)**

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### **ABSTRACT**

Thermal management system (TMS) for commonly used lithium-ion (Li-ion) batteries is an essential requirement in electric vehicle operation due to the excessive heat generation of these batteries during fast charging/discharging. In the current study, a thermal mode of lithium-titanate (LTO) cell and the three cooling comprising natural air cooling, forced fluid cooling, and a flat heat pipe-assisted method is proposed experimentally. A new thermal analysis of the single battery cell is conducted to identify the most critical zone of the cell in terms of heat generation. This analysis allowed us to maximize heat dissipation with only one heat pipe mounted on the vital region. For further drawing we have drawn SOLIDWORKS 2017 Multiphysics and validated with surface temperature profile along the heat pipe and cell. For real applications, a numerical optimization computation is also conducted in the module level to investigate the cooling capacity of the liquid cooling system and liquid cooling system embedded heat pipe (LCHP). Moreover, in the module level, the liquid cooling system and LCHP shows better performance compared with natural air cooling while reducing the module temperature respectively.

**Key Words:** Thermal management system, Solid works.

## PERFORMANCE AND EMISSION CHARACTERISTICS OF DIESEL ENGINE FUELLED BY BIO-DIESEL

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### ABSTRACT

In this fast growing world of Industrialization, quick transport plays a vital role. The majority of this transportation is fulfilled by Road-ways, where mostly vehicles with combustion engines are used where engines are primarily run by diesel. These engines in turn emit lots of pollutants, such as Carbonmonoxide, Carbon-dioxide, Hydrocarbons, NOX smoke etc, which are harmful for the Environment as well as us. Also, these petroleum fuels are limited in nature. Many scientific repons says there will be shortage of petroleum in the near future. So, To mitigate these challenges, many research have been done on different types of bio-diesels to reduce the pollutant emissions and fulfill the future demands of our upcoming generations. Surprisingly, it is found that alternate fuels gives better engine performance and reduce emission by a great percentage. Here in these projects, we used Transesterification of Waste Cooking Oils and hence produced conventional bio-diesel. During this process, a glyceride (also known as glycerol) reacts with alcohol (typically methanol or ethanol) in the presence of a catalyst formingfatty acid alkyl ester and alcohol. Those fatty acid alkyl ester are subjected to mild refining process and thus the non-toxic biodegradable Bio-diesel are produced by transesterification process which reduces the high viscosity of the waste cooking oils.

**Keywords:** - Transesterification, Combustion Engine, Bio-diesel, Engine Performance, Reduction in Emissions

## EXPERIMENTAL INVESTIGATION OF DIFFUSION BONDED DISSIMILAR MATERIALS

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### ABSTRACT

Diffusion bonding of Az80 Magnesium alloy with AA7075 Aluminum alloy dissimilar materials was carried out in a vacuum under 10 Mpa for 15 minutes bonding period at various temperatures under 10 Mpa for different temperatures. Diffusion bonding of Az80 magnesium alloy with AA7075 aluminium alloy dissimilar materials in vacuum has been researched to determine the optimal process conditions. When the joints were tested at room temperature, the bonding quality of the joints was evaluated using microstructure analysis, ram tensile testing, and lap shear testing. Through the use of optical microscopy, researchers were able to examine the microstructure of bonded joints, as well as the primary elements that influence the diffusion bonding process.

**Key words:** Diffusion bonding, Magnesium alloy, bonding quality



## INVESTIGATION OF $\text{Ni}^{2+}$ IONS ON STRUCTURAL, MORPHOLOGICAL AND MAGNETIC PROPERTIES OF $\text{Ni}_{1-x}\text{Co}_x\text{Fe}_2\text{O}_4$ NANOPARTICLES

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### ABSTRACT

Spinel  $\text{Ni}_x\text{Co}_{1-x}\text{Fe}_2\text{O}_4$  ( $x = 0.0, 0.3$  and  $0.5$ ) nanoparticles (NPs) have been investigated through structural, morphological and magnetic measurements using powder X-ray diffraction (XRD), Scanning electron microscope (SEM), transmission electron microscope (TEM) and selected area electron diffraction pattern (SAED) analyses. Powder XRD and SAED data indicated the presence of Nano crystalline cubic spinel with single phase. The lattice parameters of the samples gradually increased with increasing Ni content and follow Vegard's law. The crystallite size ( $D$ ) and X-ray density of  $\text{Ni}_x\text{Co}_{1-x}\text{Fe}_2\text{O}_4$  samples decreased with increasing Ni content. The spherical shape morphology of spinel  $\text{Ni}_x\text{Co}_{1-x}\text{Fe}_2\text{O}_4$  ferrite particles and grain size (26.45, 24.36 and 22.65 nm for  $x = 0.0, 0.3$  and  $0.5$ , respectively) was established by TEM. VSM analysis showed the typical magnetic properties of  $\text{Ni}_x\text{Co}_{1-x}\text{Fe}_2\text{O}_4$  spinels. The shape of the magnetic hysteresis (M-H) loops revealed the dependence of super Paramagnetic behavior at room temperature (RT). The further effects also investigated and presented in this paper.

**Keywords :** Spinel  $\text{Ni}_x\text{Co}_{1-x}\text{Fe}_2\text{O}_4$ ; Sol-gel combustion; Nanoparticles; Super paramagnetic behavior.

## EXPERIMENTAL INVESTIGATION ON NATURAL FIBER WITH FILLER REINFORCED POLYMER COMPOSITE MATERIALS

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### ABSTRACT

The composite enters a recent development by utilizing natural fibers, both as reinforcement or filler in polymer matrix. The benefits of utilizing natural materials are being environmentally friendly, abundant natural availability, high strength, low cost and simple extraction process. There are some synthetic materials which produce toxic substance when heated to some temperature. Hence replacing these materials with natural materials has more benefit of environment. In this research work, the Palmyrapalm leaf stalk fiber (PPLSF) and coconut shell powder (CSP) reinforced polymer composites were fabricated by compression molding method and the tensile properties were investigated experimentally. The weight fraction of the composite was fixed as 35:65. The composites were fabricated by different compositions by weight fraction such as 25:10, 20:15, 15:20, 10:25 and (PPLSF/CSP). The result shows that the 20:15 composition (PPLSF/CSP) exhibited highest tensile strength is 33 N/mm<sup>2</sup> and the flexural Properties of PPLF composite is 83.56 MPa respectively.

**Keywords:** Natural fiber, Polymer matrix, Extraction process, PPLSF, CSP, Compression Molding, weight fraction, Tensile strength, Flexural Properties.

## GESTURE BASED MINI ROBOTIC WHEELCHAIR USING ARDUINO

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### ABSTRACT

Hand Gestures have been defined as the mode of communication while interacting with the machine robot. The hand gesture robot is beneficial to reduce human efforts and carry out effective results. Hand gesture robot uses simple module like Arduino, accelerometer, andnRF2401L, etc. which is found to be effective than other wireless modules. The majority of industrial robots are autonomous as they are required to operate at high speed and with great accuracy. But some applications require semi-autonomous or human-controlled robots. Some of the most commonly used control systems are voice recognition, tactile or touch-controlled, and motion control. One of the frequently implemented motion-controlled robots is a Hand Gesture Controlled Robot. Taking into consideration of the revolutionary technology, we have built a project to reduce the dependency of the people paralyzed half side of their bodies. By using the gestures for the movement of the wheelchair rather than using remote controls or joysticks, so the person can control the wheelchair themselves easily. Additionally, we have mounted the mini wheelchair prototype with a robotic arm, which acts as combined support for the deadened side for picking and placing some necessary objects like water-bottle, books, food, etc. Through the gestural controllers given by the body's active side with minimal effort. It is based on wireless communication, where the data from the hand gestures is transmitted to the robot over the RF link (RF Transmitter – Receiver pair), the project is divided into transmitter and receiver sections. The circuit diagram and components are explained separately for both transmitter and receiver sections.

**Keywords:** Arduino, Hand Gestures, Robot, transmission, Sensors

## TOWARDS THE FUTURE OF SMART VEHICLES

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### ABSTRACT

Transportation contributes for 18% of worldwide CO<sub>2</sub> emissions (as of 2019). Consumers and businesses must embrace sustainable transportation that meets the UN Sustainable Development Goals of enhanced energy efficiency and decreased greenhouse gas emissions. To achieve these goals, a new vehicle class called smart vehicles has just developed, reducing CO<sub>2</sub> emissions by up to 43% compared to diesel vehicles. However, supporting architecture is required to optimize these vehicles in a sustainable way. The report examines contemporary research and business developments in smart electric cars which includes autonomous navigation, enhanced driver assistance, vehicle health monitoring, battery management systems, vehicle power electronics, and electrical power drive systems. This study will give an eclectic picture of the smart car system by discussing each component in detail. This examination helps understand the function of this technology inside each categorization from a technological standpoint.

**Key words:** Smart vehicles, Sustainable transportation

## DESIGN AND DEVELOPMENT OF SEMI-AUTOMATIC WHEEL CHAIR CUM STRETCHER

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### ABSTRACT

The wheelchair and stretcher are generally used in hospitals, airports, train stations, shopping malls, etc. This design here is a modified wheelchair with stretcher as needed. This machine can be used to convert the wheelchair to a stretcher as needed. It is accessible semi-automatically. The chair transforms into a stretcher when the rocker switches are pressed by using electric actuators. The stretchers can be detached from the main frame for the convenience of the patient and clinician, facilitating patient access with less effort and transport. The folding mechanism makes it easy to store a large number of stretchers inserted as chairs in a relatively smaller space. The number of patients around the world is increasing day by day. Thus, in hospitals, patients must be moved from wheelchair to stretcher, from stretcher to bed, from bed to wheelchair or vice versa; which creates dangerous conditions for patients. A wheelchair with stretcher is required to facilitate the mobility of the disabled patient and to provide new medical equipment for use in hospitals. This paper focuses on Design and Development of Semi-Automatic Wheel Chair cum Stretcher.

**Keyword:** Wheel Chair, Automatic controller, Linear Actuators, Kinematic analysis

## ADVANCEMENTS OF AI AND ITS APPLICATIONS ON MACHINE TOOLS

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### ABSTRACT

AI can be implemented in agriculture by means of modern machineries instead of manual processing by which we can conserve lots and lots of time and energy. These robots does not require any non renewable resources and human guidance for every time they work. Some may use solar energy thus these can work on daytime and others perhaps work on both day and nights. Next are some robots that are now rapidly developing in the medical field. For example, arobot that is used to reduce anxiety in ‘anxiety therapy’. Last but not least, the world richest man Elon Musk is now eagerly in efforts of creating the tesla bot, the robot. Hence, we may conclude that AI is now developing adversely in each and every sector and we engineers are responsible for any sectors that needs developments and betterments.

**Keywords:** AI, Modern Machineries, Robots

## DESIGN AND FABRICATION OF AUTOMATED MOTORIZED SCREW JACK

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### ABSTRACT

A jack is a device which is used to raise part of vehicle in order to facilitate vehicle maintenances or breakdown repairs. In normal jack system a mechanical jack is used for lifting the vehicles. The most common form is a car jack, garage jack, floor jack which lifts vehicles so that maintenance can be performed. Jacks are generally used to increase mechanical advantage (lifting the vehicle). Generally jacks undergo buckling when they reach maximum load conditions( as per the tests conducted by consumer affairs). For this reason, we have to develop the system which can use toggle jack which is automatic in operation using electric motor. Vehicle's battery can be used as a source of power for this motor. Our research in this regard reveals the facts that mostly some difficult methods were adopted in lifting the vehicles for reconditioning. This paper attempts to overcome this difficulty and a suitable device is to be designed such that the vehicle can be lifted from the floor without any application of impact force. The operation remains to be an essential part of the system although with changing demands on physical input, the degree of mechanization is increased.

**Keywords:** Jack, mechanical jack, Motorized Screw Jack

## SOLAR ASSISTED COMBINED REFRIGERATION SYSTEM

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### ABSTRACT

Solar energy is a periodic unsteady heat source. In the utilization of solar energy, direct recovery at about 100°C is feasible and economical. In the solar driven ejector-absorption refrigeration cycle with re-absorption of the strong solution and pressure boost of the weak solution. High COP is obtained by increasing the efficiency of the absorber with the help of Ejectors (liquid - gas) Low pressure refrigerant vapour is injected and pressurized high pressure solution. Flow resistance is minimized. A small solution pump is used, in this system No moving parts, No Lubrication, Low maintenance and simple in operation. Working fluids is based on salt absorbent, low evaporation temperature and reduce the problem of crystallization. Working pairs used in the system is NH<sub>3</sub> - H<sub>2</sub>O (or) NH<sub>3</sub> - Lithium Nitrate.

**Keywords:** Solar energy, refrigeration



## **STUDY ON CURRENT AND POTENTIAL APPLICATIONS OF ROBOTIC FOR COVID-19 ENVIRONMENT**

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### **ABSTRACT**

Robots and flexible technology play their key role in serving under COVID-19 situations. Because of the ongoing coronavirus epidemic caused by the novel corona virus, healthcare professionals around the world are at high risk for infection through the treatment of infected patients. The risks are not limited to them, people working in the service sector who need to move out with various other commercial institutions are also at risk of economic hardship due to the instability of resources and personnel. This paper discusses a brief review of the current and potential uses of robots and automation in health care, education, and various industries that prove to be beneficial not only in reducing the spread of COVID-19 by maintaining social distance but also in accomplishing additional tasks. safely and effectively.

**Keywords:** Robotic patient Assistance systems, Mitra Robot, Disinfection Robots

## LEVEL CONTROL OF THREE TANK SYSTEM USING OPTIMUM TECHNIQUES

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### ABSTRACT

A Three Tank System can be used for water treatment or storing liquids in many industrial plants. The Liquid levels need to be controlled in order to provide desired specifications. In this paper, level control of Three Tank system using PID controller by various optimization technique such as Differential Evolution algorithm (DE) and Teaching Learning based Optimization algorithm (TLBO). The response of PID controller, DE based PID controller and TLBO based PID controller are compared using MATLAB/ Simulink Software. Simulation results show that the performances of optimized PID controller are better than those obtained by the classical ZN-PID controller.

**Keywords :** Tank System, Water treatment, MATLAB, Simulation

## SIX STROKE ENGINE: AN INNOVATION IN AUTOMOBILE ENGINE

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### ABSTRACT

Two-stroke and four-stroke engines have ruled for over a hundred years now. The Two Stroke Engine paved the way for the introduction of the Four Stroke Engine. The benefit has been on both fronts: increased mileage as well as reduced emission. As the prices of oil continually increase as also the emissions from millions of vehicles. This demanded the development of a new hybrid engine with increased efficiency and lower emissions. The Six- Stroke Engine is a completely new development of the internal combustion engine. Termed six- stroke due to the radical hybridization of two- and four-stroke technology, the engine achieves increased torque and power output, better fuel economy, and cleaner burning with reduced emissions, longer service intervals, and considerably reduced tooling costs when compared with a conventional OHC four-stroke engine. It is these that make it seem so viable, the most important being the ubiquitous fuel economy. Six stroke engine is 35 percent more economical at low revs/throttle openings than the equivalent conventional engine, and 13 percent less thirsty at high rpm/full throttle. Therefore, there are reduced hydrocarbon emissions, because it uses less fuel to achieve the same performance. Next, there's improved torque at lower revs. The most attractive benefit is the significantly reduced number of moving parts, compared to a four-stroke not as few as a two-stroke. Fewer moving parts also mean reduced manufacturing costs and mechanical noise from the engine. Torque, which together with the crisp, responsive throttle pickup and the reduced vibration are the three strong points of the six-stroke motor. So this is a hybrid engine design with the above advantages, allied with good squish, the ability to run radical bore/stroke ratios, quiet mechanical operation, and no exotic materials such as ceramic coatings or costly alloys required, nor complicated machining operations.

**Keywords:** Six-Stroke Engine, Internal Combustion Engine, Hybrid Engine Design

## **IMPACT OF PHYSICAL / CHEMICAL PROPERTIES OF NANOPARTICLES IN THE FIELD OF AGRICULTURAL SCIENCES AND THEIR COMPUTATIONAL ANALYSIS**

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### **ABSTRACT**

Nanotechnology is a technique to bring enrichment in the field of agriculture with new tools to increase the rate of productivity as well as the new innovations. Nanoparticles can exhibit significantly different types of physical and chemical properties to their larger material counterpart. Even though nanoparticles have many positive effects in the agricultural field for crop production or new improvements, the adverse effects of some of the nanoparticles has been identified. In this case, the effect of nanoparticles characteristics such as shape, size and diameter on agriculture have their significant role. The impact in the agricultural field which is based on the species of plants, Type of nanoparticles and their concentration. Once nanoparticles are reached into the soil, they may undergo series of transformation which ultimately determines the toxicity of nanoparticles and generate oxidative stress and can be absorbed by plants, posing a potential threat to human health via transferring in the food chain. These physical and chemical properties of the nanoparticles are visualized and analyzed by using the one of the well-known technique called computational analysis. This review is an attempt based on the physical and chemical properties of the nanoparticles in the agricultural sciences and in the agro industry involves the analysis of the computational method.

**Keywords:** Nanoparticles, Computational analysis, Agro industry, Computer-Based models, Silver Nanoparticles.

## **APPROACH, DEVELOPMENT AND FIELD ASSESSMENT OF A ROBOTIC ROVER TO EARLY DETECTION OF COMMON DISEASES IN TOMATO (SOLANUM LYCOPERSICUM) WITH INTELLIGENT VISION**

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### **ABSTRACT**

These days, Robotic vision is one of the unavoidable techniques in precision farming. For the instantaneous crop monitoring in larger farmhouses, robotic vision can recognize evolving ailments and inform farming community for identification and to take remedial action of the related ailments. In this exploration, an intelligent vision-guided detecting and monitoring robotic rover was programmed to spot the various diseases that can infect Tomato (*Solanum Lycopersicum*) plant at the early stages to prevent further contamination of stem, fruit, leaves through color changes of the entire plant. The major components of the intelligent robotic vision system are a mobile robot unit with precision-controlled robotic camera and a digital image evaluation element with graphical representation. The intelligent rover with robotic vision system will capture Tomato leaf, stem, fruit features to govern the complete plant growth and healthiness instantaneously. These features extracted are color, texture, and shape. This system will monitor the farm field autonomously with minimal human intervention and instant, proactive alerts will be send to the farming community for remedial actions, so that the harm can be minimized. The captured data can also be viewed from anywhere over the cloud and intelligent analysis can be done using historical data.

**Keywords**— Septoria, robotic vision, tomato, predictive analysis, robotic rover

## DESIGN AND DEVELOPMENT OF ARTIFICIAL INTELLIGENCE BASED INSPECTION MACHINE

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### ABSTRACT

Robots and flexible technology play their key role in serving under COVID-19 situations. Because of the ongoing corona virus epidemic caused by the novel corona virus, healthcare professionals around the world are at high risk for infection through the treatment of infected patients. The risks are not limited to them, people working in the service sector who need to move out with various other commercial institutions are also at risk of economic hardship due to the instability of resources and personnel. This paper discusses a brief review of the current and potential uses of robots and automation in health care, education, and various industries that prove to be beneficial not only in reducing the spread of COVID-19 by maintaining social distance but also in accomplishing additional tasks safely and effectively.

**Keywords:** Robotic patient Assistance systems, Mitra Robot, Disinfection Robots

## **HIGH-VOLTAGE BATTERY MANAGEMENT SYSTEMS (BMS) FOR ELECTRIC VEHICLE**

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### **ABSTRACT**

Due to the limited operating windows of lithium-ion batteries regarding temperature, voltage, and current and the dangerous situations that can arise if those operating windows are violated, a battery management system (BMS) is required to supervise and control the batteries in a multicell battery energy storage system. This chapter presents the requirements for an automotive BMS, the different possible topologies, and a typical implementation of a master/slave BMS for hybrid electric vehicle or battery electric vehicle applications, with a focus on the challenging design aspects.

**Keywords:** Battery management system (BMS), Hybrid vehicle, Multicell battery

## MINI GROUNDNUT & PEANUT SHELLING MACHINE

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### ABSTRACT

Groundnut is the sixth most important oilseed crop in the world and it belongs to beans family. Shelling is a fundamental step in groundnut processing and it can be done by hand or machines. Hand shelling process is labor intensive, slow and tiresome. Numbers of groundnut Sheller machines are available in the market but they are large in size, costly and not suitable for domestic applications, they are best suitable for industrial applications where mass production is required. Hence it is essential to design and fabricate a portable groundnut Sheller machine for domestic application.

**Keywords:** -Groundnut oilseed, Shelling process, Compact size, Sheller machine.



## **VIBRATION FREE SHEET METAL HOLE PRODUCING ATTACHMENT IN DRILLING MACHINE**

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### **ABSTRACT**

“Diamond cuts Diamond”, says the adage. This is the philosophical statement. This is the underlying idea that underpins the machining of material from a solid. The use of a punching machine in sheet metal punching is a highly expensive and time-consuming procedure. Instead of utilizing a punching machine to solve the aforementioned difficulty, we are using our vibration-free sheet metal hole generating attachment to do so. The primary focus of this research was to minimize vibrations in the work material. Specifically designed spring and ball attachments are employed to accomplish this task. Using this sheet metal hole creating attachment, you may create holes with precise proportions. Sheet metal hole generating attachment is used to cut arcs in sheet metal, which is accomplished by the use of sheet metal hole creating attachment. Designing and modelling the attachment, as well as identifying the advantages and disadvantages of this drilling method, are the primary goals of this project. Another goal is to increase the machining rate of this machine.

**Key words:** Sheet metal, Drilling, Vibration, Diamond cuts Diamond, Vibration-Free

## INVESTIGATION OF BATTERY MANAGEMENT SYSTEM FOR ELECTRIC VEHICLES

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### ABSTRACT

The electric vehicle depends upon the power battery. The Research on battery technology in electric vehicle application is advancing tremendously. The effectiveness of electric vehicle depends on functionality and diagnosis of the battery system. However poor monitoring and safety strategies of the battery system can lead to critical issues such as battery overcharging, over discharging, overheating, cell balancing. To overcome these problems the battery management system plays a main role for battery performance including overcharging, discharging control, heat management, battery safety. In this paper the main goal is to deliver a review of different approaches and control scheme of battery management system in electric vehicle.

**Keywords:** Electric vehicle, Battery, Battery overcharging

## FABRICATION OF PNEUMATIC RECIPROCATING GRINDING MACHINE

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### ABSTRACT

We have pleasure in introducing our new project “Fabrication Of Pneumatic Reciprocating Grinding Machine” is the process of removing metal by the application of abrasives which are bonded to form a rotating wheel. When the moving abrasive particles contact the work piece, they act as tiny cutting tools, each particle cutting a tiny chip from the work piece. It is a common error to believe that grinding abrasive wheels remove material by a rubbing action; actually, the process is as much a cutting action as drilling, milling, and lathe turning. The grinding machine supports and rotates the grinding abrasive wheel and often supports and positions the work piece in proper relation to the wheel. The grinding machine is used for roughing and finishing flat, cylindrical, and conical surfaces; finishing internal cylinders or bores; forming and sharpening cutting tools; snagging or removing rough projections from castings and stampings; and cleaning, polishing, and buffing surfaces. Once strictly a finishing machine, modern production grinding machines are used for complete roughing and finishing of certain classes of work. A grinding section with spring and lock arrangement is used to attach the grinding tool with the rotating wheel. Thus simultaneously the cutting/grinding section will be rotated and the speed of rotation is depending upon the velocity of wind flow. This equipment has a good efficiency compared to other and also forward and reverse speed is constant, so good finishing is obtained by using this machine. This project is developed for the users to grind and cut objects and also provide a hole using air pressure. The vanes are rotated by wind energy. A set of gears is connected with the axle to reduce the speed and to increase the power. A chain drive mechanism is connected with the gear to extend the rotation at the bottom. When the axle is rotated, the cutting section will be rotated.

**Keywords:** Grinding Machine, Chain Drive Mechanism, wind energy

## ISOLATION AND IDENTIFICATION OF ENZYME FROM SEAWEED

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### ABSTRACT

Protease occurs naturally in all organisms and is an essential constituent for all the existing live forms. Microorganisms such as bacteria and fungi and yeast are the main source of protease enzyme. They act as an important industrial enzyme occupying for about 60% of total enzyme market. In this study, protease was isolated from marine algae such as Gracilariacorticata, Chladophoravagabunda, Chaetomorphaattenina and Ulva spp. Proteinconcentration and special activities were measured and compared for these species. Among these, Gracilariacoricata, Chladophoravagabunda and Chaetomorphaattenina showed maximum specific activity (7.53, 6.77 and 6.75 units/mg of protein) of protease respectively.

**Keywords :** Enzyme, Seaweed, Gracilariacoricata, Chladophoravagabunda

## DESIGN OF AUTONOMOUS MULTIPURPOSE ORNITHOPTER ROBOT

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### ABSTRACT

In nowadays, the biologically inspired robotic systems which closely resemble the actions of small insects, birds and animals are used for many applications like surveillance and monitoring. This paper explains the design of an ornithopter which is a robot that mimics the flapping action of the wings of the birds. It is an aerial vehicle that generates its thrust and lifts forces from the mechanism of flapping wings. The ornithopter consists of two sections on-board control and user control. The on-board control which is placed on the body of the ornithopter to control the flapping action of the wings receives a signal from the user control. The user control is used to control the flapping action, pitch and yaw movement of the ornithopter by the user. The onboard control and the user control are connected by using a wireless module and a camera is also mounted on the body of the ornithopter for surveillance purposes. Environmental pollution is monitored by using various sensors for measuring the levels of CO<sub>2</sub>, O<sub>3</sub>, NO<sub>2</sub>, temperature and humidity. The ornithopter which resembles a bird can be used for various purposes like surveillance, spying and monitoring the pollution in the areas where the humans cannot reach. Also this is used to carry the sanitizer to spray at a specified region as CORONA relief activities.

**KEYWORD:** Ornithopter Robot, Environmental pollution Monitoring, Actuators

## AERODYNAMIC STUDY OF HL-20 DESIGN MODIFICATION

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### ABSTRACT

Lifting Body Re-entry Vehicle configuration is one of the most promising approaches for developing a reusable re-entry vehicle. The combination of lifting re-entry and ballistic re-entry enables these vehicles to achieve deceleration values optimum for crewed re-entry. It also provides the vehicle an increased accuracy in landing, minimized heating rates and fair control over the maneuvers. The optimization of the vehicle body shape to achieve desired lift to drag ratio and low ballistic coefficient is one of the prime focuses of research on these vehicles. The diameter of launch vehicles imposes a constraint on the width of the re-entry vehicle design which directly affects the platforms area of the re-entry vehicle. HL-20 PLS vehicle is a lifting body configuration developed by NASA Langley Research Centre in the 1990s with intent to achieve frequent manned orbital missions. This study focuses on the aerodynamic effects of incorporating a retractable wing extension on the HL-20 PLS design. The simulation results indicate an improved lift to drag ratio performance at lower angles of attack for the modified HL-20 PLS design with wing extensions. The modified design is also observed to showcase an early stall character in comparison with the original design.

**Keywords:** Re-entry, HL-20 PLS,

## OPTIMIZATION OF MATERIAL AND CROSS SECTION OF HOISTING HOOK A NUMERICAL INVESTIGATION AND EXPERIMENTAL VALIDATION

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### ABSTRACT

Hoisting Hook is one of the critical components in various cranes and hoisting systems. In particular, a five ton capacity hoisting hook has very wide applications in various industries as well as in building constructions. The impact of such hosting hook failure is sometimes very high. So this research focuses the measures of prevention of failure five ton hosting hook. The factors like loadings near the capacity, three previously recommended cross section of the hooks as well as two proposed cross sections were considered for analysis. The proposed cross sections are incremented and decremented types from the trapezoidal cross section. The commercially available five different materials of hook considered for the investigation. Taguchi mixed L25 orthogonal array is used for designing the experiments. The total deformation, equivalent stress and maximum principle stress were considered as a measure of performance. The hook tested near to the capacity at five different loads. The optimal result is validated numerical method and experimental method.

**Keywords:** Crane Hook, Cross Section, material, Numerical Analysis, Experimental Analysis, Taguchi Method, Optimization.

## **EVALUATION OF PERFORMANCE AND EMISSION PARAMETERS OF DIESEL ENGINE USING DIFFERENT BIODIESEL BLENDS**

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### **ABSTRACT**

In recent years, the acceptance of fatty acid methyl esters (biodiesel) as a substitute to petroleum diesel has rapidly grown in India. The raw materials for biodiesel production in this country mainly include traditional seed oils and used frying oils. In the search for new low-cost alternative feed stocks for biodiesel production, this study emphasizes the evaluation of Celosia oil and Eucalyptus Oil. The experimental results showed that the oil content of Celosia were remarkably high (45%). The main emphasis has been laid on optimum production of biodiesel from Celosia oil and Eucalyptus Oil then using the biodiesel blends with diesel studying the comparative exhaust emission characteristics and engine performance and also optimizing the compression ratio and the blends made from the biodiesel with diesel. The oil was chemically converted via an alkaline transesterification reaction with methanol to methyl esters, with a yield nearly 97.5 wt.%. All of the measured properties of the produced biodiesel met the current quality requirements. Oils were esterifying (butyl esters) before blending with pure diesel in the ratio of 10:90, 15:85, 20:80, 25:75 and 30:70 by volume. Pure diesel was used as control. Initially the properties of the Celosia oil and Eucalyptus Oil blends were determined density, viscosity, dynamic viscosity, flashes point, fire point and calorific value. An assessment of engine performance brake power (BP), brake specific fuel consumption (BSFC), brake thermal efficiency (BTE) and emission characteristics HC, NO<sub>x</sub> (ppm volume), CO, CO<sub>2</sub>, O<sub>2</sub>(% volume) etc., was carried out for pure diesel and the oil blends. However, Celosia oil at 25% blend with diesel gave best performance as compared to other blends in terms of low smoke intensity, emission of HC and NO<sub>x</sub>.

**Keywords:** Celosia oil, Transesterification, Methyl esters, Smoke intensity, Esterifying, Eucalyptus Oil



## **MANUFACTURING OF CEMENT AND ITS VARIOUS HAZARDS AND SAFETY MEASURES PROVIDED IN THE CEMENT INDUSTRIES**

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### **ABSTRACT**

Cement is the basic material for constructions which is made from a mixture of elements that are found in natural materials such as limestone, marl and/or clay. Cement manufacturing is an energy and resource intensive process with both local and global environmental, health and safety impacts. Because of these impacts, ensuring healthy and safe working conditions for employees is one of the most significant issues for the cement industry. From limestone loading to dispatching of cement various hazards takes place which causes harm. Cement is typically made from limestone and clay or shale. These raw materials are extracted from the quarry crushed to very fine powder and then blended in the correct proportions. The pollutants in the cement industry are emitted from the various production processes from the material such as the raw material, crusher, rotary kiln, cranes, mills, storage silos and packing section, etc., Airborne respirable dust levels from less than 5 to more than 40 mg/m<sup>3</sup> have been recorded in the work place air of cement factory workers and it leads to causes a disease. Cement manufacturing process was clarified briefly and potential hazards and their risks in cement industry were investigated.

**Keywords:** Natural Materials, Airborne respirable dust, Cement Industry

## ANALYSIS OF TURNING PROCESS PARAMETERS USING TAGUCHI METHOD

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### ABSTRACT

Selection of machining process parameters to achieve a set of quality attributes is important in bridging up the quality and productivity requirements. Especially in machining processes such as turning, milling, a set of process parameters such as feed, speed and depth of cut are to be selected appropriately to provide a minimum surface roughness which is considered as the quality attribute. In this project, turning process is carried out on medium carbon steel bar using H.S.S. tool bit in a conventional lathe. Free length of the specimen is used as key a process parameter. Whereas the feed widely used parameter. The reason for selecting free length is that the increase in free length might increase the vibration and hence influence the surface roughness. Experiments are designed and conducted based on Taguchi's L9 orthogonal array.

**Key words:** Turning process, Surface roughness and Taguchi method.

## REGENERATIVE BRAKING SYSTEM USING ELECTROMAGNETIC CLUTCH

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### ABSTRACT

The objective of this paper is to store the kinetic energy dissipated in the brakes to accelerate the vehicle. This project is based on a prototype model of a regenerative braking system using an electromagnetic clutch. Regenerative braking results in an increase in energy output for a given energy input to a vehicle, the efficiency is improved. The amount of work done by the engine of the vehicle is reduced, in turn reducing the amount of prime energy required to propel the vehicle. In order for a regenerative braking system to be cost effective the prime energy saved over a specified lifetime must offset the initial cost, size and weight penalties of the system. The energy storage unit must be compact, durable and capable of handling high power levels efficiently. The energy can be directly provided to a dynamo itself to generate current and will be displayed on the Ammeter installed in the set up. This set up also consists of an Infrared Sensor which helps to prevent the frequency of accidents increasing due to inefficient braking system and therefore can be considerably avoided using IR sensors. The vehicle instantly stops as any object appears in front of it where IR Sensors are installed.

**Keyword:** Dynamo, Efficiency, Electromagnetic Clutch, Infrared Sensor, Regenerative Braking

## EXPERIMENTAL INVESTIGATION ON THE PROPERTIES OF HYBRID NATURAL COMPOSITE

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### ABSTRACT

Natural fiber reinforced composite is an emerging area in the polymer science. Natural fibers are usually low cost fibers with low density and have high specific properties. These are biodegradable and non-abrasive. The natural fiber composites offer specific properties comparable to those of conventional fiber composites. The purpose of this project is to produce a hybrid composite suitable for various applications. In this hybrid composite loofah fiber (obtained from plant L.Cylindrical) is used with tamarind seed powder, coconut shell powder and epoxy araldite resin. Hand layup method is used to fabricate the hybrid composite. Tamarind seed powder, coconut shell powder and loofah fiber are mixed in the ratio of 7:2:1 and 5:4:1. There is an increase in the tensile strength and the hardness of the composite with the increase in filler materials. Tensile strength was found to increase from 4 Mpa to 8 Mpa, and Rockwell hardness value was found to be increase from 56.66 to 57.66.

**Keywords:** Hybrid natural composite, loofah fiber, hand layup method, coconut shell powder, tamarind seed powder.

## AIR CONDITIONING PURIFICATION USING SIMPLE CARDBOARD

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### ABSTRACT

An Air or Air cleaner is a device which removes contaminants from the air in a room to improve indoor Air Quality. These devices can be beneficial to Allergy sufferers Asthmatics, and at reducing or eliminating Tobacco-Smoke. Air pollution is now a global Problem and Especially in major cities. The air pollution levels in many cities usually reach pollution levels way beyond health air standards. And there is an increasing concern about air pollution levels both outdoors and indoors. According to the Indian “Environmental Protection Agency” (EPA), indoor air can be five times as polluted as outdoor air. Because indoor air is not circulated as much as outside air, many airborne pollutants continue to thrive inside.

**Keyword:** - Cardboard Air Conditioning, Simple Cardboard Air Conditioning, Air Purifier, Air Freshener, Room Freshener, Low Cost AC

## **MACHINING PARAMETERS IN WEDM OF EN31 STEEL USING TAGUCHI TECHNIQUE OPTIMIZATION**

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### **ABSTRACT**

Wire electrical discharge machining (WEDM) is often used in the machining of conductive materials when precision is important. The current study looked at wire-cut electric discharge machining of EN31 steel. Taguchi's L27 orthogonal array was used to finish the investigation using various amounts of input parameters. This method was used to determine the optimal parameter combination. The experimental findings show that the machining model is correct, and Taguchi's approach meets the practical requirements. Surfaces having micro cracks and porosity, as well as poor surface quality, are produced by rough machining with WEDM. Finish machining yields a better surface finish ( $R_a$ ) but at a slower rate (MRR). As a result, the Taguchi approach's purpose is to improve MRR while lowering  $R_a$ . To check the performance measures in terms of Surface Roughness, control parameters such as voltage applied, pulse width, pulse interval, and speed were used.

**Keywords:** WEDM, EN31, SN method, DOE, MRR

## SOLAR POWERED ELECTRIC VEHICLE

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### ABSTRACT

In the current state of technological development, the future of vehicles seems to be with the hybridization of various energy sources. This sort of development in vehicles seeks to take the benefits from the best quality of each energy source and it is especially useful in urban driving vehicles. In cities of India one of the major medium of transportation is auto rickshaws, which is producing a huge amount of air pollution as well as greenhouse gases like CO<sub>2</sub>. Fuel, which is used is a non-renewable source and also which costs high as a result of that transportation charges increases. It would also affect the economy as well as the users of the autorickshaw. Thus they should go for a reliable source as know that current trend of using the reliable source like solar energy which is available in plenty in country like India. We using the solar panel, controller and DC motor setup to convert the light energy as an electrical energy which is fed to the DC motor to obtain mechanical motion. The mechanical motion was transferred to wheels through chain drive which leads to cheap and effective transmission. Finally, fabricated a concept auto rickshaw with the help of modified transmission system and energized with solar energy to run it.

**Keywords :** Solar panel, DC motor, CO<sub>2</sub>, Non-renewable source ,controller, chain drive, Effective transmission

## STUDY OF COMPOSITE MATERIALS IN MECHANICAL APPLICATIONS

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### ABSTRACT

The objective of this paper is to eliminate the water leakage on FRP material & to increase the life time by providing a special Anti-graffiti coat on the surface. Composite materials are formed by combining two or more materials that have quite different properties. The different materials work together to give the composite unique properties. There are 3 types of Composite material available. 1. Polymer Matrix Composite (PMCs) 2. Metal Matrix Composite (MMCs) 3. Ceramic Matrix Composite (CMCs). Now a days, Fibre Reinforcement Plastic (FRP – comes under Polymer Matrix Composite) materials are unavoidable and which is having equal strength of steel at the light weight and less cost compared to steel. Also, it has good corrosion resistance. Ex: Manufacturing of yacht, lifeboat, cruise ship, fishing boats, Light weight bridges are made up of Composite material, which should be leak proof. In General, Gel coat is used on the surface of the composites (FRP) which is in contact with water. In long run, the Gel coated composite material absorbs water which leads leakage and reduction in strength and life of the product. Sometime it may leads to accident also. To avoid such kind of problem in FRP composites, there is a special coat called 'Anti-graffiti Clear coat' which give Glossy finish and leak proof for the entire surface of the material (both interior and exteriors). By this way, we can use the composite material for long duration without any replacement.

**Keywords:** Composite material -FRP -Water leakage– Surface coat -Anti graffiti Clear



## INVESTIGATION ON ENERGY MANAGEMENT AND RENEWABLE ENERGY INTEGRATION IN SMART GRID SYSTEM

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### ABSTRACT

Smart grid technology is enabling the effective management and distribution of renewable energy sources such as solar, wind, and hydrogen. The smart grid connects a variety of distributed energy resource assets to the power grid. Renewable Energy Integration focuses on incorporating renewable energy, distributed generation, energy storage and demand response into the electric distribution and transmission system. Smart grid aids interface among the consumer and utility which allow the ideal usage of energy based on environmental, price preferences and system technical issues. This enables the grid to be more reliable, resourceful and secure, while reducing greenhouse gases. This paper presents evaluation of ecological benefits and a cost benefit analysis of the energy management system while integrating renewable energy sources into smart grid system. Numerous objectives, such as increasing energy efficiency, maximizing utilization, cost reduction, and controlling emission have been investigated. Results show that the system is economic only by using energy management systems with renewable energy.

**Keyword:** Smart Grid Technology, Energy Efficiency, Emission

## **DESIGN AND ANALYSIS OF HEAT TRANSFER ENHANCEMENT OF DOUBLE PIPED HEAT EXCHANGER USING DIFFERENT INSERTS**

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### **ABSTRACT**

Heat transfer enhancement is an active and important field of engineering research since increase in the effectiveness of heat exchangers through suitable heat transfer augmentation techniques can result in considerable technical advantages and savings of costs. Analysis is done by placing different twisted tapes such as normal twisted tape, W-Shaped cut twisted tape, Rhombus cut twisted tape, Rectangular cut twisted tape, Triangular cut twisted tape at different mass flow rate 2.2 kg/s, 2.75 kg/s, 3 kg/s for cold water and 2.4 kg/s, 2.8 kg/s, 3.2 kg/s for hot water. The result shows that Triangular cut twisted tape is 33% more efficient than Rhombus cut twisted tape of heat transferring.

**Keywords:** Heat transfer enhancement, Effectiveness, Twisted Tapes, Heat Transfer

## **A REVIEW PAPER ON NATURAL FIBER COMPOSITE MATERIALS**

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### **ABSTRACT**

Natural fibers are basically considered to have potential use and as a reinforcing material in polymer matrix composites due to their high strength, good stiffness, lower cost, light in weight and it is eco-friendly. Natural fiber composite can be coconut, cotton, bamboo, wheat straw, abaca, wood, sisal, pineapple, banana leaf fiber, kenaf, flax, jute, etc.,. Natural fibers are cheap and they are partially recyclable, inexpensive and bio degradable. Hand layup method or Compression moulding technique can be used to fabricate the composite. The test specimens are basically prepared with different values of weight ratio of fiber to matrix. The fibers are randomly oriented, hence the test specimens are cured for different periods of time. The Specimens are cured for studying the effect of curing time on the mechanical properties. The results of the various tests such as tensile test, compression test, impact test, bending test and hardness tests are conducted on the test specimens and reported. The final failure morphology analysis is done by using SEM to determine the fracture direction, fiber orientation and the matrix structure. A detailed study of chemical, physical and mechanical properties will bring out reasonable utilization of fiber for various applications. Natural fibers are employed as filler material for several industrial applications. Some of the realistic applications are real view mirror, name plate, bumper beam, switch boxes, automobile door panels, dash board, etc.

**Keywords :** Natural fibers, Mechanical Properties, Compression moulding, SEM

## STUDIES ON EFFECT OF SURFACE TREATMENTS ON MILD STEEL

### “J-BOLT” AISI 1008

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### ABSTRACT

Surface treatment plays an important role in increasing the protection against Corrosion and wear. In the present work the comparative study of surface treatments on Mild steel J-Bolt(AISI 1008) were studied. The treatments such as Nitroxy-QPQ, Zinc Plating and Hard Chrome Plating are considered for this work. Impact energy is found to be higher for Nitroxy-QPQ than zinc plating and hard chrome plating. Hard chrome plated sample to be the best in Hardness test, however Nitroxy-QPQ sample has closer to chrome plated sample. Nitroxy-QPQ had more corrosive resistant than hard chrome plating, zinc plating.

**Keywords:** Mild Steel, AISI 1008, Surface treatments, Corrosion analysis

## **DESIGN AND FABRICATION OF SMART STAIR CLIMBING AND STUFF DELIVERING ROBOT**

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### **ABSTRACT**

People who work in office, school, colleges, industries etc. are often running from ground floor to all floors to deliver files or some other stuff. Due to this their works has been interrupt and disturbed. To overcome this problem we design and fabricate a robot which climbs stairs and delivers the stuff. In this system we use microcontroller (Arduino) as a heart of robot, then wheels with belt driver unit to climb the stairs, which was controlled by high torque D.C motors unit. For path finding, we using wireless A.V camera which is an vision unit for robot and which will be controlled by computer using RF modules for serial communication between robot and computer. And the Transmitter (TX) unit connected to computer will transmit the encode to Receiver unit (Rx) where decoded process takes place and makes the robot to move as per the received signal from computer. And for locating robot position, we used GPS module as an advantage. Thus via computer we could control the robot and delivers the stuff.

**Keywords-** Stair climbing, Wireless camera, Arduino and RF unit, Transmitter

## CFD ANALYSIS OF HEAT TRANSFER IN A PARTIALLY HEATED ENCLOSURE FILLED WITH HYBRID NANOFLUIDS – A CONJUGATE HEAT TRANSFER

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### ABSTRACT

A numerical study of conjugate natural convection heat transfer of hybrid nanofluids inside a partially heated square enclosure with the thick baffle attached to its hot wall has been carried out. The length of heating varies from 20% to 100% on the left side hot wall. In this study,  $\text{Al}_2\text{O}_3$ -Cu,  $\text{Al}_2\text{O}_3$ - $\text{SiO}_2$  and Cu- $\text{SiO}_2$  hybrid nanofluids combinations are used. A detailed parametric study has been carried out to analyze the effect of Rayleigh number ( $10^4 \leq \text{Ra} \leq 10^6$ ), volume fraction and thermal conductivity ratio on heat transfer. The presence of the baffle affects the heat transfer significantly. The average Nusselt number is found to be an increasing function of Rayleigh number, volume fraction of the hybrid nanofluid and thermal conductivity ratio. The maximum heat transfer enhancement is found by using  $\text{Al}_2\text{O}_3$ -Cu hybrid nanofluid.

**Keywords:** Conjugate heat transfer, Enclosure, Hybrid nanofluid

## THERMO ELECTRIC AIR CONDITIONER FOR BIKES

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### ABSTRACT

This project is developed for users to use the air conditioner in the vehicle using the heat energy emitted from the silencer. A lot of energy is being wasted every second, for example, engines produce power to make the bike move with just around 20% efficiency. Most of energy is wasted as heat energy. we can reuse the heat energy to make more cooling for the bikes, we are saving the energy world. This is a process which is opposite to thermoelectric generator. We can use Peltier Effect to make thermoelectric refrigeration machine. It has some advantages which normal refrigeration doesn't have, such as small size, smaller mass, very low noise, no environmental pollution, quick reaction time and so on. Thermoelectric materials are becoming more important as an alternate energy source, and applications for these materials are increasing this is a process which is opposite to thermoelectric generator. We can use Peltier Effect to make thermoelectric refrigeration machine. It has some advantages which normal refrigeration doesn't have, such as small size, smaller mass, very low noise, no environmental pollution, quick reaction time and so on. Thermoelectric materials are becoming more important as an alternate energy source, and applications for these materials are increasing. The useless heat emitted from the bike silencer can be given to the Thermoelectric material and the resulting cooling can be used as a mini air conditioner in bike. Thermoelectric material is a thermoelectric material. Thermoelectric materials are used for the thermoelectric refrigeration.

**Keywords :** Thermo Electric, Peltier Effect, Thermoelectric Material, Refrigeration

## **EFFECT OF NICKEL INTERLAYER ON DISSIMILAR WELDED Cu-Al SHEET BY ULTRASONIC WELDING**

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### **ABSTRACT**

Copper(Cu) and Aluminium(Al) are welded by ultrasonic spot welding which forms intermetallic compounds to a large extent at the weld zone. So to reduce the formation of intermetallic compound, Ni powder of mesh size 50 (297 microns) are applied at the interface between Al-Cu so due to this the intermetallic compound formed is less compared to welded sample without interlayer. This is due to fact that the Ni powder reduces the diffusion of Al and Cu atoms so the intermetallic formed will be less and the brittleness at the weld zone get decreases. The Grade of Copper is Cu-110 (99.99% pure), The grade of Aluminium used is 5754. The pressure used in welding was 4, 6 and 8 bar. Ni powder of 0.05gram is placed as interlayer betweenCu and Al. The effect of interlayer is studied using microstructure examination, Vicker's Microhardness test and Shear Test. The dimension of specimen used was 60\*30\*1 mm. In this work it is concluded that the use of Ni Interlayer reduces the precipitate formation and increases the shear strength. Ultrasonic Spot Welding of Aluminium and copper with and without Nickel asa interlayer is successfully fabricated with sound weld. The shear strength increased with increasein pressure. The strength of the welded specimen with interlayer is slightly higher than the specimen without interlayer at the interface .he Intermetallic Compound formed is less when Ni isused as an interlayer which is observed from the microstructure evaluation. The Microhardness value at the interface is lower when Nickel is usedas a interlayer compared to one without interlayer.

**Keywords:** Ultrasonic welding, Dissimilar welding, Ni – Interlayer, Material characterization



## DESIGN AND ANALYSIS OF E- VEHICLE ANATOMY

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### ABSTRACT

Electric vehicle drives offer a number of advantages over conventional internal combustion engines, especially in terms of lower local emissions, higher energy efficiency, and decrease dependency upon oil. In current days the E-vehicle is moving to a part of major role in the road transportations. Electric vehicles could represent a sustainable technology path. They may constitute an important component of a larger roadmap for sustainable transportation. Aesthetics of E-vehicles can be quite different from what we see today in fuel cars or hybrid vehicles to depict the uniqueness of this breed of products. Only using the scrab materials to build a anatomy Analysis of aesthetics for E-vehicle by using ANSYS software. Aerodynamics represents a special scientific field that has a huge impact on modern automotive engineering. Vehicle design in this context is primarily concerned with developing the visual appearance or aesthetics of the vehicle, through it is involved in the creation of the product concept. Electric Vehicles (EVs), compared to classic internal combustion engine (ICE) vehicles, are fairly simple and easy to operate.

**Key words:** E-vehicles, Aesthetics E-vehicles, Aerodynamics, Ansys

## DESIGN AND ANALYSIS OF SOLAR HYDROGEN POWER GENERATION

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### ABSTRACT

There is a lot of concern nowadays about the efficiency of the various plants. Here we are introducing the use of non renewable energy sources. Hydrogen produced through renewable energy sources, most commonly with a device which uses electricity to separate water into hydrogen and oxygen called an electrolyzer, is an emissions-free way to carry energy. Hydrogen is plentiful and can safely be harnessed for a variety of stationary and mobile applications.

**Keyword :** Hydrogen Power, electrolyzer, Non Renewable Energy

## CARBON FIBER ELECTRONIC INTERCONNECT

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### ABSTRACT

Carbon fiber is an emerging material in electrical and electronics industry. It has been used as contact in many applications, such as switch, potentiometer, and commutator brush. A new technique of electronics interconnect is developed, with carbon fiber as a conductive medium. This carbon fiber interconnect can provide interconnection between two planes in different levels of electronics packaging, from semiconductor die, substrate, packaged component to printed circuit board. For example, it can provide a separable interconnect between a land grid array (LGA) or ball grid array (BGA) IC package to a printed circuit board, as an LGA or BGA socket. The interconnect device consists of an array of contact pins. Each contact pin consists of a large number of carbon fibers which can act cooperatively to provide a high degree of reliability and predictability to the interconnect function. A nickel coating can be applied over carbon fibers to enhance its conductivity and solderability. Analytical evaluations and experimental mechanical and electrical characterizations have been conducted to conclude that the carbon fiber interconnect is a promising interconnect technique.

**Keywords:** Solderability, interconnect technique, Carbon fiber, ball grid array

## **EXPERIMENTAL INVESTIGATION ON DIFFUSION BONDING OF AA 7075 AND AZ80 WITH ZINC AS AN INTERLAYER**

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### **ABSTRACT**

Aluminium-Magnesium alloys are widely in fields of aeronautical and automotive body structure, wind and solar energy management. When, aluminium alloys are joined by fusion welding process there is a formation of extensive brittleness and oxide films are occurred. However, solid-state welding process such as diffusion bonding is suitable for joining both similar and dissimilar alloy. This bonding process works through the diffusion of atoms across the joint interface at elevated temperature. Various methods are used to determine the physical phenomena and optimum parameters of diffusion bonding. The Characteristics of the material are tested by SEM analysis & Optical microscope and the physical phenomena that have significant influence on diffusion bonding such as time, temperature & pressure on joints and metallurgical characteristics. It also aimed to obtain optimum parameters for diffusion bonding of aluminium over magnesium with Zinc as an interlayer

**Keywords:** Diffusion Bonding, AA7075, AZ80, SEM , Optical microscope, time, temperature & pressure.

## OPTIMIZATION OF FACTORS AFFECTING DIFFUSION BONDING EXPERIMENTS USING TAGUCHI'S ANALYSIS

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### ABSTRACT

Solid-state welding process such as diffusion bonding is suitable for joining both similar and dissimilar alloys. This bonding process works through the diffusion of atoms across the joint interface at elevated temperature. Here AA7075 (Al alloy) & AZ80 (Mg alloy) are the materials welded by diffusing bonding. There are various mathematical and statistical algorithms used for optimization process. Using Taguchi's technique because it is used to specify the relationship between the input and output parameters and here optimizing the parameters of diffusion bonding. The parameters to be optimized are bonding temperature, bonding pressure, holding time, bonding strength, shear strength and a combined analysis. Hence, this work is an effort to make the optimization of diffusion bonding by Taguchi's technique to attain maximum bonding strength.

**Keywords:** Diffusion Bonding, AA7075 , AZ80, Taguchi's Technique, L9 Orthogonal Array

## AERIAL ROBOTS PATH PLANNING STRATEGIES

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### ABSTRACT

This paper presents the meticulous study of path planning strategies of aerial robot and its evaluation. Most of the criteria's are taken into account such as known and unknown environment, obstacles, etc and then compared with all the methodologies present. There are various strategies used for path planning which are mainly classified into two categories, Classical approach and Reactive approach. In this paper we concentrate on reactive approaches such as genetic algorithm (GA), fuzzy logic (FL), neural network (NN), firefly algorithm (FA), particle swarm optimization (PSO), ant colony optimization (ACO), artificial bee colony (ABC) and cuckoo search (CS) are considered for study. These are the most commonly and widely used algorithms and strategies which are compared for further study.

**Keyword :** Genetic Algorithm, Neural Network, Aerial Robots

## **EXPERIMENTAL ANALYSIS FOR CORROSION RESISTANCE OF AISI-2205 DUPLEX STAINLESS STEEL USING ELECTROCHEMICAL POTENTIOSTAT TEST**

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### **ABSTRACT**

The effects of cryogenic treatment which is used to improve the mechanical properties of a material, on the corrosion of AISI 2205 Duplex stainless steel in 3.5% NaCl solution were examined by electrochemical Potentiostat test. The materials were cryo-treated using the cooling medium (Liquid Nitrogen) with the temperature of (-196°C) for 24 hours and the hardness tests were conducted. It was shown in this study that in hardness tests cryogenically treated material showed an increase in material life. The surface structure of the AISI 2205 Duplex stainless steel was examined by scanning electron microscopy (SEM) after the electrochemical Potentiostat investigations.

**Key words:** Corrosion, Cryogenic treatment, Electrochemical impedance spectroscopy, AISI 2205 duplex steel.

## **REDUCTION OF BUTT WELDING USING FAILURE MODE AND EFFECTS ANALYSIS**

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### **ABSTRACT**

In the globally competitive environment, reduced time to market, cost competitiveness and customer delight are important for the survival of a product. Concurrent Engineering (CE) concepts are applied extensively to achieve the same. In this paper, Failure Mode and Effects Analysis (FMEA), which is one of the CE tools, has been applied to a scale industry, where job works such as manufacturing of Boiler Drum, which is a part of power plant Process FMEA has been applied in the manufacturing process of the boiler drum to identify the errors and the defects before manufacturing the inspection of the component. The process FMEA is represented in the form of a table for each process. Based on the highest RPN values obtained from the FMEA table, the potential failure modes are prioritized and recommended actions are suggested. The implementation of process FMEA resulted in the reduction of failures.

**KEY WORDS:** Concurrent Engineering, Failure Mode and Effects Analysis



## PERFORMANCE ENHANCEMENT OF SOLAR AIR HEATER WITH QUATREFOIL SHAPED ARTIFICIAL ROUGHNESS

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### ABSTRACT :

Solar air heater is one of the best methods to convert solar energy into heat energy. Solar heating technologies use only free, renewable and clean energy. Large number of experimental investigations, Involving different types of artificial roughness element have been carried out to improve the heat transfer from the absorber plate to air flowing in solar air heaters. In this study Experimental investigates the glazed solar air heater with quatrefoil shaped artificial roughness is placed above the absorber plate in the solar air heater. The solar air heaters with quatrefoil shaped artificial roughness and conventional solar air heater are tested. The result shows that the maximum temperature of artificial roughened SAH and Conventional SAH are 670C and 470C respectively. Due to increase of heat transfer area and increase the turbulence lead to higher heat recovery rate of quatrefoil shaped artificial roughness is 47% more compared to conventional type.

**Keywords:** quatrefoil shaped artificial roughness, Diameter, Heat transfer area, Solar irradiation.

## SMART TRAFFIC CLEARANCE SYSTEM WITH IMAGE PROCESSING

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### ABSTRACT

Vehicle use has grown exponentially in the past decades and is still growing so that we need advanced systems to control the vehicle flow at traffic signals. In this paper we are providing a system to control traffic flow which is (Smart traffic clearance system with image processing). Image processing will be able to sense when a vehicle approaches and change the light accordingly. This will lead to faster and more efficient travel times for commuters, which will improve their overall experience on the road. Image processing used to control the turn-on time of traffic lights according to the density (number) of vehicles on the road. Images from CCTV cameras are processed to detect any accidents and make response to it. By in two ways one way is alerting the emergency workers and another way is controlling the traffic signal in response to the accident. The system enables the identification of the emergency vehicle and gives the green light to emergency vehicles such as ambulances, fire engines, etc. Image processing is used to detect pedestrians, monitor pedestrian safety and modify traffic signals accordingly.

**Keywords:** Traffic light control, image processing, vehicle density, Flow control, pedestrian's detection, Accident Detection.

## **A REVIEW ON USAGE AND PRODUCTION OF ETHANOL AS AN ALTERNATIVE FUEL FOR IC ENGINES FROM SUGARCANE**

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### **ABSTRACT**

The IC engine fuels are the tight spot of the people because of the increasing price and dilemma in price fixation. The demand of energy and depletion in the fossil fuels leads to search for supplementary fuel. Molasses is the byproduct of sugar industry which is under research and Consideration for effective utilization. Brazil is a major sugarcane producer and its production more than doubled over the last decades to meet global bioenergy demands for reducing crude oil dependency and mitigating climate change. The government has an interest in maintaining the use of this alternative fuel because of several merits, e.g., the large number of jobs created in the field and the significant amount of hard currency saved on oil imports. On the other hand, most of the subsidies provided to ethanol producers have been removed because they have been in existence for a long time. The first use continues and all gasoline sold in the country contains 24% ethanol. The cost of molasses is increasing so there is a need to improve the ethanol production from cane molasses. Molasses nearly involved about 10 % unfermentable sugars relative to the fermentable sugars. Depolymerising enzymes such as alpha amylase, glucoamylase, dextranase and cellulase were applied to break down the biopolymer such as starch; dextral and cellulose to monosaccharide can be fermented to bio-ethanol during the process of fermentation. Petroleum Planning and Analysis Cell, India has imported 198 million tons of crude oil worth \$62.7 billion in 2020-21. The consumption slightly reduced in the second pandemic time. The enhancement of sugar cane cultivation and development of alternate fuel from sugar cane products will reduce the investment in crude oil and thus increases the Indian economy. This paper deals the review of investment in crude oil import and effective utilization of sugarcane products.

**Key words:** Depolymerising enzymes, Alpha amylase, Glucoamylase, Dextranase, Molasses

## REVIEW UPON THE ADVANCED IN AUTOMOBILE

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### ABSTRACT

The automotive industry plays a vital role as the stamina of any countries economy. Automotive Glove Box is one of the most important parts in vehicle interior parts. One of the business strategies is finding out what you want from this product and help them achieve customer satisfaction. The specification for choosing a Glove Box unit is analyzed with the customer's preference and converted into engineering characteristics. Automobile engineering is a branch of applied engineering that involves incorporating elements of mechanical, electrical, electronic, software and safety engineering as applied to design manufacture and operate automobiles. The advances in automobile engineering journal provide an open access platform to automotive engineering. Automation devices are the devices used in the technique of making an apparatus, a process, or a system operate automatically. Some automotive industry is a wide range of companies and organizations involved in the design, development, manufacturing, marketing, and selling of motor vehicles. It is one of the world most important economic sectors by revenue. Automotive engineering is a combination of; mechanical, electrical and materials science. Engineers in this field can design new vehicles or look for ways to improve existing automotive engineering technology. The automotive industry is a wide range of companies and organizations involved in the design, development, manufacturing, marketing, and selling of motor vehicles. It is one of the world's most important economic sectors by revenue. The new product development requirements are identified from the market survey, and the voice of the customer is converted into the customer's requirements. Advance automobile method was using important development in car glove box material quality, cooling unit and increasing the inner dimension and modifying the current design to add a multi-compartment partition and knee airbag should be in the right place and convenient to use according to the customer's expectation. Automotive engineering, along with aerospace engineering and naval architecture is a branch of vehicle engineering, incorporating elements of mechanical, electronic, software and safety engineering as applied to the design, manufacture and operation of motor cycles and trucks and their respective engineering subsystems. It also includes modification of vehicles. Manufacturing domain deals with the creation and assembling the whole parts of automobiles is also included in it. The automotive engineering field is research-intensive and involves direct application of mathematical models and formulas. The study of automotive engineering is to design, develop, fabricate, and test vehicles or vehicle components from the concept stage to production stage.

**Keywords:** Glove box material, Multi-compartment partition, Knee Airbag Vehicle, Automotive Engineering.

## INVESTIGATION OF MECHATRONICS EQUIPMENTS AND ITS APPLICATION IN ENGINEERING AND MEDICINE

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### ABSTRACT

Mechatronics, also called mechatronic engineering, is a multidisciplinary branch of engineering that focuses on the engineering of both electrical and mechanical systems, and also includes a combination of robotics, electronics, computer, systems, control, and product engineering. Some of our students get access to mechatronics equipment through the Integrating Studies modules as part of their undergraduate degree. Other students will also come into contact with mechatronics when developing a product and require assistance from our technicians to understand how their product can work electronically and what options they have. Mechatronics is an exciting, multidisciplinary application, which facilitates a basic introduction to various engineering disciplines. Measurement systems consisting of sensors and instrumentation are well suited for physics-based modeling, so that teachers, drawing upon their existing science and mathematics skills, can collect/analyze data and gain valuable insights to draw conclusions. Control systems consisting of physical plant, actuators, and power electronics provide the teachers an opportunity to apply their existing science and mathematics skills for physics-based system modeling. Exposure to computer hardware and software for measurement and control introduces the teachers to modern tools such as data acquisition boards, micro-controllers, Lab- VIEW, Mat lab, etc. Teachers are given an opportunity to learn and apply modern, state-of-the- art, computerized, remote data acquisition, monitoring, and control and computerized delivery tools such as presentation graphics, document preparation, and spreadsheets.

**Keywords:** Multidisciplinary, Measurement systems, Control systems, Data acquisition boards

## PORTABLE E- SPRAYER FOR AGRICULTURAL APPLICATIONS

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### ABSTRACT

In order to protect food and fiber crops against insects, disease and weed pests used agricultural chemicals such as insecticides, fungicides herbicides. With classical methods more chemical than theoretically needed is often applied due to the variability in field conditions and the need to ensure complete. In this case, 95% of the chemical applied can be wasted to the ground, for soil pollution, or at most 50% of mass transfer onto the desired plant. The project shows that electrostatic spraying can offer a possible solution to those environmental problems by reducing spray drift and improving coverage of chemical to target plant. In this project are presented principle of Electrostatic Spraying, the equipments, technological aspects and application. There are more product in market but they are should be carried in shoulder another type product should be kept in a place and they don't have storage tank. To make a solution for this we created this product. This doesn't need of electricity to charge solar panel is also provided. It operated with a double diaphragm pump with 8.5 bar. provided with 15Ahm lithium ion battery backup of 3 hours running time. It also provided with solar plane of 75watts. It has a carrying capacity of 50 liter of water.

**Keywords:** E- Sprayer, Lithium ion battery, Electrostatic Spraying, Fiber crops

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