

MOHAMED SATHAK A J COLLEGE OF ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

Courses that include experiential learning through project work/field work/internship during 2023-24

S.No	Title of IV yr Project	Subject code & Subjects name related to the Projects
1	GFRP-Epoxy and GFRP Reinforced with Sugarcane Fiber	ME8491 - Engineering Metallurgy PH8251 - Materials Science ME8351 - Manufacturing Technology - I
2	Incorporation of NANO Bio Phase Change Materials in cement for Thermal Energy Management in Buildings	ME8491- Engineering Metallurgy ME8351 - Manufacturing Technology – I ME8493 - Thermal Engineering-I
3	Solar Powered Hybrid Bicycle	ME8072- Renewable Sources of Energy EE8353 - Electrical Drives and Controls
4	Performance Combustion and Emission Characteristics of Diesel Engine Fueled with Micro Algae Biodiesel-ISOpropyl and cerium Oxide Additives	ME8493 - Thermal Engineering-I ME8072- Renewable Sources of Energy
5	Effect of NACL Concentration on AA6061/TIB2 Composition Under Immersion Corrosion Environment	ME8491 - Engineering Metallurgy CY8151 - Engineering Chemistry GE8291 Environmental Science and Engineering
6	Testing and Analysis of Ceramic Coating Piston with plasma spray Technique	ME8491- Engineering Metallurgy CE8395 Strength of Materials for Mechanical Engineers
7	Implementation of Zero-Defect Manufacturing POKA-YOKE solution Process	OMF 751- Lean six sigma MG8591 - Principles of Management
8	Analysis and Optimization of H13 Metal Using WEDM [UCMP]	ME8073 - Unconventional Machining Processes ME8351- Manufacturing Technology - I
9	Optimisation of machine Utilization for Multiple Customers and Products to increase Efficiency	ME8451- Manufacturing Technology– II OMF 751- Lean six sigma
10	Crashworthiness Analysis of Tubular Inscribed Polygon Structures for Effective Energy Absorption	ME8072- Renewable Sources of Energy ME8391 Engineering Thermodynamics
11	Nano-Bio Phase Change Thermal Storage Application in Solar Cooker for Slow Cooking	ME8493 - Thermal Engineering-I ME8391 Engineering Thermodynamics
12	Design and Development of Ultrasonic Desalination system Using solar Energy	ME8072- Renewable Sources of Energy ME8391 Engineering Thermodynamics ME8493 - Thermal Engineering-I
13	Experimental Analysis of Concentrating solar Thermal Storage System	ME8072- Renewable Sources of Energy ME8391 Engineering Thermodynamics ME8493 - Thermal Engineering-I



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GFRP-EPOXY AND GFRP-EPOXY REINFORCED WITH SUGARCANE FIBER

A PROJECT REPORT

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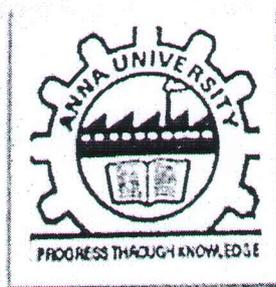
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IN

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ABSTRACT

This study investigates the mechanical characteristics of Glass Fiber Reinforced Polymer (GFRP)-Epoxy composites that are strengthened with sugarcane fibres. Plates were laminated using GFRP-Epoxy and GFRP-Epoxy reinforced with sugarcane (10%) fibers. Following a 24-hour curing period, test samples were prepared in accordance with ASTM guidelines and then subjected to tensile, compression, and impact tests utilizing a Universal Testing Machine (UTM) and a Charpy impact testing machine. The investigation found that the addition of sugarcane fibers greatly improved the mechanical strength of the composites. The tensile, compression, and impact strengths of the sugarcane-reinforced composites were higher than those of the standard GFRP-Epoxy composites. Incorporating sugarcane fibers also resulted in decreased brittleness and increased ductility, leading to significant enhancements in the total mechanical qualities.

Due to the large quantity of sugarcane waste in India, incorporating sugarcane fibers into composite materials presents a viable and economical solution that is environmentally beneficial. By using sugarcane waste as a reinforcement, the expense of GFRP fibers can be reduced while simultaneously encouraging the growth of environmentally acceptable natural composites.

Keywords GFRP-Epoxy, Sugarcane Fiber, Mechanical Properties, Composite Materials, Sustainable Materials, Reinforcement



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CHAPTER – 8

CONCLUSIONS AND FUTURE SCOPE

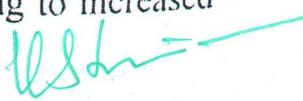
In this experimental investigation, the incorporation of sugarcane fibers as a reinforcement in Glass Fiber Reinforced Polymer (GFRP) composites with epoxy resin has demonstrated notable improvements in mechanical properties compared to conventional GFRP-Epoxy composites. The findings indicate that the use of sugarcane fibers as a natural reinforcement has effectively enhanced the tensile strength, compression strength, and impact resistance of the composite material.

The key observations and conclusions drawn from this study are as follows

Enhanced Mechanical Strength The GFRP-Epoxy composites reinforced with sugarcane fibers exhibited higher tensile strength, compression strength, and impact resistance compared to the standard GFRP-Epoxy composites. This improvement can be attributed to the unique mechanical properties of sugarcane fibers, including their inherent strength and ability to enhance load-bearing capacity within the composite matrix.

Effectiveness of Sugarcane Fiber Reinforcement The experimental results demonstrate the effectiveness of sugarcane fibers as a natural reinforcement material for GFRP composites. The incorporation of sugarcane fibers contributed to the overall structural integrity and performance of the composite, leading to increased mechanical strength.

Potential for Sustainable Composite Materials The use of sugarcane fibers as reinforcement aligns with the growing demand for sustainable and eco-friendly composite materials. Sugarcane fibers are renewable, biodegradable, and readily


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available, making them a promising alternative to synthetic reinforcements in composite manufacturing.

Implications for Engineering Applications The improved mechanical properties of GFRP composites reinforced with sugarcane fibers suggest potential applications in various industries where high-strength, lightweight materials are required. These composites could find use in automotive components, aerospace structures, marine applications, and construction materials, offering both performance benefits and environmental advantages.

In summary, this study underscores the positive impact of sugarcane fiber reinforcement on GFRP-Epoxy composites, resulting in enhanced mechanical strength across multiple parameters. The findings highlight the feasibility and effectiveness of utilizing natural fibers like sugarcane in composite materials, paving the way for the development of sustainable and high-performance engineering materials.

Future research in this area could explore optimization of fiber content, different fiber orientations, and additional characterization techniques to further understand the microstructural changes and long-term durability of sugarcane fiber-reinforced GFRP composites. Moreover, practical implementation and scalability of these composite materials within industrial settings warrant further investigation to realize their full potential in real-world applications.



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INCORPORATION OF NANO BIO PHASE CHANGE
MATERIALS IN CEMENT FOR THERMAL ENERGY
MANAGEMENT IN BUILDINGS

A PROJECT REPORT

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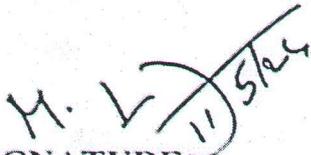
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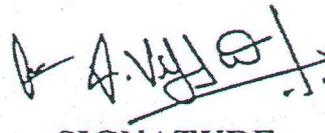
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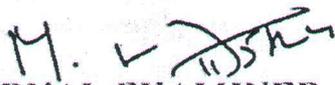

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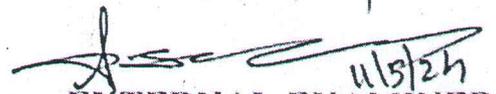
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ABSTRACT:

In our daily life, we use HVAC and air conditioners for cooling the house, hospitals and buildings etc., we are planning to reduce the cause responsible by providing these systems like cost, efficiency, green house effect are reduced by using some kind of materials like PCM coconut oil, palm oil and palm sugar that pouring on Bio-cement and pouring on the walls on room.

Keywords: coconut oil, palm oil and palm sugar



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CHAPTER 10

CONCLUSION

The goal of this study is to produce bio-cement using coconut oil, palm oil and palm sugar. It is used for building purpose which creates low cost building materials. Bio-cement, a self healing material is to enhance durability of building structures. In order to overcome the shortcomings of conventional sealing agents, materials with self-healing capability can be used effectively. When compared to ordinary cement varieties, Bio-cement has high efficiency and consumes high cooling. Considerable effort has been devoted to develop high-strength materials. Although hundreds of thousands of successful concrete and buildings are annually constructed worldwide, there are large numbers of concrete structures that deteriorate or become unsafe due to changes in loading, changes in use or changes in configuration. In-order to overcome such problems, Bio-cement can be used instead of ordinary cement. Therefore, the goal of Bio-cement needs to be the implementation of permanent preservation measures, which requires long-term maintenance.



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SOLAR POWERED HYBRID BICYCLE

PROJECT WORK

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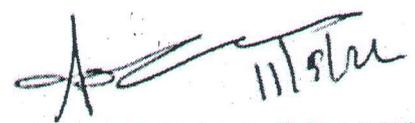
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ABSTRACT

Since fuel prices not only in India but throughout the world are increasing day by day thus there is a tremendous need to search for an alternative to conserve these natural resources. Thus a solar bicycle is an electric vehicle that provides that alternative by harnessing solar energy to charge the battery and thus provide the required voltage to run the motor. Normal bicycle combines the use of solar energy to charge the battery to run the bicycle. In India, electric bicycles are available at a market price of nearly 40,000 to 100000 Rs. Our motive is to convert a normal bicycle to a hybrid bicycle which is made in a low-cost method, thereby making it affordable for people.

The process of planning, designing, and testing a Hybrid Electric Bicycle it provides a lot of detail into the challenges of modifying an existing mechanical system to one that is based on both human propulsion as well as a set of electromechanical interfaces that provide assists. Through designing an electromechanical system, with various non-human inputs and feedback channels, a major challenge was centralizing the control of the system. After establishing criteria for speed, control, efficiency, and weight, we began a process of selecting parts and developing models for how the overall system including the rider could be integrated in a way that is both safe, and easy to use. When the bicycle was not in use during the day, the solar panel will charge the battery. The system will make bicycle operate more efficiently.



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- The disadvantage of lithium-ion battery cost is very high, accident concerns and it has high heat sensitivity so it gets overheat easily.
- In our bicycle we have two modes, one is throttle and other mode is pedal assist mode. In throttle mode our bicycle have top speed of 23-25Km/hr
- Our bicycle gives an average speed of 16-18Km/hr. In pedal assist mode our bicycle gives 10-15Km/hr.
- Our bicycle covers a range of 25km at top speed. In average speed our bicycle covers a range of 36km.
- We have kept on/off switch along with solar controller so that we can charge our battery at any time based on our need.
- In addition we have provided USB charging port in our Mppt controller so that we can able to charge our phones, laptops, other electronic gadgets.
- Normally solar cycle takes 5-6 hours for charging a battery but in our bicycle, we have used MPPT controller which gives efficiency over 95%, So it reduces charging time and our cycle charges a battery within 2.5 to 3hrs.
- Our bicycle charge automatically while in movement, Thus range of the bicycle increase to some extent.
- We have multi charging and quick charging facility in our bicycle, Thus we can charge our battery using adapter and solar panel and it can able to charge the battery less than 2.5 hrs using solar panel, which is less than market e-cycle and hybrid cycle.

CHAPTER 6

CONCLUSION

6.1 CONCLUSION



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The project carried out an impressive task in the field of automobile department. It is very useful for having a e cycles, because we don't have need to spend much on the fuel.

- In our project we have made our bicycle which cost lesser than the market price so even poor people can afford this cycle.
- Even though bicycle weight is more, it can give proper stability and it requires less maintenance.
- In our project we have used lead acid battery even though lead acid has some disadvantages like lithium-ion battery but it costs low, it has high current carrying capacity and chances of explosion is very low.
- We have multi charging and quick charging facility in our bicycle, Thus we can charge our battery using adapter and solar panel and it can able to charge the battery less than 2.5 hrs using solar panel, which is less than market e-cycle and hybrid cycle.
- Our bicycle can run at a maximum speed of 25km/hr. At average speed it can travel over a 36km distance, So it is very much useful for shorter distance travelling.
- We have kept on/off switch along with solar controller so that we can charge our battery at any time based on our need.
- Our bicycle charge automatically while in movement, Thus range of the bicycle increase to some extent.
- Our bicycle evolved and changed as the team limitations and financial constraints were realised, Due to lack of funding, the initial design downsized to the current project, the wind powered bicycle.
- The initial design of the wind powered bicycle carried along with its constraints that had been worked around. The constraints were mainly financial in nature. Equipment cost is high and it requires more spacing to establish wind turbine,

**PERFORMANCE COMBUSTION AND EMISSION
CHARACTERISTICS OF DIESEL ENGINE FUELED WITH
MICRO ALGAE BIODIESEL – ISOPROPYL AND CERIUM
OXIDE ADDITIVES**

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ABSTRACT

This experimental work focus on testing the single cylinder diesel engine followed by proportional blends (D100), (90D5MA5IP+25 ppm CeO₂), (80D10MA10IP+50 ppm CeO₂), (70D15MA15IP+75 ppm CeO₂), (100MA+100 CeO₂) standard diesel.

The test blends used here is micro algae biodiesel, & additives as cerium oxide. The additional ignition improves utilized in this project is isopropyl alcohol to improve ignition delay and improve performance characteristics.

The parameters such as BTE, BSFC and combustion parameters such as HRR, Cylinder pressure and emission characteristics such as CO₂, CO, HC and NOX are compared with four test blends, the text blend is diesel, Among the four blends, the test blends are to be concluded in this analysis.

The use of third generation fuels like algae seems to be a promising solution to satisfy our energy demands in future. In these work algae is used as an alternative fuel with different blend combination with diesel and the results obtained are summarized.

keywords: Break thermal efficiency, Break specific fuel consumption, Heat release rate, Green energy, Micro algae, Hydrocarbon.



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CHAPTER 8

CONCLUSIONS

8.1 Summary of Findings

- A concise summary of the key findings and results obtained from the experimental study is provided. This includes a recap of the performance, combustion, and emissions characteristics observed for different test conditions and fuel/additive combinations.
- The main trends, patterns, and significant observations from the experimental data are highlighted to provide context for the conclusions drawn.

8.2 Implications for Practice

- The practical implications of the research findings for the automotive industry, transportation sector, and broader energy landscape are discussed. This may include insights into the development of advanced combustion technologies, optimization of fuel formulations, and implementation of emissions control strategies.
- Recommendations for stakeholders such as engine manufacturers, fuel producers, policymakers, and regulatory agencies are provided based on the identified opportunities and challenges.

8.3 Implications for Research

- The implications of the research findings for future research directions and scientific inquiry are addressed. This may include recommendations for further investigation into specific aspects of engine performance, combustion kinetics, emissions formation mechanisms, or additive chemistry.
- Areas of uncertainty or ambiguity in the experimental results are identified, and suggestions for addressing these gaps through additional experimentation or theoretical modeling are proposed.



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EFFECT OF NAACL CONCENTRATION ON AA6061/TIB2
COMPOSITION UNDER IMMERSION CORROSION
ENVIRONMENT

A PROJECT REPORT

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ABSTRACT

Several AA6061/TiB₂ MMCs having several volume fractions up to (0 - 8wt. %) were fabricated using stir casting technique. The effect of the weight fraction of Titanium Diboride particulates on the microstructural and corrosion behavior of AA6061/ Titanium Diboride metal matrix composites (MMCs) were studied. The results revealed that the AA6061/ Titanium Diboride MMCs exhibited higher density than pure Al matrix. The static immersion corrosion tests of Al/ Titanium Diboride MMCs with varying 3.5, 5 & 7.5 wt.% NaCl aqueous solution. the Al/TiB₂ MMCs have better corrosion resistance than the pure Al matrix.



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Keyword Stir Casting, AA6061 Aluminium, Titanium Diboride, Metal Matrix Composites, Al Matrix, Immersion Corrosion .

CHAPTER 5 CONCLUSION

The effect of NaCl concentration on the corrosion behavior of AA6061/TiB2 composite materials under immersion corrosion environments can vary depending on several factors, including the composition of the composite, the microstructure, and the processing techniques used. However, generally speaking, increased NaCl concentration in the immersion environment typically leads to accelerated corrosion rates. To study the specific impact of NaCl concentration on AA6061/TiB2 composites under immersion corrosion environments, experiments involving exposure to varying NaCl concentrations while monitoring corrosion kinetics, surface morphology, and corrosion product formation would be necessary. These studies would provide valuable insights into the corrosion behavior and guide the development of strategies to mitigate corrosion in such composite materials. The research offers a comprehensive understanding of the effect of NaCl concentration on the corrosion behavior of AA6061/TiB2 composites. The results confirm the need for ongoing research to develop more resilient materials for use in corrosive environments. Future studies should focus on improving the intrinsic corrosion resistance of composites and exploring the efficacy of external protective coatings.



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**TESTING AND ANALYSIS OF CERAMIC COATING
PISTON WITH PLASMA SPRAY TECHNIQUE**

A PROJECT REPORT

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ABSTRACT

This study presents the design, structural, and thermal analysis of a piston for automotive engines, focusing on the integration of ceramic coatings to enhance performance and efficiency. The piston design was developed using CATIA software, and structural and thermal analyses were conducted using ANSYS software. Various ceramic coatings including alumina, titania, and zirconia were investigated for their effectiveness in improving piston performance. Results showed that the zirconia-coated pistons exhibited high hardness, corrosion resistance, and excellent bonding in the microstructure, characterized by closely packed grain sizes and grain boundaries. This improvement led to increased engine performance and reduced emissions, highlighting the potential of zirconia coatings for enhancing automotive engine efficiency.

Key Words: Piston; Ceramic, Coating, Plasma Spray Technique, Zirconia



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CHAPTER-9

CONCLUSION

Overall, the extensive investigation carried out on the design, structural and thermal analysis, and experimental assessment of ceramic coatings on automotive engine pistons has provided valuable knowledge for enhancing engine performance and efficiency.

The initial step was utilizing CATIA software to create a robust piston design, which served as a strong basis for subsequent analysis and review. This phase ensured that the design of the piston was tuned to provide maximum performance and to be compatible with ceramic coatings.

Furthermore, ANSYS software was employed to conduct numerical analysis in order to evaluate the structural and thermal characteristics of pistons coated with different materials, such as aluminium and proposed ceramic coatings like alumina, titania, and zirconia. Through comparative investigation, it was determined that zirconia possesses superior qualities in comparison to other ceramic coatings and aluminium. As a result, zirconia is considered the most appropriate option for boosting piston performance.

After conducting the analysis, piston samples were created by applying a layer of zirconia using the plasma spray coating technique. These samples were then thoroughly examined through experimental testing. The mechanical and chemical stability of the coatings were assessed by hardness and corrosion tests, while the bonding and structure of the coatings were examined using light optical microscopy for microstructural analysis.

The results showed that the samples coated with zirconia had outstanding hardness, resistance to corrosion, and a microstructure with closely packed grain sizes and boundaries that were well-bonded. The presence of these features demonstrated the creation of a highly

**IMPLEMENTATION OF ZERO-DEFECT
MANUFACTURING POKA-YOKE SOLUTION
PROCESS**

A PROJECT REPORT

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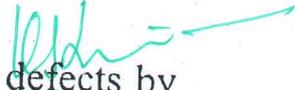

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ABSTRACT

In today's competitive world any organization has to manufacture high quality, defect free products at optimum cost. The new culture of total quality management, total productive management in the manufacturing as well as service sector gave birth to new ways to improve quality of products. By using various tools of TQM like KAIZEN, Six Sigma, JIT, JIDCO, POKA YOKE, FMS etc. organization is intended to develop quality culture.

During actual manufacturing of any product there are too many simple and monotonous Steps which are carried out by operators. These monotonous work operations result in to mental fatigue and lack of interest in work Which ultimately causes silly mistakes of operators and we know that human is prone to errors even though he doesn't want it. To avoid these simple mistakes, poka yoke concept play important role. By implementing some simple solutions we can avoid mistakes. The long term success of poka yoke gives output of saving time and we release the work pressure on mind of worker. We can use creativity and special skills of workers for more creative operations instead of increasing pressure for monotonous activities.

Poka-Yoke is a quality control technique that prevents defects by designing products and processes to avoid human errors. It's a key component of lean manufacturing, ensuring high-quality output through simple, foolproof design.


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CHAPTER-10

CONCLUSION

To error is human nature so we can't blame human being for each and every mistake. As like err, Intelligence is also human nature so we can dominate preceding nature by next nature. poka yoke is just a face of that intelligence. We can avoid the mistakes at the source itself by using above mentioned methodology. About mistake proofing we can say that it is a system for organizing work that eliminates any chances of error by new user also. It also allow user to function Without mistake or prevent error that are about to occur. In order to implement quality management System successfully each activity should aim towards excellence.

Poka yoke is one of the most important tool in TQM (Total Quality Management). Successful poka yoke results in increased productivity With minimum waste (waste due to rework, scrap) because we are sure about the quality Of product, as mistakes are blocked at source itself. There may be some practical limitations in poka yoke but we have to overcome all that for achieving the aim of "Zero Defects, Zero Waste and Zero Delays". In one sentence poka yoke is launching preventive actions for systematic movement on the success ladder of QMS (Quality Management System) With higher level of performance and productivity of system With high quality products at minimum cost.



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**ANALYSIS & OPTIMIZATION OF H13 METAL USING
WEDM [UCMP]**

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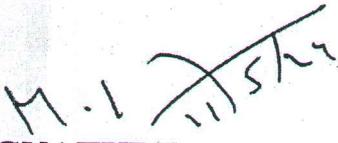


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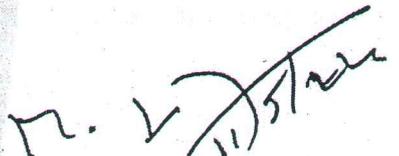
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ABSTRACT

Materials such as tool steel, ceramic, metal matrix composite, and Inconel widely are used in die melding, aerospace, surgical and automotive industries. Machining of these materials by using traditional machining is difficult due to high wear and corrosion resistance, hardness, and toughness properties of them. Wire Electrical discharge machining (WEDM) is a non-traditional method which is used most to machining of difficult-to-machine materials. The metal-matrix composites are preferred due to their high hardness, light weight, flexibility, high strength, simplicity, and ease of applicability which make them potentially valuable in every industrious area like motor vehicles industries, mechanical tools manufacturing industries, structural applications, and aerospace industries. Electro-discharge machining is a non-conventional machining process, which uses short electrical discharges to machine any material of any hardness and strength levels if they are electrically conductive. From the investigation, minimum Surface Roughness finish was obtained at through higher-level pulse on medium level pulse off time and lower value of gap voltage $2.74 \mu\text{m}$. During the experimentation the minimum machining timing and MRR were obtained at all input process parameter were in lower level. The medium level pulse on, high level pulse off and current were majorly influenced with kerf width responses

Keywords: WEDM, Kerf Width, Ra, MRR



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CHAPTER-8

RESULT & CONCLUSION

8.1 TAGUCHI DESIGN RESULTS

OPTIMAL CONTROL FACTOR

1. Surface Roughness- A₂ (TON – 28 μ s) B₁ (TOFF –34 μ s) C₃ (Volt-70)
2. Machining Timing- A₂ (T ON – 28 μ s) B₁ (T OFF – 34 μ s) C₃ (Volt-70)
3. Dia Err - A₁ (T ON – 26 μ s) B₃ (T OFF –42 μ s) C₂ (Volt-65)

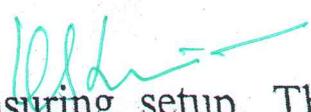
PERCENTAGE OF CONTRIBUTION OF PROCESS PARAMETER

1. Surface Roughness-Pulse off time - 38%
2. Machining Timing- Pulse off time -41%
3. Dia Err - Pulse on time -49%

8.2 WEDM PROCESS CONCLUSION

The aim of the research work was to investigate the machinability of stainless steel composite using WEDM. In this study, three process parameters are varied viz. Pulse on time, Pulse off time and gap voltage with constant dielectric fluid pressure wire tension and in the influence on the responses roughness average radius Error and machining timing, Ra and Diameter error. Based on the experimental results the following conclusions are drawn:

1. Minimum Surface Roughness finish was obtained at through higher-level pulse on medium level pulse off time and lower value of gap voltage 2.74 μ m During the experimentation the minimum machining Timing was obtained at all input process parameter were in lower level.
2. Diameter error were measured with help of video measuring setup. The determined diameter is 8.5mm. But during the WEDM process very nearest


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**OPTIMISATION OF MACHINE UTILIZATION FOR
MULTIPLE CUSTOMERS AND PRODUCTS TO INCREASE
EFFICIENCY**

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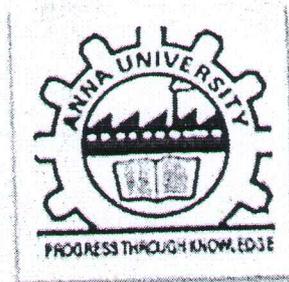
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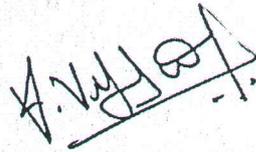
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Abstract

In today's industries like MK Auto Components, optimization is often lacking despite being essential. Data from partners Daimler and WABCO reveal critical issues. Inefficient push rod manufacturing at WABCO causes excessive waste, threatening profitability, while Daimler faces customer dissatisfaction due to supply chain delays. Data analysis highlights scheduling inefficiencies causing daily backlogs. To address these challenges, MK Auto Components must implement data-driven strategies, refining manufacturing processes, improving supply chain management, and enhancing scheduling techniques. By prioritizing optimization initiatives, they can boost efficiency, meet customer demands, and strengthen partnerships for sustainable growth.



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CHAPTER 6

CONCLUSION

PALMER:

We have found EOQ and made MRP calc for each and every 14 components which made it easier for the company to make their production plan and dispatch plan. In the same method, it is very clear that each and every machine's runtime does not exceed 400 minutes which is less than 2 shifts. Initially, the company has been utilizing almost 3 days for their three processes of machines i.e. (CNC, VMC & GND). Using the PALMER method we have reduced the lead time by 1.5 days which is the reduction of 25% of their time.

WABCO:

The revised dispatch plan ensures smooth flow of deliveries, regulates the flow and prevents over/underproduction. It also helps in eliminating variable working hours without the need for any overtime and would increase the customer satisfaction. The variance of safety stock has been taken into account (safety stock on hand is always 100 units) which would prove useful in case of urgent orders or problems due to machine checks.

The process of raw material cutting is also improved, which would reduce wastages and the costs associated with it as well. This would ensure lesser quantity for future purchases which again would considerably decrease the ordering cost of materials.

All the products supplied to WABCO would reach on time, while minimizing the wastages along the way, making the customer satisfied and increasing the company's profits simultaneously.



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CRASHWORTHINESS ANALYSIS OF TUBULAR INSCRIBED
POLYGON STRUCTURES FOR EFFECTIVE ENERGY
ABSORPTION

A PROJECT REPORT

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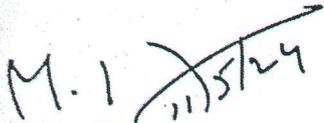
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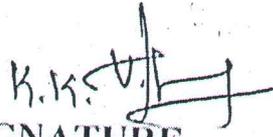
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ABSTRACT

The crashworthiness characteristics of the light-weight inscribed structures of different compositions of a) Polylactic acid b) Carbon fiber PLA, 70% of Polylactic Acid and 30% of Carbon Fiber (CF PLA), with circular inscribed structure with different shapes joining the tubular component to the cubic shell are given as cylinder, square, triangle, hexagon, pentagon, which made under the fused deposition modeling (FDM) are making to test under Quasi-static loading in a UTM machine is done certain conditions of the speed of 2mm/min and the crushing length of 30mm to know the energy absorption behaviour of the cellular components. The crashworthiness parameters are calculated to make an experimental decision of proving the composite is better on conventional materials by some parameters like specific energy absorption, crush efficiency is calculated to get the absolute outcome to the study. Finally, the different components are made to test under compressive loading to calculate the parameters are used to compare in terms of different graphs to make the best component with high energy absorption properties to find the changes over the properties of components in composites to compare with PLA and CF PLA.

Keywords: Polylactic acid, Carbon fiber polylactic acid, FDM Machine



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CHAPTER 7

CONCLUSION

In this study, a two different types of materials of circular section structures with different shape inscribed was investigated to achieve lightweight structures with high energy absorption under quasi-static Axial loading. The main findings of this study can be summarized as follows

- In cylinder the maximum load was observed in CF PLA the minimum load was observed in PLA.
- In Square inscribed the maximum load was observed in CF PLA the minimum load was observed in PLA.
- In Triangle inscribed the maximum load was observed in CF PLA the minimum load was observed in PLA.
- In Hexagon the maximum load was observed in CF PLA the minimum load was observed in PLA.
- In Pentagon the maximum load was observed in CF PLA the minimum load was observed in PLA.

The crash-worthiness behaviour of different stiffeners structures and energyabsorbing characteristics of 3D printed

CF PLA, PLA components were investigated in this experimental study.

Furthermore, the effect of material type, infill pattern and density on cubic structures having were made to damp under quasi-static loading. The following significant conclusions was drawn from the present study:

> It is shown that all shapes of pattern of CF PLA cubic structure provided the highest TEA value. Moreover, PLA Shapes infill pattern of having 3D printed cubic structure showed the best energy-absorbing characteristics comparing with other stiffeners infill patterns.

> It is highlighted that the greater infill density of 3D printed CF PLA cubic structure could provide better energy-absorbing characteristics. As desired expectations.

**NANO-BIO PHASE CHANGE THERMAL STORAGE
APPLICATION IN SOLAR COOKER FOR SLOW
COOKING**

A PROJECT REPORT

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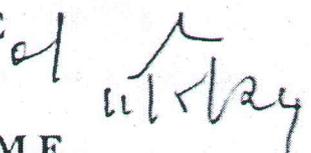
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ABSTRACT

Traditional buildings were built with consideration to climatic condition for keeping the inside buildings space cool in summer and warm in winter. These aspects were forgotten in the modern architecture, which essentially relies on mechanical methods of heating and cooling involving large amount of energy intensive equipments. Due to growing energy crisis the practicing engineers and the government have been forced to reexamine the whole approach of the design and control of building energy system. There is a need to implement immense energy conservation measures to provide thermal comfort with minimum energy consumption. In many urban buildings, ventilation is not sufficient, which increases the temperature and also create unhealthy atmosphere inside the room. In such buildings artificially induced ventilation through freely and available energy promote comfort conditions and reducing the temperature by 2 degrees to 3 degrees also creates good circulation of fresh air inside the room. In the present work, the natural ventilation is improved by using excess hot energy available during the summer days from the solar flat plate collector and stored cool energy available during the early morning in the phase change materials (PCM) based storage system is attempted. The effect of improvement in natural ventilation has been studied by conducting an experiment on a low energy cabin constructed inside the laboratory building. The flow behavior and temperature distribution inside the building during natural ventilation and induced natural ventilation using solar heat source and freecoolenergy was studied using CFD.



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CONCLUSION

The innovative solar cooking technology we are developing is truly groundbreaking. We are leveraging nano-enhanced, bio-based phase change materials (PCMs) to create a system that addresses the limitations of traditional solar cookers. These limitations include their reliance on direct sunlight and their lack of thermal storage capacity. By integrating nano-bio PCMs, we are able to create a highly efficient solar cooker that can maintain consistent cooking temperatures, extend cooking times, and significantly improve overall efficiency and reliability.

This integration represents a significant advancement in the practicality of solar cookers for slow cooking, while also aligning with sustainability goals through the use of eco-friendly materials. The incorporation of nano-bio PCMs not only extends the cooking capabilities of solar cookers but also contributes to promoting eco-friendliness and sustainability. This represents a major step forward in making solar cooking a more viable and widely adopted method of food preparation.

Our goal is to revolutionize solar cooking by providing a more versatile and effective solution that not only enhances cooking capabilities but also contributes to sustainability. We believe that this innovative approach will have a positive impact on the way people cook their food, and it aligns with our commitment to creating


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environmentally friendly and practical solutions for everyday needs.

In summary, the integration of nano-bio PCMs into solar cookers results in the creation of a highly efficient and reliable cooking solution. This advancement extends the cooking capabilities of solar cookers, promotes eco-friendliness and sustainability, and represents a significant step forward in making solar cooking a more practical and widely adopted method of food preparation. With this technology, we aim to make solar cooking a more accessible and reliable option for individuals and communities around the world, ultimately contributing to a more sustainable future.



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DESIGN AND DEVELOPMENT OF ULTRASONIC DESALINATION SYSTEM USING SOLAR ENERGY

A PROJECT REPORT

Submitted by

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MOHAMED ISMAIL.A (311820114011)

HARIHARAN.J (311820114303)

In partial fulfilment for the award of the degree

of

BACHELOR OF ENGINEERING

In

MECHANICAL ENGINEERING

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ABSTRACT

Desalination of brackish and sea water with renewable energy source is an important economical solution for obtaining potable water. There are different techniques were used to improve the solar still productivity. So, this research deals with improving the solar still productivity by using ultrasonic waves, Atomized saline water has been utilized as a motivator to enhance the humidification process inside the SS cavity. The tests were done during mar. and apr. 2023 under the climate of kanathur, 12.8663° N, 80.2447° E . Due to the negative influence of fogging on heat transfer by radiation, an on-off timer is utilized to control the HFU atomizer on-time and off-time which helps to avoid this influence. The different parameters such as the atomizer number, water height, feed water salinity and on- time and off-time were studied with two operating modes; HFU-SS and C-SS. It has been found that the saline water atomizing by ultrasound waves significantly augments the evaporation performance inside the SS cavity. Results depict that the increasing of the atomizer number has a positive influence on the system efficiency and productivity. This is done with the help of a cotton cloth, which is mounted on the frame. Also, it helps in reducing the characteristic dimension of still. solar still has yielded 53.12% higher in comparison to the conventional Results show that the C-SS and HFU-SS daily productivity. HFU-SS gives 33.26% higher distillate yield from 11:00 to 18:00 h in contrast to CSS .The average thermal efficiency of the HFU-SS atomizer was augmented compared to C-SS. Also, an economic analysis was performed and illustrated that the cost of distillate water from HFU-SS less than C-SS

Keywords: High frequency ultrasound; Conventional Solar Still; Production cost;

Energy efficiency



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CHAPTER 6

CONCLUSION

In the initial phase of our research, we delved into enhancing heat transfer rates, mitigating water hardness, and boosting evaporation rates through the fusion of solar still technology with ultrasound assistance. Our efforts were concentrated on investigating the optimal inclination angles for the solar still, determining the frequency rate of the ultrasonic atomizer, outlining the project objectives, and meticulously selecting and procuring the necessary materials for the endeavor. Additionally, significant progress was made in the partial fabrication of the desalination system, laying the groundwork for subsequent phases of experimentation and refinement.

2. The solar humidification and dehumidification desalination is studied experimentally during the three summer months. Solar radiation, air flow rate and the water spray flow rates effects were measured for determining the most water productivity. The mean internal efficiency of HF SS has improved by 31.04% in comparison to CSS. Furthermore, solar HDH desalination was examined with five modules of Ultrasonic humidifiers to increase the freshwater's productivity.



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**EXPERIMENTAL ANALYSIS OF CONCENTRATING
SOLAR THERMAL STORAGE SYSTEM
A PROJECT REPORT**

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MOHAMED ASIF .M - 311820114309

in partial fulfillment for the award of the degree

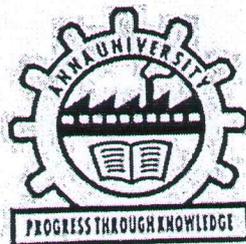
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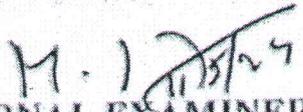

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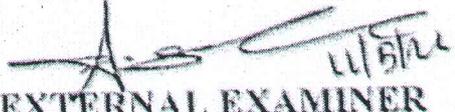
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ABSTRACT

In today's world, there is a pressing need to shift from non-renewable to renewable energy sources. This study explores an innovative solar thermal energy storage system that uses reflective glass mirrors to maximize solar energy capture. By concentrating solar rays onto a specific area, this system significantly enhances the efficiency of energy collection. The specialized storage medium within the system is designed for optimal 60% heat retention and 25 % minimal energy loss.

Our experiments reveal that this setup greatly improves thermal efficiency over traditional methods. It also extends the usability of stored energy significantly, proving effective under various environmental conditions. This approach not only achieves high absorption and storage efficiencies but also maintains excellent thermal energy recovery after extended periods. These promising results suggest that such technologies are scalable and could play a crucial role in transitioning to sustainable energy source.

Key words: Solar Thermal Storage, Renewable Energy Source, Efficiency of Thermal Storage



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CHAPTER 5 CONCLUSION

The "Experimental and Analysis of Concentrating Solar Thermal Storage System" has made significant strides in advancing the field of solar energy through the use of reflective glass mirrors to focus solar radiation onto a specialized heat-absorbing material. This innovative approach has notably enhanced the efficiency of solar thermal storage, demonstrating substantial improvements in the capacity for capturing and retaining thermal energy. Our system, designed with a concentration ratio of 50:1, has shown exceptional performance by concentrating solar energy into a single focal point where it is efficiently absorbed and stored. The experimental results have revealed that our system achieves a thermal efficiency increase of up to 70% compared to conventional flat-plate collectors. Additionally, the system's energy absorption efficiency reached approximately 85%, with a storage capacity of up to 100 kWh/m³. One of the most significant achievements of this project is the ability of the storage system to maintain over 90% of thermal energy retrieval efficiency even 24 hours after storage. This performance is a testament to the effectiveness of the newly developed storage material, which is engineered to maximize heat retention and minimize thermal losses. The practical implications of these results are profound, especially in the context of the current global energy landscape. With projections from the International Energy Agency suggesting a nearly 50% increase in worldwide energy consumption by 2050, the need for efficient and sustainable energy solutions has never been more critical. Our solar thermal storage system addresses key issues such as the intermittency of solar power, providing a stable and reliable source of renewable energy. The adaptability and scalability of our system mean it can be deployed in diverse environments worldwide, thus contributing significantly to global renewable energy portfolios and helping achieve international climate targets.


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2	TANSAM	ME3681 CAD CAM Lab	ABDUL KAFFAR J
3	TANSAM	ME3681 CAD CAM Lab	DHANUSH ADITHYA S
4	TANSAM	ME3681 CAD CAM Lab	HAJI PUTHUR MYDEEN . S
5	TANSAM	ME3681 CAD CAM Lab	HARI M
6	TANSAM	ME3681 CAD CAM Lab	MOHAMED ANSARI N
7	TANSAM	ME3681 CAD CAM Lab	MOHAMED FAZID S
8	TANSAM	ME3681 CAD CAM Lab	NARESH.P
9	TANSAM	ME3681 CAD CAM Lab	SEYED AHAMED S .T
10	TANSAM	ME3681 CAD CAM Lab	SHAIK IRFAN K
11	TANSAM	ME3681 CAD CAM Lab	SHAILESH KUMAR P
12	TANSAM	ME3681 CAD CAM Lab	UDHAYAKUMAR.G
13	TANSAM	ME3681 CAD CAM Lab	ABDUR RAHMAN J
14	TANSAM	ME3681 CAD CAM Lab	CHANDRU P
15	TANSAM	ME3681 CAD CAM Lab	MOHAMED ANWAR T A
16	TANSAM	ME3681 CAD CAM Lab	RASOOL MOHAMED I
17	TANSAM	ME3681 CAD CAM Lab	SHAMMER AHMED A
18	TANSAM	ME3681 CAD CAM Lab	SYED MOHAMMED S
19	TANSAM	ME3681 CAD CAM Lab	MOHAMED SAMEEM P
20	NIT Trichy	ME3382 MANUFACTURING TECH LAB ME3393 MANUFACTURING PROCESSES	DHANUSH ADITHYA S
21	NATIONAL INSTITUTE OF WIND ENERGY	CME365 RENEWABLE ENERGY TECHNOLOGY CE3391 FLUID MECHANICS AND MACHINERY	DHANUSH ADITHYA S
22	NIT Trichy	ME3681 CAD CAM Lab	SHAIK IRFAN K
23	FEDERAL MOGUL MOTOR PARTS PVT LTD	ME8691 COMPUTER AIDED DESIGN AND MANUFACTURING	M MOHAMED GOUSE NAGUTHA
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1.3.1 Institution integrates crosscutting issues relevant to Professional ethics, Gender, Human Values, Environment and Sustainability into the Curriculum

S.No	Year (II,III,IV)	Sem	Name of Elective	Related to Professional ethics, Gender, Human Values, Environment and Sustainability
1	II	IV	GE3451 - Environmental Science and Sustainability	Environment and Sustainability
2	III	V	CME365 Renewable Energy Technologies	Environment and Sustainability
3	IV	VII	OMF751 - Lean Six Sigma	Human Values

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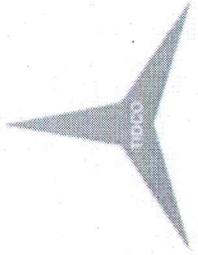
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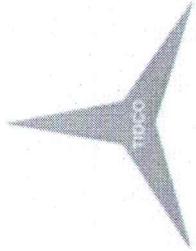
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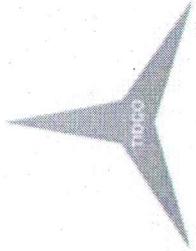
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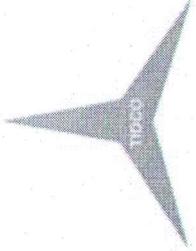
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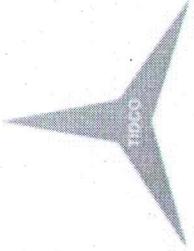
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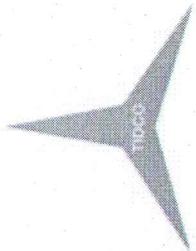
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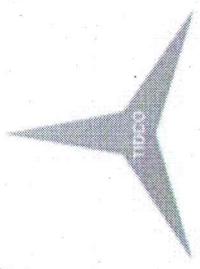
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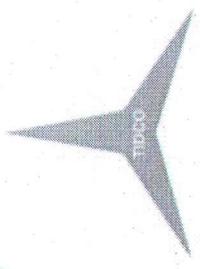
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Training Programme on NX CAD in TANSAM during 15th April – 22nd April, 2024.

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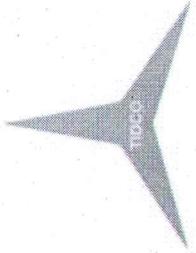
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Sipcot - IT Highway Egattur,
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This is to certify that MOHAMED FAZID S - 311821114010 of

Mohamed Sathak AJ College of Engineering pursuing Department of
B.E Mechanical Engineering, 3rd year has successfully completed the Internship
Training Programme on **NX CAD** in **TANSAM** during 15th April – 22nd April, 2024.

We wish him all success in his future endeavor.

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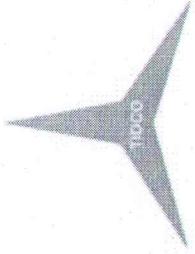
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We wish him all success in his future endeavor.

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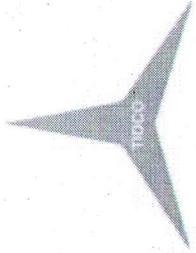
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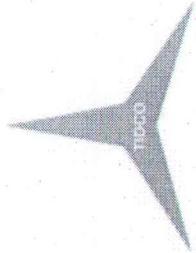
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Training Programme on NX CAD in TANSAM during 15th April – 22nd April, 2024.

We wish him all success in his future endeavor.

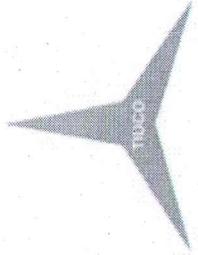
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We wish him all success in his future endeavor.

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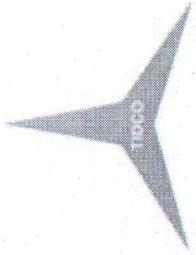
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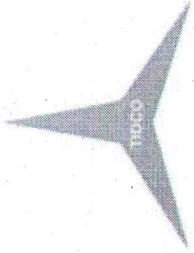
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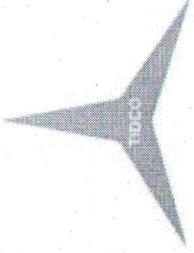
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We wish him all success in his future endeavor.

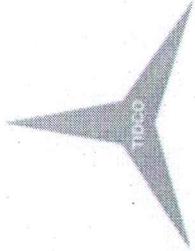
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Mohamed Sathak AJ College of Engineering pursuing Department of

B.E Mechanical Engineering, 3rd year has successfully completed the Internship Training Programme on NX CAD in TANSAM during 15th April – 22nd April, 2024.

We wish him all success in his future endeavor.

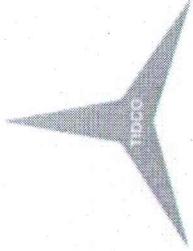
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This is to certify that UDHAYAKUMAR - 311821114018 of

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Training Programme on NX CAD in TANSAM during 15th April – 22nd April, 2024.

We wish him all success in his future endeavor.

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DEPARTMENT OF PRODUCTION ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY
TIRUCHIRAPPALLI-620 015
(TAMILNADU, INDIA)

Mob.: 08056615876 Tel:(0431) 2503501, 2503511 Fax: + 91(0431) 2500133 E-mail: hodprod@nitt.edu
csathiya@nitt.edu

Dr. C.SATHIYA NARAYANAN
PROFESSOR & HEAD

Date: 31/07/2024

INTERNSHIP CERTIFICATE

This is to certify that **Mr. DHANUSH ADITHYA S** (Roll number: 311821114003), Final year B.E. student of Department of Mechanical Engineering, Mohamed Sathak A J College of Engineering carried out his Summer Internship project titled "**Incremental Forming Process of Sandwich sheets**" under my supervision during the period **01-06-2024 to 31-07-2024 (8 weeks)**.

The candidate had exposure to experiments and finite element simulations. He is dedicated, sincere and hardworking internship student and was keen in understanding the concepts, design and its analysis.

Supervisor

Dr.Satheeshkumar V



C. S. Athi. N. L.

Head of the Department

Dr.C.Sathiya Narayanan, M.E., Ph.D.,
Professor & Head
Department of Production Engineering
National Institute of Technology (Govt. of India)
Tiruchirappalli - 620 015, Tamil Nadu, India

PRINCIPAL

Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (O.M.R)
Sipcot - IT Highway Egattur,
Chennai - 603103.



नीवे NIWE
(ISO 9001 Certified)

राष्ट्रीय पवन ऊर्जा संस्थान NATIONAL INSTITUTE OF WIND ENERGY

(पूर्व में "पवन ऊर्जा प्रौद्योगिकी केन्द्र" Formerly "Centre for Wind Energy Technology")
(नवीन और नवीकरणीय ऊर्जा मंत्रालय, भारत सरकार Ministry of New and Renewable Energy, Government of India)

नीवे/अनुसंधान एवं विकास/ इंटरनशिप / 2023-24
NIWE / R & D / Internship -43/ 2023-24

दिनांक : 31 जुलाई 2023
Date: 31.07.2023

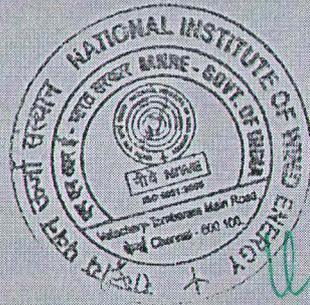
सभी संबंधितों को TO WHOMSOEVER IT MAY CONCERN

यह प्रमाणित किया जाता है कि श्री/सुश्री/श्रीमती धनुष आदित्य.एस, बी.ई. (मैकेनिकल इंजीनियरिंग) (पंजीकरण सं 311821114003), मोहम्मद साथक ए.जे कॉलेज का इंजीनियरिंग, चेन्नई, ने राष्ट्रीय पवन ऊर्जा संस्थान में 30 जून 2023 से 31 जुलाई 2023 की अवधि में इंटरनशिप कार्यक्रम पूर्ण किया है तथा "पवन टरबाइन रोटर ब्लेड डिजाइन और विश्लेषण" विषय पर रिपोर्ट प्रस्तुत किया है

This is to Certify that **Shri / Ms. DHANUSH ADITHYA. S, B.E (Mechanical Engineering) (Reg.No: 311821114003)** Mohamed Sathak A.J. College of Engineering, Chennai, has completed an internship at National Institute of Wind Energy, Chennai from 30 June 2023 to 31 July 2023 and submitted a report on "**WIND TURBINE ROTOR BLADE DESIGN AND ANALYSIS**".

इंटरनशिप की अवधि में उन्होंने आवश्यक अनुशासन, सावधानी निरूपित किया है तथा इंटरनशिप पूर्ण करने हेतु आवश्यक कौशल में विशेषज्ञता प्रदर्शित की है।

During the course of internship, he demonstrated the required discipline, rigour and expertise over the skills required for the completion of this internship.



PRINCIPAL

Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur

एम. सी. लावण्या
M.C. LAVANYA

उप निदेशक (तकनीकी) एवं प्रकोष्ठ प्रमुख,
अनुसंधान एवं विकास
Deputy Director (Technical) &
Unit Chief, R & D

वेलाचेरी - ताम्बरम मुख्य मार्ग, पल्लिकरानै, चेन्नई - 600 100. तमिल नाडु, भारत
Velachery - Tambaram Main Road, Pallikaranai, Chennai - 600 100. Tamil Nadu, INDIA
दूरभाष/Tel No.: +91 - 44 - 2246 3982 / 83 / 84, +91 - 44 - 2900 1162 / 1167 / 1195
फैक्स/Fax No.: +91 - 44 - 2246 3980 / 2246 3990
ई-मेल/E-mail : info@niwe.res.in वेबसाइट/Website : http://niwe.res.in



DEPARTMENT OF MECHANICAL ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY
TIRUCHIRAPPALLI 620015, TAMIL NADU, INDIA.

E-mail: rprakash@nitt.edu

Mobile: +91 9444810545

Dr. R. PRAKASH
ASSISTANT PROFESSOR

July 30, 2024

Internship Certificate

To whomsoever it may concern

This is to certify that **Mr. Shaik Irfan K** is a student of Mohamed Sathak A.J College of Engineering, Chennai. He participated as a Summer Intern and worked on the topic of "**Experiment and Numerical Modal Analysis of Beam and Composite Plate**" for the period of June 1st to July 30th 2024.

During the internship period his character and conduct are good.

Thanks and regards,

R. PRAKASH

Dr. R. PRAKASH, Ph.D. (IITM)
Assistant Professor
Department of Mechanical Engineering
National Institute of Technology
Tiruchirappalli 620 015, Tamil Nadu, INDIA

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No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.



Plot 42, B⁶ Avenue
DTA, Mahindra World city
Chengalpattu Tk,
Chengalpattu 603004
Drv Com

18th August 2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that the following B.E (Mech) student from Mohamed Sathak AJ College of Engineering has successfully completed in-plant training (Intern) from 11th July to 12th August 2023 in our premises.

1. M Mohamed Ghouse Nagutha Roll No. 311820114008

The above student evinced keen interest in learning during his training period.

We wish them all success in their future endeavors.

For Federal-Mogul Motorparts (India) Limited,

N. Hariharasubramanian
Manager – HR & Admin

PRINCIPAL

Mohamed Sathak A.J. College of Engineering
No.24, Rajiv Gandhi Salai (OMR)
Sipoot - IT Highway Egattur,
Chennai - 603103.

Federal-Mogul Motorparts (India) Limited (Formerly Known as Federal-Mogul VSP (India) Limited)

Corporate Identity Number - U74899DL1994PLC057419

Tel : +91 44 27483777, Fax : +91 44 27460411

Regd Office : DLF Prime Towers, 10, Ground Floor, F-79 & 80, Okhla Phase -I, New Delhi -110020 Tel.&Fax : (91-11)49057597

SATTVA

SATTVA ENGINEERING CONSTRUCTION PRIVATE LIMITED

S. BALAKRISHNAN
PROJECT MANAGER

DATE:26/02/2024

TO WHOM IT MAY CONCERN

THIS IS TO CERTIFY THAT H. MOHAMED MUFEED (311820114311) S/O HAJA NAJUMUDEEN. STUDENT OF MOHAMED SATHAK A.J COLLEGE OF ENGINEERING, CHENNAI, FINAL YEAR BACHELOR OF MECHANICAL ENGINEERING HAS BEEN INTERNSHIP PROGRAM AS JUNIOR PLUMBING ENGINEER TRAINING FOR THE PAST DURING PERIOD OF (05TH FEB 2024 TO 21ST FEB 2024). HE WAS IN CHARGES OF HDPE & DI PIPE LAYING WORKS AND LEAK RECTIFYING ACTIVE'S. DURING THE TRAINING PERIOD, HE WAS GOOD IN TECHNICAL AREA OF EXECUTION. HE IS VERY HARD WORKING AND HONEST PERSON. WE WISH HIM ALL SUCCESS IN HIS CAREER.



A handwritten signature in black ink, appearing to be "S. Balakrishnan".

S. BALAKRISHNAN
PROJECT MANAGER
SEC(P)LTD
NAGAPATTINAM WSDS
AMRUT 2.0

A handwritten signature in blue ink, appearing to be "Mohamed Sathak A.J.".

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MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING

34, Rajiv Gandhi Salai (OMR), Siruseri IT Park, Chennai - 603 103.



GE3451 ENVIRONMENTAL SCIENCES AND SUSTAINABILITY

LT P C

2002

OBJECTIVES:

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and nonrenewable resources, causes of their degradation and measures to preserve them.
- To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management.
- To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization.

UNIT I ENVIRONMENT AND BIODIVERSITY 6

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.

UNIT II ENVIRONMENTAL POLLUTION 6

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts.

UNIT III RENEWABLE SOURCES OF ENERGY 6

Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.

UNIT IV SUSTAINABILITY AND MANAGEMENT 6

Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols- Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.

UNIT V SUSTAINABILITY PRACTICES 6

Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles-



Usha
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MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING

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carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio-economical and technological change.

TOTAL : 30 PERIODS

OUTCOMES:

- To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.
- To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.
- To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.
- To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.
- To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.

TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
3. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
4. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.
6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
7. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.

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1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38 . Edition 2010.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.



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Siruseri, Chennai - 603 103.



CME365 RENEWABLE ENERGY TECHNOLOGIES

L T P C

3 0 0 3

COURSE OBJECTIVES

- 1 To know the Indian and global energy scenario
- 2 To learn the various solar energy technologies and its applications.
- 3 To educate the various wind energy technologies.
- 4 To explore the various bio-energy technologies.
- 5 To study the ocean and geothermal technologies.

UNIT – I ENERGY SCENARIO 9

Indian energy scenario in various sectors – domestic, industrial, commercial, agriculture, transportation and others – Present conventional energy status – Present renewable energy status- Potential of various renewable energy sources-Global energy status-Per capita energy consumption - Future energy plans

UNIT – II SOLAR ENERGY 9

Solar radiation – Measurements of solar radiation and sunshine – Solar spectrum - Solar thermal collectors – Flat plate and concentrating collectors – Solar thermal applications – Solar thermal energy storage – Fundamentals of solar photo voltaic conversion – Solar cells – Solar PV Systems – Solar PV applications.

UNIT – III WIND ENERGY 9

Wind data and energy estimation – Betz limit - Site selection for windfarms – characteristics – Wind resource assessment - Horizontal axis wind turbine – components - Vertical axis wind turbine – Wind turbine generators and its performance – Hybrid systems – Environmental issues - Applications.

UNIT – IV BIO-ENERGY 9

Bio resources – Biomass direct combustion – thermochemical conversion - biochemical conversion mechanical conversion - Biomass gasifier - Types of biomass gasifiers - Cogeneration – Carbonisation – Pyrolysis - Biogas plants – Digesters – Biodiesel production – Ethanol production - Applications.

UNIT – V OCEAN AND GEOTHERMAL ENERGY 9

Small hydro - Tidal energy – Wave energy – Open and closed OTEC Cycles – Limitations – Geothermal energy – Geothermal energy sources - Types of geothermal power plants – Applications- Environmental impact.

TOTAL:45 PERIODS

OUTCOMES: At the end of the course the students would be able to

1. Discuss the Indian and global energy scenario.
2. Describe the various solar energy technologies and its applications.
3. Explain the various wind energy technologies.
4. Explore the various bio-energy technologies.
5. Discuss the ocean and geothermal technologies.



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34, Rajiv Gandhi Salai (OMR), Siruseri IT Park, Chennai - 603 103.



OMF751 LEAN SIX SIGMA

LTPC

3003

OBJECTIVE:

- To gain insights about the importance of lean manufacturing and six sigma practices.

UNIT I LEAN & SIX SIGMA BACKGROUND AND FUNDAMENTALS 9

Historical Overview – Definition of quality – What is six sigma -TQM and Six sigma - lean manufacturing and six sigma- six sigma and process tolerance – Six sigma and cultural changes – six sigma capability – six sigma need assessments - implications of quality levels, Cost of Poor Quality (COPQ), Cost of Doing Nothing – assessment questions

UNIT II THE SCOPE OF TOOLS AND TECHNIQUES 9

Tools for definition – IPO diagram, SIPOC diagram, Flow diagram, CTQ Tree, Project Charter – Tools for measurement – Check sheets, Histograms, Run Charts, Scatter Diagrams, Cause and effect diagram, Pareto charts, Control charts, Flow process charts, Process Capability Measurement, Tools for analysis – Process Mapping, Regression analysis, RU/CS analysis, SWOT, PESTLE, Five Whys, interrelationship diagram, overall equipment effectiveness, TRIZ innovative problem solving – Tools for improvement – Affinity diagram, Normal group technique, SMED, 5S, mistake proofing, Value stream Mapping, forced field analysis – Tools for control – Gantt chart, Activity network diagram, Radar chart, PDCA cycle, Milestone tracker diagram, Earned value management.

UNIT III SIX SIGMA METHODOLOGIES 9

Design For Six Sigma (DFSS), Design For Six Sigma Method - Failure Mode Effect Analysis (FMEA), FMEA process - Risk Priority Number (RPN)- Six Sigma and Leadership, committed leadership – Change Acceleration Process (CAP)- Developing communication plan – Stakeholder

UNIT IV SIX SIGMA IMPLEMENTATION AND CHALLENGES 9

Tools for implementation – Supplier Input Process Output Customer (SIPOC) – Quality Function Deployment or House of Quality (QFD) – alternative approach – implementation – leadership training, close communication system, project selection – project management and team – champion training – customer quality index – challenges – program failure, CPQ vs six sigma, structure the deployment of six sigma – cultural challenge – customer/internal metrics

UNIT V EVALUATION AND CONTINUOUS IMPROVEMENT METHODS 9

Evaluation strategy – the economics of six sigma quality, Return on six Sigma (ROSS), ROI, poor project estimates – continuous improvement – lean manufacturing – value, customer focus, Perfection, focus on waste, overproduction – waiting, inventory in process (IIP), processing waste, transportation, motion, making defective products, underutilizing people – Kaizen – 5S

TOTAL: 45 PERIODS

OUTCOME:

- The student would be able to relate the tools and techniques of lean sigma to increase productivity

REFERENCES:

- Michael L. George, David Rowlands, Bill Kastle, What is Lean Six Sigma, McGraw – Hill 2003
- Thomas Pyzdek, The Six Sigma Handbook, McGraw-Hill, 2000
- Fred Soleimannejed, Six Sigma, Basic Steps and Implementation, AuthorHouse, 2004
- Forrest W. Breyfogle, III, James M. Cupello, Becki Meadows, Managing Six Sigma: A Practical Guide to Understanding, Assessing, and Implementing John Wiley & Sons, 2000

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