



National Conference on Recent Advances in Mechanical Engineering-2023  
on 10<sup>th</sup> and 11<sup>th</sup> November, 2023

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# NATIONAL CONFERENCE ON RECENT ADVANCES IN MECHANICAL ENGINEERING-2023 (NCRAME-2023)

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November 10th & 11th 2023

GIET  
BHUBANESWAR



**ORGANIZED BY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

Department of Mechanical Engineering, GIET, Ghangapatana, Bhubaneswar, Odisha  
**GANDHI INSTITUTE OF EXCELLENT TECHNOCRATS (GIET)**  
Ghangapatana, Bhubaneswar, Dist: Khurda, Odisha, Pin: 752054

**National Conference on Recent Advances in Mechanical Engineering–2023  
on 10<sup>th</sup> and 11<sup>th</sup> November 2023**

GANDHI INSTITUTE OF EXCELLENT TECHNOCRATS,  
GHANGAPATANA, BHUBANESWAR  
ODISHA



“National conference on Recent Advances in  
Mechanical Engineering-2023”  
(NCRAME-2023)  
(10<sup>TH</sup> & 11<sup>TH</sup> NOVEMBER)



Organized By  
DEPARTMENT OF MECHANICAL ENGINEERING  
GIET, GHANGAPATANA, BHUBANESWAR

# CONFERENCE COMMITTEE

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Prof. Smruti Ranjan Bhadra  
Prof. Surendra Majhi  
Prof. Sachindra Kumar Nayak  
Mr. Suman Kumar Sahu  
Mr. Basudeb Mohanty

## *About the Institution.....*

Gandhi Institute of Excellent Technocrats GIET, Ghangapatana, Bhubaneswar under the flagship of Gandhi Group of Institutions (G.G.I) is an AICTE approved institute established in the year 2009. The B. Tech, MBA and MCA programs of the institute are affiliated to Biju Patnaik University of Technology, Odisha and the Diploma Programme is affiliated to State Council for Technical Education and Vocational Training, Govt. of Odisha, Bhubaneswar. The institute is set up by Venkateshwar Educational Trust and is being managed by distinguished Governing Council members comprising senior executives from Academics and Industries. The Institute works with a mission to provide quality education of international standards for producing technocrat sand future leaders in a disciplined and conducive environment as an integral part of our societal commitment to promote education globally. It was started with an intake of 240 students in four branches with a motto of providing quality engineering education in a highly disciplined environment. In less than a decade it become a citadel of engineering education having 1080 intake with 7 B. Tech. Courses and 2 PG courses i.e., MBA and MCA. It has been regarded as Modern Gurukul by the students, alumni, faculty and all distinguished visitors for its learning environment, faculty, infrastructure and the facilities.

## *About the Department....*

The Department of Mechanical Engineering was established in the year 2009 with intake capacity of 60 in B. Tech degree. The department maintains state-of-the-art facilities and well-equipped laboratories to support both academic and research activities. The laboratories cover a wide range of areas including solid mechanics lab, fluid mechanics lab, heat transfer lab, machine dynamics lab and workshop. The Mechanical Engineering Department at GIET, Ghangapatana is a dynamic and vibrant academic unit that offers a comprehensive and well-rounded education in Mechanical Engineering. The main objective of the department is to strengthen the academic and technical knowledge of the students through various world-class technologies, teaching-learning, and research activities. The department boasts a highly qualified and experienced faculty comprising experts in various fields of mechanical Engineering. The department also emphasizes practical learning by incorporating laboratory sessions, design projects, and internships into the curriculum. The department maintains collaborations with industry partners and research institutions to foster innovation and create opportunities for technology transfer.

## *About the Conference...*

**Gandhi Institute of Excellent Technocrats, Ghangapatana, Bhubaneswar is organizing a conference, “National Conference on Recent Advances in Mechanical Engineering-2023” on 10th & 11th November 2023, at GIET, Ghangapatana, Bhubaneswar. The objective of this national conference NCRAME-2023 is to bring together individuals and organizations within the technical field to foster collaboration, knowledge exchange, and professional growth, while advancing the state of the field through re- search and innovation.**

### **Conference Highlights:**

- **In-depth discussions on Advances and innovations in Mechanical Engineering.**
  - **Smart grid integration for a sustainable future for Mechanical Engineering.**
  - **The role of recent in advancing Mechanical Engineering solutions.**
  - **Networking opportunities with industry leaders and experts.**
  - **Presentation of cutting-edge research papers and case studies.**
  - **In depth discussion of materials and manufacturing technologies in automation by mechatronics in the field of mechanical engineering.**
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## **CHIEF GUEST**

- ❖ **Dr. Ramanuj Narayan**  
Director,  
CSIR-IMMT, Bhubaneswar
- ❖ **Dr. Manmatha K. Roul**  
Principal,  
GITA, Bhubaneswar

## **KEY NOTE SPEAKER**

- ❖ **Dr. Pravas Ranjan Behera**  
Principal Scientist,  
CSIR-IMMT, Bhubaneswar
- ❖ **Dr. Silani Sahoo**  
Principal Scientist,  
CSIR-IMMT, Bhubaneswar
- ❖ **Dr. Biranchi Narayan Padhi**  
Assistant Professor,  
IIT, Bhubaneswar
- ❖ **Dr. Bamadev Sahoo**  
Assistant Professor,  
IIT, Bhubaneswar
- ❖ **Er. Syed Irfan Ali**  
Assistant Manager,  
IRR, Saudi Arab

## ***Message from Chief Patron.....***



**DR. SATYA PRAKASH PANDA  
CHAIRMAN  
GIET, GHANGAPATANA, BBSR**

*I am extremely pleased to know that the Department of Mechanical Engineering, of GIET, Ghangapatana is organizing “National Conference on Recent Advances in Mechanical Engineering-2023” organized by the Departments of Mechanical Engineering on 10th and 11th of Nov 2023.*

*I understand that the large number of researchers have submitted their research papers for presentation in the conference and also for publication. The response to this conference from all over India is most encouraging. I am sure all the participants will be benefitted by their interaction with their fellow researchers and engineers which will help for their research work and subsequently to the society at large.*

*I wish the conference meets its objective and confident that it will be a grand success.*

A handwritten signature in black ink, appearing to read 'Panda', written over a horizontal line.

***Best regards,  
Dr. Satya Prakash Panda  
Chief Patron, NCRAME-2023***



## ***Message from Chief Patron.....***



**ER. RAM NARAYAN SABAT  
VICE CHAIRMAN  
GIET, GHANGAPATANA, BBSR**

*I hope this message finds you well. I am delighted to announce our institution's upcoming “National Conference on Recent Advances in Mechanical Engineering-2023” scheduled to take place from 10th & 11th of November. As the Vice Chairman of our Institution, I am truly excited about this significant event that reflects our commitment to academic excellence and sustainable development.*

*This conference will serve as a platform for the exchange of ideas, insights, and research findings related to Advance in mechanical Engineering. It is an opportunity for us to showcase our institution's dedication to advancing knowledge and contributing to the betterment of society.*

*Together, we can make this National Conference a platform for meaningful discussions, networking, and collaborative research that will have a lasting impact on the field of Mechanical Engineering.*

***Best regards,  
Er. Ram Narayan Sabat  
Chief Patron, NCRAME-2023***

## ***Message from Chief Patron.....***



**ER. MINAKSHI PANDA  
SECRETARY  
GIET, GHANGAPATANA**

*It is indeed a memorable day that a two-day National conference on “**National Conference on Recent Advances in Mechanical Engineering-2023**” on 10th-11<sup>th</sup> Nov, 2023 is being organized at GIET, Ghangapatana to achieve the well-defined purpose of setting up an important landmark successfully by way of utilizing the activities consisting of expert lectures from exceptional achievers and presentations of researchers in relevant areas in an atmosphere of healthy interaction and sharing.*

*The enlisted topics shall set up a platform of spreading light of the recent technologies and enable us to grow by way of learning from knowledge reserves and absorbing expertise from treasury of learned academicians.*

*I am highly grateful to the members of the team for exercising painstaking effort in making this conference successful.*

*Minakshi Panda*

***Thank you***

***Best regards,***

***Er. Minakshi Panda***

***Chief Patron, NCRAME-2023***

## ***Message from Patron.....***



**DR. SUBHRAJIT PRADHAN  
PRINCIPAL  
GIET, GHANGAPATANA**

*I am pleased to announce that our Institution will be hosting a “National Conference on Recent Advances in Mechanical Engineering-2023”, Which is scheduled to take place from 10th & 11th of November 2023. This event represents an excellent opportunity for our academic community to contribute to the advancement of knowledge in this critical field.*

*The conference aims to bring together experts, researchers, and industry professionals to discuss the latest trends, innovations, and best practices in Mechanical Engineering. It will serve as a platform for exchanging ideas and fostering collaborations that can have a lasting impact on our industry.*

*I encourage all faculty members to actively participate in this conference by submitting research papers, organizing sessions, and engaging in meaningful discussions. Your contributions will undoubtedly enhance the quality and significance of this event.*

*Thank you for your dedication to advancing knowledge and promoting sustainable practices in our field. Let us work together to make this National Conference a memorable and transformative experience for all involved.*

**Thank you  
Best regards,  
Dr. Subhrajit Pradhan  
Patron, NCRAME-2023**

## ***Message from Dean R&D.....***



**DR. CHANDAN KUMAR SAHOO  
DEAN R&D  
GIET, GHANGAPATANA**

*Research, curiosity and discovery have been in existence ever since man's presence on this planet millions of years ago, civilization has been characterized by curiosity and discovery. Therefore, the curiosity to explore what will happen, how it happens, is there a better way to do it, has been the driving force behind all research efforts. During the past few decades, the engineering faculties have taken a number of initiatives to reorient the engineering machinery to play leading roles in the industrial development process.*

*I am delighted to acknowledge the a “National Conference on Recent Advances in Mechanical Engineering-2023”, organized by the Department of Mechanical Engineering. I appreciate organizing team for showing their keen interest in organizing a successful conference to provide a platform for contributors to explore new ideas and exchange research findings among researchers.*

*I thank the support of all students, authors, reviewers, conference team, faculty members, and conference Convenor for making the conference a grand success.*

*Chandan Kumar Sahoo*

**Best regards,  
Dr. Chandan Kumar Sahoo  
Dean R & D  
Advisory Committee, NCRAME-2023**

## ***Message from Chief Guest.....***



**DR. RAMANUJ NARAYAN  
DIRECTOR,  
CSIR-IMMT, BHUBANESWAR**

*Dear delegates,  
Warm wishes to everyone*

*I am pleased to know that GIET Ghangapatna is organizing the “National Conference on Recent Advances in Mechanical Engineering-2023” from 10th to 11th November 2023. This conference would instil passion amongst the budding engineers who are the future of the country. Recent Advances in Mechanical Engineering is the need of the hour keeping an eye on the growing population and rapid increase in the modernisation of the country. As a Mechanical Engineer we are at the podium position to bring a change and adopt Recent Advances as much as possible. More such type of conferences should be held to encourage and enhance the knowledge of the young engineers. These types of conferences allow dignitaries from all over India can share their knowledge and ideas. I extend my greetings to the organizers on the occasion and wish them all success in their endeavour.*

*Best regards,  
Dr. Ramanuj Narayan  
Director, CSIR-IMMT, BBSR,  
Chief Guest, NCRAME-2023*

## **Message from Resource Person**



**Prof. Dr. Manmatha K. Roul  
Principal,  
GITA, Autonomous College, Bhubaneswar**

*It gives me immense pleasure to know that GIET, Ghangapatana, Department of Mechanical Engineering is organizing the “National Conference on Recent Advances in Mechanical Engineering-2023” from 10<sup>th</sup> to 11<sup>th</sup> November 2023. I wish with strong desire that the conference to unfold new domains of research among the Mechanical Engineering fraternity and will boost the knowledge level of many participating budding scholars throughout the world by opening up plethora of future developments in the field of Mechanical Engineering. The proceedings represent scholarly work of advanced and innovative thinkers and educators from around the world. It is felt that it is only through the exchange of information that one can hope to keep up with the rapidly changing world around us. I wish all the delegates, a great educational and informative experience at the conference. I strongly believe that this conference will provide tools and knowledge to overcome significant problems appearing in our industry and society by identifying innovative ideas and technologies introduced by the researchers and students. In a nutshell, I wish the conference may transcend to a new and unprecedented level of excellence. It is thus the zenith where technology and skill meet opportunities and guidance. It is a milestone that one would not dare to miss. I wish NCRAME-2023 a grand success.*

*Best regards,  
Prof. Dr. Manmatha K. Roul  
Resource Person, NCRAME-2023*



**Dr. Pravas Ranjan Behera**  
**Principal Scientist**  
**Department of Advanced Materials Technology**  
**CSIR-IMMT, Bhubaneswar**

*Technical conferences not only enrich the participants with knowledge and tunes them about the latest developments in the relevant fields but also help create a strong network of professionals who can collaborate and work jointly to contribute efficiently for the economic and societal growth of nation. Additionally, the platform encourages the building up of a strong bridge amongst academia, industries, and R&D institutes that aids to have a systematic and channelised approach in place for working towards a common interest or cause. In this line, it gives me a soothing feeling that GIET, Ghangapatana, Bhubaneswar has walked the right path in organising a “National Conference on Recent Advances in Mechanical Engineering-2023” from 10<sup>th</sup> to 11<sup>th</sup> November 2023. Mechanical engineering being a field that is common and has its own connotation in all the industries (manufacturing and production), the conference will focus chiefly on the core developments and practices in the area. I am sure the forum will bring together experts from industries and academia to have the much-needed exchange of ideas and findings of current research activities, thereby fostering the young minds of the nation. I am equally glad and thankful to the organisers for the invite as a resource person in this prestigious national-level conference.*

*I appreciate wholeheartedly the organisers and technical team for making this happen with my best and sincere wishes for the grand success of the conference.*

*Best regards,*  
**Dr. Pravas Ranjan Behera**  
**Resource Person, NCRAME-2023**



**Dr. Silani Sahoo**  
**(Principal Scientist),**  
**Department of Advanced Materials Technology**  
**CSIR-IMMT, Bhubaneswar**

*It is of immense pleasure to know that GIET, Ghangapatana, BBSR is organising a “National Conference on Recent Advances in Mechanical Engineering-2023” during 10<sup>th</sup> and 11<sup>th</sup> November. The conference will definitely provide a forum for research scholars, academic technocrats, and industry specialists to engage, exchange, and discuss their unique research ideas and contributions. The conversations, brainstorming sessions, and deliberations will reveal the growing trends concerning with the advances in Mechanical Engineering. No doubt, that this conference will surely encourage learning ability among the participants coming from different disciplines. It is an honour and a privilege to be invited as a resource person for this conference. It is a pleasure to share my perspective with such an engaged audience.*

*I congratulate the organisers for their commitment in organising this conference that shall enrich the existing knowledge with innovative and path breaking research contributions. I believe that this conference will play a pivotal role in fostering new ideas for a better tomorrow.*

*My best wishes for the success of this conference.*

*Best regards,*  
**Dr. Silani Sahoo**  
**Resource Person, NCRAME-2023**





**Dr. Biranchi Narayan Padhi**  
**Assistant Professor**  
**IIIT, Bhubaneswar**

*I am happy to learn that GIET, Ghangapatana, BBSR is organising a “National Conference on Recent Advances in Mechanical Engineering-2023” during 10<sup>th</sup> and 11<sup>th</sup> November. This conference has been organised on the recent developments in a core engineering branch like Mechanical Engineering. In the modern world, this type of conference is very relevant to meet the emerging fields. I believe that this conference will provide an international technical forum for experts and researchers from both the academia and industry to meet and exchange new ideas and present their findings of ongoing research in various disciplines of Mechanical Engineering. I am also happy to be invited as a resource person for this conference. I thank the organisers to give me an opportunity to share my thoughts on this apt theme with students, engineers and fellow researchers working in the field.*

*Hearty congratulations to the organizers for their effort put forward and best wishes for the success of the conference.*

*Best regards,*  
*Dr. B. N. Padhi*  
*Resource Person, NCRAME-2023*



**Dr. Bamadev Sahoo**  
**Assistant Professor**  
**IIIT, Bhubaneswar**

*I am pleased to hear that on November 10 and 11, GIET, Ghangapatana, BBSR, will be hosting a “National Conference on Recent Advances in Mechanical Engineering-2023”. The newest advancements in a fundamental engineering discipline such as mechanical engineering are the focus of this conference. This kind of meeting is highly pertinent in today's world to match the emerging fields. In my opinion, this conference will offer a global technical platform where professionals and scholars from academia and business may come together to share innovative concepts and showcase the results of their current investigations across multiple Mechanical Engineering specialties. I'm delighted to have been asked to this conference as a resource as well. I appreciate the chance to speak with students, engineers, and other scholars in the area about this timely issue, and I thank the organizers for that.*

*Warm regards and felicitations for the conference's success to the organizers for their hard work.*

*Best regards,*  
**Dr. Bamadev Sahoo**  
**Resource Person, NCRAME-2023**



## Message from Convenor

*Dear Professors and Researchers*

*It is my privilege and honour to welcome you all to the National Conference on “National Conference on Recent Advances in Mechanical Engineering-2023” on 10th & 11th November, 2023 at Gandhi Institute of Excellent Technocrats.*

*This conference is remarkable opportunity to develop the latest trends and innovations in mechanical engineering. It will bring together experts, researchers and students from across the state to discuss and explore ground-breaking advancements in our field. The primary objective of this conference is multifaceted. We aim to foster knowledge sharing, promote interdisciplinary collaboration, and facilitate discussion on the ethical and societal implication of emerging technologies in our field. Additionally, this*

*event will provide a platform for you to showcase your own research and ideas opening doors to potential career opportunity.*

*As a department, we believe in power of staying at the forefront of our discipline. By participating in this conference, you will have a chance to learn the best. Your participation is vital in making this conference a resounding success. I would like to thank in advance the conference committee for their valuable time in organizing the program and all the authors, reviewers and other participants for their excellent work and their belief in the excellence of NCRAME, 2023. I am looking forward to your enthusiastic participation and have no doubt that this conference will be a transformative experience for everyone involved.*



**Prof. Saroj Kumar Dash**  
**HOD, Mechanical Engineering**  
**GIET, Ghangapatana**

*Saraj Kumar Dash .*

**Best regards,**  
**Prof. Saroj Kumar Dash**  
**Convenor, NCRAME-2023**



## Message from Co-Convenor

*I am truly honoured to welcome you all to the “National Conference on Recent Advances in Mechanical Engineering-2023” (NCRAME-2023) on 10th and 11th November, 2023 as the Co-Convenor. I believe that this conference will serve as a pivotal platform for sharing the latest developments and innovations in the field of Mechanical Engineering.*

*I would like to extend my heartfelt appreciation to our distinguished keynote speakers, diligent organizing committee, and all the participants for your invaluable contributions. Over the course of this conference, let us collectively explore the frontiers of Mechanical Engineering, engage in stimulating discussions, and*

*foster meaningful collaborations. Together, we can make this conference a grand success and a beacon of excellence in our field.*

*Thank you for your unwavering commitment to the National Conference on Recent Advances in Mechanical Engineering-2023. I eagerly look forward to the fruitful interactions and outcomes that this event will generate.*



**Dr. Monoja Kumar Sahu**  
Associate Professor  
Mechanical Engineering  
GIET, Ghangapatana

*Best regards,*  
**Dr. Monoja Kumar Sahu**  
Co-Convenor, NCRAME-2023

## Message From Organising Committee



**Prof. B. Srinivas Rao**  
Associate Professor  
Mechanical Engineering  
GIET, Ghangapatana

*I am pleased to announce our “National Conference on Recent Advances in Mechanical Engineering-2023”, scheduled for [11th & 12th Nov 2023]. This event promises to be an excellent platform for sharing knowledge and insights into the latest developments in the field of mechanical engineering.*

*As esteemed members of our faculty, your participation and contributions to this conference are highly valued. Your expertise and research are integral to the success of such events, and we encourage you to consider submitting your research papers or participating in panel discussions.*

*The conference will cover a wide range of topics within the mechanical engineering domain, including but not limited to:*

- *Advanced Materials and Manufacturing*
- *Energy and Sustainability*
- *Robotics and Automation*
- *Thermal and Fluid Systems*
- *Design and Analysis*

*I encourage each one of you to actively engage in the sessions and discussions, and take full advantage of the wealth of expertise gathered here. Let's foster an environment of intellectual curiosity, where ideas flow freely, and meaningful conversations spark new insights.*

*Best regards,*  
**Prof. B. Srinivas Rao**  
Prof Incharge Exam Section  
Organizing Committee, NCRAME-2023

## Message From Organising Committee



**Prof. Sibabrata Mohanty**  
**Assoc. Professor Mechanical**  
**GIET, Ghangapatana**

*It is my pleasure and honour to welcome you to the department of Mechanical Engineering. Mechanical engineering is one of the oldest and broadest engineering disciplines, and plays a significant role in enhancing safety, economic vitality, enjoyment and overall quality of life throughout the world. Our objective is not to merely produce professionals capable to serve their own needs but endeavour to serve the society with great concern for human values. We are striving hard continuously to improve upon the quality of education and to maintain its position of leadership in engineering and technology. The core values of the departments help the students to develop their overall personality and make them worthy to compete and work at global level.*

*We have an exciting program at this conference that will allow members to reflect upon and celebrate our past accomplishments, renew friendships and extend our networks, and jointly explore current and future research directions. To put a conference of this magnitude together is not a small task. To that end, we want to thank our honourable Chairman, Vice Chairman, Principal, HOD mechanical for the support to conduct the national conference (NCRAME 2023). Lastly, we would like to thank all of the conference participants for their contributions which are the foundation of this conference.*

*I hope (NCRAME 2023) will bring a platform for the young technocrats to carry out research in an effective way and will come with flying colours to mechanical engineering department.*

**Best regards,**  
**Prof Sibabrata Mohanty**  
**Prof Incharge Academics**  
**Organizing Committee, NCRAME-2023**

## Message From Organising Committee



**Prof. Amit Jain Biswal**  
**Asst. Professor Mechanical**  
**GIET, Ghangapatana**

*I am indeed delighted to convey that our department of mechanical engineering of GIET, Ghangapatana is organising the “National Conference on Recent Advances in Mechanical Engineering-2023” on 10th and 11th November 2023. I'm sure that these efforts will augment the concept of modern approach to various mechanical problems and give new concepts to the field of engineering.*

*I wish the conference will be very successful and I hope the conference will be a great scientific extravaganza.*

*Amit Jain Biswal*

**Best regards,**  
**Prof. Amit Jain Biswal**  
**Organizing Committee, NCRAME-2023**

## Message From Organising Committee



**Mr. Smruti Ranjan Bhadra**  
**Asst. Professor Mechanical**  
**GIET, Ghangapatana**

*I am thrilled to extend a warm welcome to all of you at the “National Conference on Recent Advances in Mechanical Engineering-2023” (NCRAME-2023). It is indeed an honour to host this prestigious event, bringing together brilliant minds and innovative ideas in the field of mechanical engineering. In today's rapidly evolving technological landscape, staying updated with the latest trends and advancements is crucial. This National Conference serves as a platform for knowledge exchange, collaboration, and inspiration. As faculty member, we recognize the importance of continuous learning and the impact it has on shaping the future of our discipline. I encourage each one of you to actively engage in the sessions and discussions, and take full advantage of the wealth of expertise gathered here. Let's foster an environment of intellectual curiosity, where ideas flow freely, and meaningful conversations spark new insights.*

**Best regards,**  
**Prof. Smruti Ranjan Bhadra**  
**Organizing Committee, NCRAME-2023**



## Message From Organising Committee



**Prof. Sachindra Kumar Nayak**  
**Asst. Professor Mechanical**  
**GIET, Ghangapatana**

*Mechanical Engineering plays a vital role in this endeavor. The aim of the “National Conference on ‘Recent Advances in Mechanical Engineering-2023” being conducted by the Departments of Mechanical Engineering of GIET, Ghangapatana, is to create a platform for academicians and researchers to exchange their innovative ideas and interact with researchers of the same field of interest. This will enable to accelerate the work to progress faster to achieve the individuals end goals, which will ultimately benefit the larger society of India.*

*A National Conference on recent advances in mechanical engineering is a significant event that brings together researchers, scholars, and professionals in the field of mechanical engineering to discuss and share the latest developments, research findings, and innovations. These conferences serve as a platform for networking, collaboration, and learning, and they often cover a wide range of topics within the mechanical engineering domain.*

*I am delighted to know that large number of researchers have submitted the papers on Interdisciplinary streams. I wish all the best to the participants of the conference additional insight to their subjects of interest. I wish the organizers of the conference to have great success.*

*Best regards,*  
**Prof. Sachindra Kumar Nayak**  
**Organizing Committee, NCRAME-2023**

## Message From Organising Committee



**Mr. Surendra Majhi**  
**Asst. Professor Mechanical**  
**GIET, Ghangapatana**

*I am delighted to welcome you to the “National Conference on Recent Advances in Mechanical Engineering-2023”. This conference is a platform of paramount importance where researchers, professionals, and students come together to engage in meaningful discourse and exchange ideas that can shape the future of mechanical engineering.*

*Mechanical engineering is a field that has a profound impact on our world, from developing cutting-edge technologies to designing efficient systems and machinery. It is imperative that we, as mechanical engineers, embrace the principles of sustainability and innovation to address the challenges of the modern world.*

*Our theme for this conference underscores the critical importance of sustainability in mechanical engineering.*

*Our industry's resource consumption and environmental impact cannot be ignored, and it is our responsibility to find innovative solutions to minimize these effects while advancing the field. By promoting sustainability, we not only reduce environmental harm but also contribute to a more resilient and advanced society.*

*To our students, I encourage you to actively participate in this conference. Your fresh perspectives, innovative ideas, and enthusiasm are invaluable in driving change in the field of mechanical engineering. Attend the conference sessions, engage in discussions, and seek mentorship from experienced professionals and faculty members. Your contributions can help shape the future of our discipline.*

*I look forward to seeing you all at the conference, where together, we can chart a path towards a more sustainable, innovative, and resilient future for mechanical engineering. Let's use this platform to share our knowledge and expertise, fostering collaboration and learning that will benefit not only our field but also society as a whole.*

*Thank you for your participation, and I'm excited about the possibilities that this conference holds for the advancement of mechanical engineering.*

**Best regards,**  
**Prof. Surendra Majhi**  
**Organizing Committee, NCRAME-2023**

**INVITED TALK**

**HYDROGEN PLASMA SMELTING: AN ECO-FRIENDLY  
TECHNOLOGY TO PRODUCE GREEN AND CLEAN STEEL**

**Dr. Pravas Ranjan Behera**

*Principal Scientist*

*Advanced Materials Technology Department*

*CSIR - Institute of Minerals & Materials Technology*

*Bhubaneswar-751013, Orissa, India*

*E-mail: prbehera@immt.res.in*

**ABSTRACT**

India is the second largest producer of steel with 106.5 MT in 2018 which signifies the economic growth of the nation along with increase in per capita consumption. As per the target set by India to ramp up the production capacity to 330 MT by 2030, there has to be an alternative to coke as a reductant used in reduction of iron ores. The conventional method of steelmaking is so established that following the green path is not possible in quick time. As a result, iron and steel industries are adopting blue practices by using scraps, alternative gaseous reductants (natural gas and syn gas) to curb the generation of CO<sub>2</sub> to the atmosphere. In this regard, CSIR-Institute of Minerals and Materials Technology, Bhubaneswar, Odisha, India has devised a state-of-the-art technology to produce steel with negligible/no emission of CO<sub>2</sub> to the atmosphere, thereby calling it a green and clean steelmaking route. Additionally, it is just a single-step process of producing steel with acceptable content of phosphorous and sulphur that require no additional unit operations for removal, thus making the process cost-friendly. The steel produced is 99.54% pure Fe with water vapour coming out as the only by-product. This environmentally-friendly approach will not only reduce greenhouse gas emissions but also meet the finest quality of steel required for niche applications that is imported from other countries.

**Keywords:** Smelting Reduction, Iron ore, Green and Clean Steel, Hydrogen Plasma, Sustainability

**INVITED TALK**

**FABRICATION AND MECHANICAL BEHAVIOUR OF  
STEEL-BASED COMPOSITES**

**Dr. Silani Sahoo**

*Principal Scientist*

*Advanced Materials Technology Department*

*CSIR - Institute of Minerals & Materials Technology*

*Bhubaneswar-751013, Orissa, India*

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**ABSTRACT**

Steel Matrix Composites (SMCs) reinforced with TiB<sub>2</sub> particles are of much interest owing to their excellent improved properties. Despite several advantages of steel/TiB<sub>2</sub> composites, the fabrication of these composites remains a big challenge. Although, researchers have already developed different manufacturing technologies for SMCs, the processing of SMCs with all desirable properties at an economical price remains a daunting task. Challenges remain there in development of these composites with desired properties by a technically feasible and cost effective method.

Steel matrix composites reinforced with 2-4 vol.% TiB<sub>2</sub> particles were fabricated successfully by powder metallurgy method via hot pressing route. Densification behaviour of the hot pressed composites was investigated by taking into consideration the influence of process parameters and volume content of reinforcement. Microstructural analysis of the synthesized composites revealed a homogeneous and uniform distribution of TiB<sub>2</sub> particles in the steel matrix. The addition of TiB<sub>2</sub> was found to be very effective for the enhancement of hardness, ultimate compressive strength, elastic modulus and yield strength as compared to their unreinforced counterpart. Creep rate was found to be sensitive to variation of volume fraction of reinforcement.

***Keywords: Steel Matrix Composites (SMCs), TiB<sub>2</sub> particles, Powder metallurgy, Creep rate***

**INVITED TALK**

**STABILITY, BIFURCATION AND CHAOTIC DYNAMICS OF A  
MECHANICAL SYSTEM**

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**ABSTRACT**

Viscoelasticity is the property of materials that exhibit both viscous and elastic characteristics when undergoing deformation. The difference between elastic materials and viscoelastic materials is that viscoelastic materials possess a viscosity factor and the elastic ones don't. As viscoelastic materials have the viscosity factor, they have a strain rate dependent on time. Purely elastic materials do not dissipate energy (heat) when a load is applied, then removed; however, a viscoelastic substance does. Viscoelastic materials are used for isolating vibration, dampening noise, and absorbing shock. They give off the energy absorbed as heat.

Transverse vibration due to parametric excitation of axially moving systems originates from the time dependency of either axial velocity or axial tension of the system or both. For last few decades vibration of axially moving continua specifically in transverse direction has attracted considerable attention of many researchers owing to huge applications in the areas like process industry, industrial machinery with high precision where the productivity and accuracy depends on the mechanical stability and reliability of the axially moving parts. These axially moving components may be modeled as a beam or a string. Some other application areas of travelling systems are power transmission belts, band saw blades, paper sheets, robotic arms, pipe conveying fluid and many more. Hence it is important to study the mechanics of travelling beam, its dynamic stability which will help design engineering in parameter selection in the design of beam considering its operational environment. In the present work, Stability, various bifurcations and chaotic behaviour of a travelling Euler beam is studied. Kelvin-Voigt viscoelastic model is adopted for the beam material. The beam has time dependency in velocity as well as tension in axial direction which is considered for the first time for traveling viscoelastic beam. The multi-frequency parametric resonance is assumed to be comprised of simultaneous principal parametric resonance of first mode due to the time dependency of speed while the principal parametric resonance of second mode is due to the variable tension in the axial direction. The two frequency parametric resonance is considered along with 3:1 internal resonance. Such multi-resonant case has not been considered so far in any available literature. The higher order integro-partial differential equation of motion is attacked with direct method of multiple scales. Solvability condition is incorporated to get two complex variable modulation equations for amplitude and phase. From these two equations a set of normalized reduced equations are derived through Cartesian transformation which are subsequently utilized to get numerical solutions for the nonlinear system. Continuation algorithm is used to depict the effect of system parameters like fluctuating tension component, fluctuating velocity component, internal frequency detuning parameter, different damping on the frequency response curves, their stability and bifurcation analysis

**Keywords:**

**Viscoelasticity, Vibration isolation, Beam modelling, Kelvin-Voigt viscoelastic model, Parametric resonance**

**INVITED TALK**

**THERMAL PERFORMANCE ASSESSMENT OF WATER-COOLED  
STEAM SURFACE CONDENSER**

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**ABSTRACT**

Traditional thermal power units must, among other things, be more adaptable over a full and thus enlarged range of load situations as the role of renewable energy sources in the energy balance increases. Furthermore, under lower load situations, which will frequently occur, the efficiency of power units shouldn't decline noticeably. In a thermal power plant, the water cooled steam surface condenser (WCSSC) is a crucial component. It condenses the turbine exhaust steam's latent heat. As a result, the WCSSC's effectiveness has a direct impact on the plant's efficiency. This study is to develop a simulation model based experiment for WCSSC to develop the correlation between the operating variables and key performance indices. Additionally, the model creates a correction factor for condenser heat load, cooling water inlet temperature, velocity, and other variables. The simulation model is created using a technique called lumped parameter modeling. The generated correlation has been validated using operating data from a power plant associated with WCSSC and controlled performance test results. This study's condenser thermal performance relationships are dependent exclusively on the condenser's inlet circumstances and without constant coefficients. Based on sensitivity analysis, it is discovered that the proposed relations offer good accuracy based on the actual measurement data obtained from the power plant.

**Key Words:** Condenser; cooling water flow rate; simulation; sensitivity; thermal performance.

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## **INTEGRATION OF HYDRAULIC POWER IN RENEWABLE ENERGY SYSTEMS**

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### **Abstract:**

In order to handle the world's energy concerns, it is now crucial to pursue sustainable energy alternatives. In order to improve efficiency and store energy, this talk explores the potential of integrating hydraulic power into renewable energy systems. The capacity of hydraulic power to store energy for extended periods of time and respond quickly makes it a unique advantage that can be used to offset the intermittent nature of many renewable energy sources. It offers a consistent supply of clean electricity that works in harmony with other renewable energy sources like solar and wind. To reduce its negative effects on the environment and guarantee effective grid integration, it must be carefully managed.

**Keywords: Renewable Energy Integration, Hydraulic Energy Storage, Pumped Hydro Energy Storage, Energy Conversion Efficiency.**

Paper ID: NCRAME - 02

## **PERFORMANCE ANALYSIS OF SIX STROKE S.I ENGINE**

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### **Abstract:**

The abstract 6-stroke engine is a theoretical concept that goes beyond the traditional four-stroke cycle and the proposed six-stroke SI engine. Beyond the conventional four-stroke cycle and the suggested six-stroke SI engine, there is a theoretical notion known as the abstract 6-stroke engine. It is a cutting-edge method for internal combustion engines with the goal of increasing efficiency and lowering emissions. To optimize the fuel-air mixture's energy extraction, more phases are added to the abstract 6-stroke engine. Since the abstract 6-stroke engine lacks a set configuration, these extra stages may differ based on the engine's particular design and implementation. The conventional four strokes (intake, compression, combustion, and exhaust) as well as two extra strokes are usually seen in an abstract 6-stroke engine. These extra strokes may entail a variety of procedures, including energy conversion, heat recovery, or additional gas expansion.

**Keywords: Six-stroke engine, S.I engine, Suction, Compression, Expansion, exhaust**

## PERFORMANCE ANALYSIS OF STEAM ENGINE

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### Abstract:

The Industrial Revolution, which began in the 18th and 19th centuries when the steam engine transformed transportation and manufacturing, was a turning point in human history. This clever device changed the world in a number of ways thanks to the growth of steam. The basic idea behind how it worked was that heated water turns into steam, which expands and produces high-pressure steam that can power a turbine or piston. Next, the condensed steam is recycled, starting a never-ending cycle of electricity production. The steam engine had a significant impact. Transportation was revolutionized by steam-powered ships and locomotives, which made it possible for people and products to travel more quickly and dependably. Due to the invention of steam-powered devices, the steam engine was also essential to mining, agriculture, and even warfare. and weapons were becoming an essential part of these realms. The steam engine's extensive use sparked innovations and engineering breakthroughs. It established the groundwork for further advancements in steam-powered machinery, steamships, and locomotives. The steam engine, which propelled the Industrial Revolution, altered economies and civilizations all over the world and created the contemporary industrialized society that we know today.

**Keywords:** Steam engine, thermodynamics, mechanical power, industrial revolution, efficiency, locomotive.

Paper ID: NCRAME - 04

## ADVANCEMENTS IN LEATHER MACHINERY STREAM LINING

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### Abstract:

Automated Cutting and Sewing Machines: These devices employ computer-controlled accuracy to precisely cut leather components and quickly stitch them together. This lowers labor expenses and material waste. Leather Digital Printing: Sophisticated digital printing technologies eliminate the need for traditional dyeing procedures, which frequently include hazardous chemicals, by enabling the direct printing of complex patterns and designs into leather. Using laser engraving and etching technologies, leather goods can be adorned with finely detailed patterns. This not only improves the appearance but also minimizes waste by lowering human process mistakes. Tannery Automation: The efficiency of processing leather has increased thanks to tannery automation. By controlling temperature, chemical usage, and waste disposal, modern machinery makes the process more ecologically friendly.

**Keywords:** Leather machine, Digital printing, Sustainable leather, Leather Processing.

### **ADVANCEMENTS IN ACTUATOR TECHNOLOGY**

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#### **Abstract:**

This research focuses on the analysis, development, and performance evaluation of actuators in the context of modern engineering systems. Actuators are vital parts of many applications because they convert electrical, pneumatic, hydraulic, or other forms of energy into mechanical motion. The design and development of actuators are methodically examined in this work, taking efficiency, control mechanisms, and material considerations into account. It also looks at cutting-edge technologies that could completely change the industry, like mechatronic systems and smart actuators. The goal of this research is to improve engineering systems in various industries by offering useful insights into actuator performance optimization through a thorough performance evaluation.

**Keywords:** Actuator analysis, Mechanical motion, Smart actuator, Mechatronic system.

Paper ID: NCRAME - 06

### **PERFORMANCE ENHANCEMENT OF SOLAR POWER PLANT**

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#### **Abstract:**

The power plant minimizes its environmental impact while meeting the increasing demand for electricity by integrating cutting-edge technologies and eco-friendly practices. Using conventional fossil fuels in addition to renewable energy sources like wind and solar power is one of the key components. Reducing emissions and promoting grid stability are two benefits of integrating energy storage systems, effective heat recovery, and sophisticated control systems. Power Generation, Energy Sources, Electricity Production, Renewable Energy, Fossil Fuels, Nuclear Power, Thermal Power Plant, Hydropower, Solar Energy, Wind Energy, Geothermal Power, Biomass Energy, Generator, Turbine, Electrical Grid, Energy Efficiency, Environmental Impact, Carbon Emissions, Power, Plant Operations, Energy Conservation This abstract highlights the importance of transitioning towards cleaner and more sustainable energy generation methods in the pursuit of a greener and more energy-secure future.

**Keywords:** Power plant, solar & wind energy, Renewable energy, Fossil fuels.

## PERFORMANCE ANALYSIS OF FOUR-STROKE PETROL ENGINES

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### Abstract:

An overview of a thorough investigation into the performance traits of four-stroke gasoline engines is given in this abstract. Since four-stroke engines are so common in the automotive sector, maximizing their efficiency and minimizing their environmental impact must be a top priority. This study looks into a number of these engines' characteristics, such as fuel consumption, power output, emissions, and thermal efficiency. Important variables like air-fuel mixture, compression ratio, and ignition timing are carefully adjusted to see how they affect engine performance. Furthermore, cutting-edge technologies like turbocharging and direct injection are investigated to improve engine performance and lower emissions. Important variables like air-fuel mixture, compression ratio, and ignition timing are carefully adjusted to see how they affect engine performance. Furthermore, cutting-edge technologies like turbocharging and direct injection are explored to enhance engine efficiency and reduce emissions.

**Keywords: I.C Engine, 4-Stroke Cycle, Performance Analysis, Efficiency, Emission, Combustion Efficiency, Performance analysis.**

Paper ID: NCRAME-08

## REGENERATIVE SMART SOLAR VEHICLE

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### Abstract:

Now a days, dealers of natural resources like fuel, coal etc. are facing a hard time to keep pace with the increasing demand. Therefore, to carry out this demand it is quite necessary to make a new exploration of natural resource of energy and power. This study aims to design and analyze the performance of a regenerative smart solar vehicle. The vehicle will utilize solar energy as its primary power source, with regenerative braking technology to recover and store energy during deceleration. The design will incorporate advanced sensors and control systems to optimize energy efficiency and provide a seamless driving experience. Experimental data will be collected through real-world testing, including performance metrics such as energy consumption, range, and charging time. The results of this study will provide valuable insights into the feasibility and effectiveness of regenerative smart solar vehicles, contributing to the development of sustainable transportation solutions.

**Keywords: Solar energy, Solar panel, Motor controller, Natural resources, DC motor, Battery.**



## RECENT ADVANCES IN HYDROGEN FUEL CELL VEHICLES

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### Abstract:

since hydrogen-powered cars emit no CO<sub>2</sub> at the exhaust, it is regarded as a promising fuel for the twenty-first century. In order to decarbonize the transportation sector and meet net-zero emissions targets, hydrogen fueling can be a significant factor. However, the current research is focused on a number of issues pertaining to transportation and refueling infrastructure, efficient hydrogen storage systems, and hydrogen production. The cost and related greenhouse gas emissions of the most recent technological developments in hydrogen production, storage, and distribution technologies are examined and analyzed critically in this study. The least expensive method of storing hydrogen was subterranean storage, which was followed by compressed and liquid hydrogen storage. Following the development of the current research, this paper ultimately identifies knowledge gaps and thereby presents future research directions.

**Keywords: Hydrogen storage & transport, Levelized cost, GHG emission, Refueling protocol.**

Paper ID: NCRAME - 10

## UNLOCKING THE POTENTIAL OF INFRARED SENSORS IN HUMAN-COMPUTER INTERACTION

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### Abstract:

Infrared (IR) sensors have emerged as crucial components in various fields, ranging from consumer electronics to industrial applications, owing to their ability to detect and measure infrared radiation. This expanded abstract offers a thorough rundown of infrared sensors, including its fundamental ideas, uses, and most recent developments. Because they are based on the fundamental idea that everything that is warmer than zero degrees Celsius emits infrared radiation, they are extremely useful for a variety of applications, including remote control systems, motion detection, and temperature measurement. To sum up, infrared sensors are essential components for a variety of uses, ranging from commonplace gadgets to state-of-the-art industrial and medical systems. As they continue to develop, a wide range of industries stand to benefit from new possibilities and solutions that will spur innovation and improve our capacity to engage with the outside world.

**Keywords: Infrared Sensor, IR Detector, Thermopile Sensor, Pyroelectric Sensor, Infrared Emitter, IR Receiver.**

## ADVANCEMENTS IN WELDING TECHNOLOGY AND IT'S APPLICATIONS

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### Abstract:

A basic technique for construction and manufacturing, welding is essential for combining materials in a variety of industries. This abstract examines how welding technology is developing and the range of uses it has. It talks about the latest developments in welding technology, such as robotic welding, laser welding, and friction stir welding, and emphasizes the effectiveness, accuracy, and environmental impact of each. Additionally, this abstract explores the several industries-such as automotive, aerospace, and energy-where welding is essential. Furthermore, the introduction of laser welding, which provides high-speed, low-heat input, and minimal distortion welding solutions, has completely changed the sector. Welding contributes to the structural integrity of cars in the automotive industry to passenger safety. In aerospace, welding plays a critical role in manufacturing aircraft components, where precision and reliability are paramount. Furthermore, in the energy sector, welding is essential for constructing and maintaining pipelines, power plants, and offshore structures. Despite these advancements, challenges persist in the welding industry.

**Keywords:** Welding technology, robotic welding, laser welding, Stir welding.

Paper ID: NCRAME - 12

## EXPERIMENTAL ANALYSIS OF HEAT RECOVERY FROM REFRIGERATION SYSTEM

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### Abstract:

The refrigeration process underpinning the operation of a refrigerator is an intricate dance of thermodynamic principles and mechanical components. This abstract delves deeper into the intricacies of this process, elucidating how a refrigerant undergoes a series of transformations to create and maintain a cool interior environment. Starting with the compression of the refrigerant gas in the compressor, followed by its release of heat in the condenser coil, the refrigerant transitions to a high-pressure liquid. The expansion valve then facilitates a rapid transformation into a low-pressure gas-liquid mix, setting the stage for the evaporator coil's role. Within the refrigerator's main compartment, warm air interacts with the evaporator coil, causing the refrigerant to evaporate and absorb heat, thus lowering the interior temperature. This continuous cycle ensures the refrigerator's ability to keep its contents fresh and cool. This abstract provides a comprehensive understanding of the intricate workings of a refrigerator, underlining its significance in modern daily life and various industrial applications.

**Keywords:** Refrigerator, Thermodynamics, Refrigeration Cycle, Compressor, Condenser Coil, Energy Efficiency, Household Appliances.

## DESIGN OF NATURAL CONVECTION SOLAR DRYER FOR EFFICIENT DRYING

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<sup>2</sup>Associate Professor, Department of Mechanical Engineering, GIET, Ghangapatana, Bhubaneswar

### Abstract:

A sustainable and environmentally beneficial way to preserve agricultural produce and other food goods is through solar drying. We describe a solar dryer system in this abstract that uses convection to dry materials effectively and with little energy. Using the laws of thermodynamics, this creative solar drier maximizes product quality preservation while minimizing energy usage using a passive drying method. The solar dryer is made up of trays that may be adjusted to fit the products that need to be dried inside a specifically constructed drying chamber. The following principles govern the drying process: Solar Absorption: The interior of the drying chamber absorbs sunlight, which raises the temperature there. Convection currents are produced as the heated air inside the chamber rises and becomes less dense. These vents are designed to optimize the convective airflow. Temperature and Humidity Control: Sensors and controls are integrated into the system to monitor and regulate the drying process, ensuring that the temperature and humidity levels are maintained at optimal levels for efficient drying.

**Keywords:** Solar drying, Natural convection, Renewable energy, Sustainable drying, Solar-powered dryer, Eco-friendly drying, Food preservation.

Paper ID: NCRAME - 14

## IMPACT OF HIGH-SPEED MACHINES ON MANUFACTURING INDUSTRIES

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### Abstract:

High speed machine is a corner stone of modern industrial processes, transforming the way we manufacturing, produce, and transport goods. These advanced mechanical systems designed for unparalleled speed and precision, have become integral in industries ranging from automotive and aerospace to electronics and pharmaceuticals. This abstract explores the evolution, applications, and impact of high-speed machine, emphasizing their pivotal role in boosting efficiency, reducing production times, and driving innovation across various sector. As technology continues to advance, high speed machine will be undoubtedly playing an increasingly critical role in shaping the future of industry and commerce. Performance analysis of high-speed machines is an ongoing process that requires collaboration among various teams, including engineering, maintenance, and quality control.

**Keywords:** Speed, precision, Efficiency, Automation, Aerospace.

## PERFORMANCE ANALYSIS OF WINDOW AIR CONDITIONER

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### Abstract:

It is necessary to re-evaluate established methods and create creative substitutes for energy conservation in window air conditioners in order to address concerns about the environment and the rising cost of energy. Physiological parameters that are based on how quickly heat is produced inside the body and dispersed out into the environment affect how comfortable people are. Convective and evaporative losses can rise with increased air speed across the body and clothing surfaces. Thus, even in situations with elevated temperatures and high relative humidity. Airflow can be increased to considerably minimize discomfort. The goal of this article is to reduce energy consumption by adding two automated control systems to a standard window air conditioner. A microcontroller-based ON/OFF control system to replace the blower motor's trail-hazed speed control system and conventional thermostat. In order to study and compare various parameters like condenser, evaporator and indoor air temperatures, motor speed and power consumption an Analog to Digital converter (ADC) card was used to interface the different sensors with a computer. The results were displayed using VISIDAQ software which enables real time process data to be automatically displayed on screen. Incorporation of the above-mentioned control systems have resulted in almost 23% saving in energy.

**Keywords:** Human comfort, Microcontroller, Thermostat, VISIDAQ software.

## EFFICIENCY IMPROVEMENT OF BOILER IN STEAM POWER PLANT

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### Abstract:

The abstract could provide more specific details on the methods and technologies mentioned. For example, it could elaborate on the specific benefits and implementation considerations of low NOx burners and flue gas recirculation. It could also discuss the types of insulation and heat recovery systems that are most effective in minimizing energy losses. Additionally, the abstract could delve further into the role of boiler maintenance and inspections. It could explain the specific cleaning and descaling techniques that are recommended, as well as the frequency at which these tasks should be performed. This could include data on fuel consumption reductions and emissions reductions achieved through efficiency improvements. Overall, providing more specific details and examples would enhance the abstract's comprehensiveness and make it more informative for readers.

**Keywords:** Boiler efficiency improvement, low NOx burners, flue gas recirculation, insulation, heat recovery systems, boiler maintenance, cleaning techniques.

## **DEVELOPMENT AND ANALYSIS OF A NOVEL 6-STROKE PETROL ENGINE**

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### **Abstract:**

The traditional four-stroke internal combustion engine has been the primary power source for automobiles for over a century. In recent years, there has been a growing interest in alternative engine designs aimed at improving efficiency and reducing emissions. One such innovation is the 6-stroke petrol engine, which offers the potential for enhanced thermal efficiency and lower environmental impact. This abstract provides an overview of the development and analysis of a novel 6-stroke petrol engine. The engine design incorporates an additional stroke, the water injection stroke, to complement the conventional four strokes (intake, compression, power, and exhaust). The study involves a comprehensive analysis of the engine's performance, including thermal efficiency, power output, and emissions characteristics, through computational simulations and experimental testing. The results of this research suggest that the 6-stroke petrol engine presents a promising avenue for enhancing internal combustion engine technology, paving the way for more efficient and eco-friendly transportation systems in the future.

**Keywords: 6-stroke engine, Petrol engine, I.C engine, Thermal efficiency, Combustion process, Efficiency improvement, performance analysis, Novel engine concept.**

Paper ID: NCRAME - 18

## **PERFORMANCE ANALYSIS OF 4-STROKE DIESEL ENGINE**

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### **Abstract:**

A four-stroke diesel engine is a type of internal combustion engine commonly used in vehicles, generators, and industrial machinery. It operates on the four-stroke cycle, which includes four distinct processes or strokes: intake, compression, power, and exhaust. Here's a brief overview of how it works: Intake Stroke: During the intake stroke, the engine's intake valve opens, and the piston moves downward. This creates a vacuum inside the cylinder, drawing in air. Compression Stroke: In the compression stroke, both the intake and exhaust valves are closed. The piston moves back up, compressing the air inside the cylinder. This high compression ratio increases the air temperature, preparing it for combustion. Power Stroke: Fuel is injected into the highly compressed air at the top of the compression stroke. The heat from compression causes the fuel to ignite spontaneously (due to the high temperature and pressure). This rapid combustion forces the piston down, generating mechanical power. This cycle then repeats, with the engine continuously turning to produce power. Diesel engines are known for their efficiency and durability, making them suitable for heavy-duty applications.

**Keywords: 4- stroke diesel engine, Intake, Compression, Power, Exhaust, Combustion.**

## **PERFORMANCE ANALYSIS OF FIVE SPEED GEARBOX MECHANISM**

**<sup>1</sup>Omm Prakash Satapathy, <sup>2</sup> B. Srinivas Rao**

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### **Abstract:**

The 5-speed gearbox mechanism is a fundamental part of manual transmissions in vehicles. It empowers drivers to choose from five distinct gear ratios, influencing speed and power delivery. This mechanism consists of two key shafts: an input shaft linked to the engine and an output shaft responsible for transferring power to the wheels. Gear selection is controlled via a gear lever with positions for "1st," "2nd," "3rd," "4th," "5th," and "Reverse." Shifting gears necessitates the engagement of the clutch pedal, momentarily disconnecting the engine from the gearbox. Inside the gearbox, a series of gears with varying tooth sizes allows for the desired gear ratio selection. When a gear is chosen, it meshes with a corresponding gear on the output shaft. Releasing the clutch pedal re-establishes the connection between the engine and the wheels, facilitating the transmission of power through the selected gear ratio. This mechanism grants drivers the flexibility to adapt to diverse driving conditions, optimizing both performance and fuel efficiency.

**Keywords: Gears, Input, Layshaft, Output, Shift, Clutch, Ratios, Transmission, Manual, Synchronizers.**

Paper ID: NCRAME - 20

## **BUTT WELDING: TECHNIQUES, APPLICATIONS, AND ADVANCEMENTS**

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### **Abstract:**

Butt welding is a fundamental joining process widely used in various industries, such as manufacturing, construction, and aerospace. This article provides a comprehensive overview of butt welding, including its techniques, applications, and recent advancements. It explores the principles behind butt welding, the equipment involved, and the crucial factors affecting the quality of welds. Furthermore, the article discusses the diverse applications of butt welding, from structural fabrication to pipeline construction, highlighting its significance in modern engineering. Finally, it delves into recent innovations and research efforts aimed at improving the efficiency, durability, and sustainability of butt-welding processes. This comprehensive resource aims to equip readers with a deeper understanding of butt welding and its relevance in contemporary industrial settings.

**Keywords: Butt Welding, Welding Applications, Welding Techniques, Welding Efficiency, Welding Sustainability.**

## DEVELOPMENT OF NOVEL MIG WELDING PROCESS

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### Abstract:

One popular arc welding method that is well-known for its adaptability and effectiveness in combining different metals is metal inert gas (MIG) welding. With this method, a consumable wire electrode that is continuously fed through a welding gun is used. The electrode is usually constructed of a material that is identical to the workpiece. An arc is created by the electrical current flowing through the wire, melting the workpiece and the electrode and allowing a solid, long-lasting weld to form. MIG welding is used in many different industries, including as manufacturing, aerospace, construction, and automotive. Its benefits include a large range of metals and thicknesses, little post-weld cleanup, and a rapid welding speed. However, correct modification of welding parameters, including voltage, wire feed rate, and shielding gas composition, is crucial to achieve optimal results. This abstract provides a concise overview of the MIG welding process, highlighting its key components and applications across various industries. Understanding these fundamentals is essential for proficient use of this welding technique in industrial settings.

**Keywords:** MIG welding, Workpiece, welding gun, welding technique.

Paper ID: NCRAME - 22

## A REVIEW ON WORKING AND APPLICATIONS OF OXY-ACETYLENE GAS WELDING

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### Abstract:

Welding process is used by many construction and manufacturing firms. There are several welding processes to join materials to achieve the desired purpose. Gas welding is one of the cheapest processes of welding and generally used in all the small-scale works. The oxygen and the acetylene are the two gasses which produce sufficient heat and temperature which can be utilized for joining the materials. It is widely used for welding pipes and tubes and also for repair work in industries. The main object of industries is to produce better quality product at minimum cost. The work and concept of each researcher is expressed in such a way that the future scope should be clear. The researchers have given their own views on the performance of the gas welding process, the materials selected for their study, effect of ratio of oxygen to acetylene etc. in their researches. In this research review work different other research papers which contained the research and analysis relating input and output parameters of welding and cutting, flames, nozzle design, effects of pre and post heat treatments and snapping were included and considered while working with oxy acetylene gas welding.

**Keywords:** Gas welding, Welding process, Flame characteristics, Welding applications, Industrial welding, Welding techniques, Welding equipment.

## **ADVANCE SAND CASTING TECHNIQUES AND DIGITAL INTERGRATION**

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### **Abstract:**

Sand casting is a versatile and widely used manufacturing process for producing metal parts. It involves creating a mold from compacted sand, then pouring molten metal into the mold cavity. The performance of sand casting can be characterized by its advantages and limitations. Versatility: Sand casting can accommodate a wide range of metal alloys and part sizes, making it suitable for various industries and applications. Complex Geometries: Sand casting can produce intricate and complex part designs with relative ease. Quick Prototyping: It allows for rapid prototyping and design iteration. Mold Wear: Sand Molds degrade over time and can only be used for a limited number of casts. Porosity: Porosity and trapped air can be an issue, affecting the structural integrity of the cast part. In summary, sand casting is a versatile and cost-effective method for producing a wide range of metal parts, especially in cases where surface finish and tight tolerances are not critical. However, it may require additional finishing and quality control steps to meet specific requirements.

**Abstract: Sand Mold, Foundry, Casting Process, Molding Sand, Molten Metal, Pattern, Green Sand, Core Making, Casting Design.**

Paper ID: NCRAME - 24

## **SOLAR ENERGY FOR COOLING AND REFRIGERATION SYSTEM**

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### **Abstract:**

Refrigeration systems are necessary to keep things cold in a variety of settings, including air conditioning, medicine storage, and food storage. An overview of the main elements and ideas of a standard refrigeration system is given in this abstract. The expansion valve lowers the pressure and temperature of the high-pressure liquid refrigerant as it exits the condenser. The refrigerant evaporates as a result of this abrupt pressure reduction, taking in heat from the surroundings. Because refrigeration systems can use a lot of electricity, energy efficiency is an important factor to take into account. Technological developments have resulted in the creation of ecologically friendly refrigerants and enhanced designs for systems that use less energy. To sum up, refrigeration systems are essential for preserving low temperatures in a range of settings. Recognizing the fundamentals and components involved can help optimize their performance and improve energy efficiency, leading to more sustainable and effective cooling solutions.

**Keywords: Refrigeration system, components, principles, compressor, condenser, expansion valve, evaporator, refrigerant, heat transfer, energy efficiency.**



### ANALYSIS OF SEAM WELDING

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#### Abstract:

One essential welding method that is used extensively in many sectors is seam welding, which is required for accurate, continuous metal joins. This process includes arc welding (such as Gas Metal Arc Welding) and resistance methods such as Resistance Seam Welding (RSEW) (GMAW). To flawlessly weld metal, seam welding uses revolving electrodes or wheels that provide pressure and electrical current. The abstract touches on aspects affecting weld quality, such as electrode pressure, welding speed, and material properties, while emphasizing the benefits of seam welding, such as automation capabilities, consistent outcomes, and efficiency. Modern industrial applications rely heavily on seam welding due to its consistent production of high-quality welds. This abstract provides a succinct overview of the basic ideas and importance of seam welding in modern production processes. Kindly continue keep in mind that an abstract's length and level of detail can vary depending on the demands of the research paper or document it is meant for.

**Keywords: Seam Welding, Continuous Welding, Metal Joining, Resistance Seam Welding, Laser Seam Welding, Hermetic Sealing, Leak-Proof Joints.**

Paper ID: NCRAME - 26

### MASS PRODUCTION: EFFICIENCY, CHALLENGES, AND FUTURE PROSPECTS

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#### Abstract:

Mass production, a hallmark of industrialization, has shaped the modern world in profound ways. Its key tenets encompass the standardization of components, division of labor, and the integration of specialized machinery, which have collectively enabled industries to produce goods at unprecedented scales, from automobiles to consumer electronics. In an era defined by environmental consciousness, finding the equilibrium between efficiency and eco-friendliness is of paramount importance. The future of mass production is undergoing a metamorphosis, driven by rapid technological advancements. Automation, artificial intelligence, and additive manufacturing (commonly known as 3D printing) are at the forefront of this transformation. These innovations promise enhanced efficiency, customization, and environmental responsibility. Embracing these technologies is pivotal for industries to stay competitive on a global scale. This comprehensive abstract offers an in-depth exploration of the multifaceted world of mass production and its ongoing evolution in the 21st century, where efficiency, sustainability, and innovation are the guiding principles shaping its trajectory.

**Keywords: Mass Production, Industrialization, Specialized Machinery, Quality Control, Environmental Sustainability, Automation, Artificial Intelligence.**

## **AIR COMPRESSORS: MECHANISMS AND UTILIZATION IN INDUSTRY**

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<sup>1</sup>*Student, Department of Mechanical Engineering, 3<sup>rd</sup> year GIET, Ghangapatana, Bhubaneswar*

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### **Abstract:**

Air compressors constitute essential equipment across diverse industries, facilitating the compression and storage of air for various applications. This abstract offers a succinct overview of air compressors, elucidating their underlying mechanisms and illustrating their versatile utilization in industrial processes. The discussion centers on the operation of air compressors, highlighting their role in increasing air pressure by reducing volume and exploring the various types of compressors, including reciprocating, rotary screw, and centrifugal. Additionally, we examine the wide array of applications for compressed air, from pneumatic tools in manufacturing to powering HVAC systems and even medical devices. Understanding the mechanics and applications of air compressors is pivotal for engineers and professionals seeking efficient solutions for air compression needs in industrial settings.

**Keywords:** Air compressor, Compressed air, Pressure gauge, Oil-free compressor, Rotary screw compressor, Portable air compressor.

Paper ID: NCRAME - 28

## **STRUCTURAL BACKBONE: THE SIGNIFICANCE OF CHASSIS FRAMES IN VEHICLE DESIGN**

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<sup>1</sup>*Student, Department of Mechanical Engineering, 4<sup>th</sup> year GIET, Ghangapatana, Bhubaneswar*

<sup>2</sup>*Associate Professor, Department of Mechanical Engineering, GIET, Ghangapatana, Bhubaneswar*

### **Abstract:**

The chassis frame is a fundamental structural component in various vehicles, including automobiles, trucks, motorcycles, and bicycles. It serves as the backbone of the vehicle, providing support for the engine, suspension, steering, and other critical systems. This abstract explores the key aspects and significance of chassis frames in vehicle design and performance. A chassis frame typically consists of a framework of metal or composite materials, engineered to withstand various forces and stresses encountered during vehicle operation. It plays a pivotal role in ensuring the stability, strength, and safety of the vehicle. The design and material selection of the chassis frame directly impact vehicle weight, handling, fuel efficiency, and crashworthiness. Materials and Manufacturing: Advances in materials science have led to the development of high-strength, lightweight materials, such as advanced steels, aluminum, and composites, which impact the frame's performance and manufacturing processes.

**Keywords:** Chassis frame, Vehicle structure, Frame design, Automotive chassis, Crash protection, Lightweight materials, Manufacturing processes, Vehicle safety.

## DEVELOPMENT AND PERFORMANCE ANALYSIS OF AN ADVANCED AIR CONDITIONING SYSTEM

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### Abstract:

This paper presents the comprehensive development and performance evaluation of a cutting-edge air conditioning system designed to meet the evolving demands of indoor climate control. The research outlines the systematic design process, incorporating state-of-the-art components, including variable refrigerant flow technology, advanced filtration, and precise control algorithms. Performance evaluation encompasses a range of metrics, including energy efficiency, cooling capacity, temperature control accuracy, and environmental impact. Results demonstrate the system's superior performance in maintaining optimal indoor comfort while significantly reducing energy consumption compared to conventional systems. This study underscores the potential of this innovative air conditioning system to enhance both user comfort and environmental sustainability, making it a promising solution for modern HVAC challenges.

**Keywords:** HVAC (Heating, Ventilation, and Air Conditioning), Thermal comfort, Indoor air quality, Environmental sustainability, Central air conditioning.

Paper ID: NCRAME - 30

## DISSIMILAR JOINING OF AISI304/LOW CARBON STEEL IN GTAW BY USING ER308L AND ER309L FILLER MATERIAL

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### Abstract:

In present work by using different filler material ER308L and ER309L and under various process parameters like welding speed, arc voltage and current the welding of an austenitic stainless steel (AISI304) and a carbon steel were performed by tungsten inert gas (TIG) welding process. Dissimilar joint strength was investigated by tensile testing machine. Microstructures of all the welds were predicted using Schaeffler diagram and cooling rate were calculated from welding parameters. The maximum strength was obtained in welded joint with heat input 296.054 using ER309L. The joint strength has been correlated with the predicted microstructure. The results indicate that in addition to weld microstructure grain size of HAZ is the dominant factor controlling dissimilar joint strength between AISI 304 and carbon steel.

**Keywords:** Austenitic stainless steel with Low carbon steel, ER 308L and ER 309L, Joint efficiency, microstructure, Schaeffler diagram, grain size of HAZ, GTAW.

## **THERMAL ENERGY STORAGE SYSTEMS: HARNESSING HEAT FOR SUSTAINABLE APPLICATION**

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### **Abstract:**

Thermal Energy Storage (TES) systems are instrumental in harnessing heat for sustainable applications. TES operates on the principle of efficiently capturing and storing thermal energy, decoupling energy production from consumption. These systems, including sensible heat storage, latent heat storage, and thermochemical storage, acquire heat from diverse sources such as solar, industrial processes, and waste heat recovery. It enhances renewable energy integration by storing surplus energy, ensuring a reliable energy supply. TES improves overall energy system efficiency, reduces carbon emissions, and promotes grid stability. Additionally, it finds application in various sectors, including industrial processes, sustainable heating and cooling, and remote energy access. In conclusion, TES systems play a pivotal role in the transition to sustainable energy practices, with their ability to efficiently capture, store, and release heat. They are essential tools for a greener and more sustainable future.

**Keywords: Thermal Energy Storage, Sustainable Energy, Energy Efficiency, Grid Stability, Carbon Emissions Reduction. Industrial Applications, Remote Energy Access.**

Paper ID: NCRAME - 32

## **A CASE STUDY ON OPERATION AND MAINTENANCE OF BOILER**

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<sup>2</sup>Associate Professor, Department of Mechanical Engineering, GIET, Ghangapatana, Bhubaneswar

### **Abstract:**

Coal fired boiler system generates approximately 38% of the electric power worldwide and will continue to be major contributors in the future. New pulverized coal fired systems routinely installed today generate power at net thermal cycle efficiency ranging from 34% to 37% (higher heating value) while removing up to 97% of the combined, uncontrolled air pollution emissions. A new generation of pulverized coal fired boiler technology is currently under development which will permit generating efficiencies in excess of 42%. This paper highlights some of today's design improvements which target reduced emissions and expanded operability, and explores some of the boiler design implications for the ultra-supercritical conditions needed to achieve the high cycle efficiencies for the future.

**Keywords: Boiler Accessories, Boiler Efficiency, Boiler Mountings, FBC Boiler.**

ISBN NO: 978-93-83060-29-0

Paper ID: NCRAME - 33

### **SOLAR-POWERED WATER DISTILLATION SYSTEM**

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#### **Abstract:**

There is almost no water left on earth that is safe to drink without purification after 20-25 years from today. This is a seemingly bold statement, but it is unfortunately true. Only 1% of Earth's water is in a fresh, liquid state, and nearly all of this is polluted by both diseases and toxic chemicals. For this reason, purification of water supplies is extremely important. Keeping these things in mind, we have devised a model which will convert the dirty/saline water into pure/potable water using the renewable source of energy (i.e., solar energy). The basic modes of the heat transfer involved are radiation, convection and conduction. The results are obtained by evaporation of the dirty/saline water and fetching it out as pure/drinkable water. The designed model produces 1.5 L of pure water from 14 L of dirty water during six hours. The efficiency of plant is 64.37%. The TDS (Total Dissolved Solids) in the pure water is 81ppm.

**Keywords: Renewable energy, pure water, TDS, radiation, convection, conduction.**

Paper ID: NCRAME - 34

### **HUMAN-MACHINE INTERACTION(HMI) IN THE ERA OF INDUSTRY 4.0**

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#### **Abstract:**

The Fourth Industrial Revolution, commonly known as Industry 4.0, has ushered in an era of unprecedented technological advancement and automation. As industries increasingly integrate smart machines, artificial intelligence, and the Internet of Things into their operations, the interaction between humans and machines has become a focal point of research and development. This abstract delves into the evolving landscape of Human-Machine Interaction (HMI) within the context of Industry 4.0. This presentation explores the fundamental shifts in how humans interact with machines, robots, and automated systems in manufacturing, healthcare, logistics, and various other sectors. It highlights the following key aspects Collaborative Robotics: Industry 4.0 has seen the rise of collaborative robots or cobots, which work alongside humans in shared workspaces. We discuss the challenges and benefits of cobots in enhancing productivity while ensuring safety and ease of use. By examining these facets of HMI in the Industry 4.0 era, this presentation aims to provide conference attendees with a comprehensive understanding of the evolving human-machine relationship and its implications for industry, society, and the future of work.

**Keywords: Industrial revolution, Industry 4.0, Human-Machine Interaction.**

## **AUTOMOBILE AIR CONDITIONING SYSTEM**

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### **Abstract:**

Automobile air conditioning, often referred to as car AC or car air conditioning, is a system designed to cool and dehumidify the air inside a vehicle. It plays a crucial role in maintaining a comfortable and controlled environment for passengers, especially during hot weather. Here are some key components and principles of automobile air conditioning: Compressor, Condenser, Receiver/Drier, Expansion Valve or Orifice Tube, Evaporator, Blower Fan, Controls. The basic principle of how car air conditioning works is that it takes advantage of the phase change of the refrigerant. The refrigerant circulates through the system, changing from a high-pressure, high-temperature gas to a low-pressure, low-temperature gas as it absorbs and releases heat. This cycle is repeated, allowing the system to maintain a comfortable temperature inside the vehicle.

**Keywords: Automobile AC, Compressor, Condenser, Receiver/Drier, Expansion Valve or Orifice Tube, Evaporator, Blower Fan, Controls.**

Paper ID: NCRAME - 36

## **PERFORMANCE ANALYSIS OF I.C ENGINE**

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### **Abstract:**

The performance analysis of an internal combustion engine (IC engine) involves evaluating its efficiency, power output, emissions, and other characteristics. It is a crucial aspect of engine design, operation, and optimization. Here are some key parameters and methods for performance analysis of IC engines: Internal combustion engines (IC engines) are machines that generate mechanical power by burning fuel within a confined space, usually a cylinder, to create high-pressure gas. There are two primary types of IC engines: Spark Ignition Engine (SI): These engines use a spark plug to ignite a mixture of fuel (usually gasoline) and air. They are commonly found in cars and are often referred to as gasoline engines. Brake Thermal Efficiency (BTE), Brake Specific Fuel Consumption (BSFC), Indicated Thermal Efficiency (ITE), Volumetric Efficiency, Torque and Power Output, Emissions Analysis, Mechanical Efficiency, Specific Power, Exhaust Gas Temperature, Combustion Analysis.

**Keywords: Performance analysis, I.C engine, Brake Thermal Efficiency (BTE), BSFC, Indicated Thermal Efficiency (ITE), Volumetric Efficiency.**

## **ELECTRIC VEHICLE**

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### **Abstract:**

Automotive landscape is undergoing a transformative he global shift with the rapid adoption of electric vehicles (EVs). This abstract explores the burgeoning era of electric mobility, focusing on the environmental and societal implications of this technology. Electric vehicles, powered by batteries or fuel cells, offer a promising alternative to internal combustion engine vehicles, significantly reducing greenhouse gas emissions and air pollution. This paper discusses the key drivers behind the surge in EV popularity, including advancements in battery technology, supportive government policies, and growing consumer demand for sustainable transportation. It also delves into the challenges that this electrified revolution faces, such as charging infrastructure expansion and battery recycling. The abstract concludes by emphasizing the pivotal role of EVs in achieving a more sustainable and environmentally friendly transportation system, paving the way for a cleaner and greener future.

**Keywords: Electric vehicles (EVs), Fuel cells, Greenhouse gas emissions.**

Paper ID: NCRAME - 38

## **MANUFACTURING TECHNOLOGY**

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### **Abstract:**

In recent years there has been a veritable avalanche of information about AMT - advanced manufacturing technology - and, latterly, CIM - computer-integrated manufacturing. But what do these terms mean, and have the associated technologies been entirely successful? The opening section of this paper seeks to answer the first question by describing some of the radical changes currently occurring in manufacturing industry and suggesting possible definitions for both 'AMT' and 'CIM'. It will be shown that there is a steady trend in manufacturing towards 'integration' (of both functions and information) and that integration has progressed furthest in the area of flexible manufacturing systems (FMS). The paper concludes with a brief description of research being carried out to develop an alternative 'human-centred' approach to the design and implementation of FMS and ultimately CIM. This approach seeks to integrate. the design of computer-aided technology and work, in order to make optimal use of both technical and human resources in manufacturing systems.

**Keywords: Advanced manufacturing technology, computer- integrated manufacturing, flexible manufacturing system.**

## DEVELOPMENT AND PERFORMANCE ANALYSIS OF AN CENTRAL AIR CONDITIONING SYSTEM

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### Abstract:

Central air conditioning systems play a pivotal role in modern building comfort and energy efficiency. This abstract provides an overview of central air conditioning, highlighting its key components, working principles, benefits, and environmental considerations. The keywords associated with this abstract are: central air conditioning, HVAC, cooling, energy efficiency, ductwork, and environmental impact. The refrigerants used in these systems can contribute to greenhouse gas emissions if not handled responsibly. Advancements in technology have led to the development of eco-friendly refrigerants with lower global warming potential. In conclusion, central air conditioning is a vital component of modern buildings, providing comfort and energy efficiency. While it offers numerous advantages, its environmental impact underscores the importance of responsible refrigerant management and ongoing efforts to enhance sustainability within the HVAC industry.

**Keywords:** Air conditioning system, HVAC (Heating, Ventilation, and Air Conditioning), Thermal comfort, Energy efficiency, Central air conditioning, Split air conditioning.

Paper ID: NCRAME - 40

## FOUR WHEEL STEERING MECHANISM

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### Abstract:

Four-wheel steering, often referred to as 4WS, is a vehicle technology that allows all four wheels of a vehicle to be controlled and steered individually. This is in contrast to traditional two-wheel steering, where only the front wheels are steered. Four-wheel steering can offer several advantages in terms of manoeuvrability, stability, and handling. There are two main types of four-wheel steering systems: passive and active. It's important to note that not all vehicles are equipped with four-wheel steering, and the specific design and performance characteristics of these systems can vary significantly between manufacturers. Additionally, the advantages of four-wheel steering may be more pronounced in certain types of vehicles and driving scenarios, so its benefits can vary. Many sports cars and performance vehicles have used passive 4WS systems to enhance their handling characteristics.

**Keywords:** Four-wheel steering, manoeuvrability, stability, handling.



### RECENT ADVANCES IN LATHE MACHINE

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#### Abstract:

Certainly, here's an abstract summary of a lathe machine: A lathe machine is a fundamental tool in the realm of machining and manufacturing. Its primary function is to rotate a workpiece on its axis while a cutting tool is brought into contact with the material to remove excess material and shape it to the desired form. Lathes are versatile, enabling the creation of various cylindrical and conical shapes, making them essential in industries such as metalworking and woodworking. These machines come in different forms, including manual lathes operated by human control and more advanced CNC (computer numerical control) lathes that are automated and capable of intricate and precise machining. The lathe's applications span from creating simple components like bolts and nuts to crafting complex parts for machinery, aerospace, and more. Its enduring importance lies in its ability to craft precision components with efficiency and accuracy, contributing significantly to modern manufacturing processes.

**Keywords:** Lathe Machine, Turning Machine, Metalworking Lathe, CNC Lathe, Wood Lathe, Machining Center, Chuck, Tailstock, Spindle, Workpiece, Tool post.

Paper ID: NCRAME - 42

### ADVANCEMENTS IN DRILLING MACHIN TECHNOLOGY, A COMPRESSIVE REVIEW

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#### Abstract:

Advancements in drilling machine technology have significantly impacted various industries and applications, enhancing efficiency, precision, and safety. Here's a comprehensive review of some key advancements in this field: Digital Control Systems, High-Speed Drilling, Improved Material Compatibility, Multi-Axis Machining, Automatic Tool Changers, Real-time Monitoring and Feedback, Energy Efficiency, Safety Features, Adaptive Drilling, IoT Integration, Environmental Considerations. In conclusion, advancements in drilling machine technology have significantly improved drilling efficiency, precision, and safety across various industries. These advancements have been driven by the integration of digital control systems, high-speed drilling capabilities, improved materials and tooling, safety features, and the use of IoT and automation. As technology continues to evolve, we can expect even more innovation in the field of drilling machines.

**Keywords:** Digital Control Systems, High-Speed Drilling, Real-time Monitoring and Feedback, Energy Efficiency, Safety Features, Adaptive Drilling, IoT Integration.

## DEVELOPMENT AND ANALYSIS OF HYBRID VEHICLES

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### Abstract:

Hybrid vehicles represent a pivotal innovation in the automotive industry, aiming to reconcile the benefits of internal combustion engines with the efficiency of electric propulsion. This abstract provides an overview of hybrid vehicles, detailing their core principles, advantages, and evolving technologies. Hybrids seamlessly blend traditional gasoline or diesel engines with electric power sources, enhancing fuel efficiency and reducing emissions. Various hybrid configurations, including parallel, series, and plug-in hybrids, cater to diverse consumer needs. This abstract also explores the environmental benefits of reduced carbon footprint and the potential for future advancements in hybrid technology, such as improved battery technology and increased electric range. Hybrid vehicles stand as a promising solution to bridge the gap between conventional and electric automobiles, contributing to a more sustainable and energy-efficient transportation future.

**Keywords:** Hybrid vehicles, Hybrid powertrains, Parallel hybrid, Series hybrid, Plug-in hybrid.

Paper ID: NCRAME - 44

## RECENT TECHNOLOGY IN CAD CAM

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### Abstract:

Computer-aided design (CAD) and computer-aided manufacturing (CAM) are software that enable users to design products and, through the use of computer-guided machinery, manufacture them according to the necessary specifications. CAD/CAM programs are used in a wide range of industries and play a key role in rapid prototyping, a process that allows companies to manufacture and test iterations of a product. Many would add to this duo a third technology, computer-aided engineering (CAE). In this paper applications of CAD/CAM in the different area of design is described where CAD/CAM software plays a very important role. Ongoing refinements in CAD/CAM systems continue to save manufacturers tens of millions of dollars in time and resources over non-computerized methods. The paper presents the advantages of using this technology as well as satisfaction of the patients and dentists by using systems as: Cercon, Celay, Cerec, Lava, Everest, which represent imperative of modern dentistry in creating fixed dental restorations.

**Keywords:** CAD-CAM Technology, CAD/CAM Software, computer-aided engineering (CAE).

## PERFORMANCE ANALYSIS OF RECIPROCATING COMPRESSOR

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### Abstract:

Reciprocating compressors are widely used in various industrial applications for gas compression. Understanding their performance characteristics is essential for optimizing their operation and enhancing energy efficiency. This study presents a comprehensive performance analysis of reciprocating compressors, focusing on key parameters such as efficiency, capacity, and reliability. We examine the impact of operating conditions, including pressure ratios and compression ratios, on compressor performance. Additionally, the influence of lubrication systems, valve dynamics, and temperature variations is considered. Through experimental data, mathematical modeling, and simulations, we provide insights into the factors affecting the efficiency and reliability of reciprocating compressors. The findings from this analysis can guide engineers and operators in making informed decisions regarding compressor selection, maintenance, and operational strategies, ultimately leading to improved system performance and reduced energy consumption.

**Keywords:** Reciprocating compressors, Comprehensive performance, Lubrication.

Paper ID: NCRAME - 46

## ANALYSIS OF COMPOSITE MATERIAL

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### Abstract:

Composite materials are engineered materials comprised of two or more distinct constituent materials with different properties, combined to achieve superior performance characteristics that surpass those of individual components. These materials have gained prominence in various industries, including aerospace, automotive, construction, and sports equipment, due to their exceptional strength-to-weight ratios, corrosion resistance, and versatility. This abstract provides an overview of composite materials, including their types, manufacturing processes, applications, and environmental considerations. Understanding composite materials is essential for optimizing their usage in diverse applications and minimizing their environmental impact. Their benefits often include high strength-to-weight ratios, corrosion resistance, durability, and the ability to be tailored for specific applications. However, they also have some limitations, such as cost, manufacturing complexity, and the potential for delamination or material degradation over time.

**Keywords:** Composite materials, Fiber-reinforced composites, Manufacturing processes, Aerospace applications, Automotive applications.

**ENERGY ABSORBING HYDRO PNEUMO MECHANICAL MECHANISM TO  
ENHANCE PASSIVE SAFETY IN MOTOR VEHICLES**

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**Abstract:**

The article describes one of the ways to enhance safety in cars. The topic is addressed by analyzing how to absorb kinetic energy during a car collision with an obstacle. The article analyzes opportunities to convert motor vehicle's kinetic energy into another type of energy in the case of collision. For this purpose, various mechanical, hydraulic or pneumatic devices are normally used. Such devices are designed to absorb collision energy and reduce or eliminate its impact on the driver, the passengers or cargo in the motor vehicle and are typically referred to as additional elements of safety to the passenger and cargo. The energy absorbing device described in the present article incorporates hydraulic, pneumatic and mechanical mechanisms. The layout of the device presented in the article includes mathematical description of mechanical, pneumatic and hydraulic processes in the equipment. Analysis of the developed mechanism employs a special application to calculate major parameters of the motor vehicle and the installed device. The article also includes sample calculations.

**Keywords: vehicle safety, hydro mechanical device, absorption of kinetic energy, mechanical mechanisms.**

Paper ID: NCRAME - 48

**SUSTAINABLE ENERGY GENERATION: A COMPREHENSIVE OVERVIEW  
OF THERMAL POWER PLANTS**

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**Abstract -**

a small area, generating high-temperature heat. This heat is then used to produce steam, which drives a turbine to generate electricity. CSP plants can store heat for continuous power generation. Geothermal Power: Geothermal energy taps into heat from the Earth's core. Hot water or steam from underground reservoirs is used to turn turbines and generate electricity. It's a constant and reliable source of energy with minimal greenhouse gas emissions. Thermal Energy Storage: Efficient energy storage systems, such as molten salt or phase change materials, help stabilize thermal power generation and provide electricity when demand is high. Sustainable thermal power generation is a key component of the transition to a greener energy future, minimize its impact on the environment.

**Keywords: Thermal Power Plant, Boiler, Turbine, Generator.**

**ADVANCEMENT IN ARC WELDING TECHNOLOGY: IMPROVING EFFICIENCY  
AND QUALITY**

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**Abstract:**

Arc welding is a widely utilized joining process in manufacturing and construction industries due to its versatility and ability to create strong bonds between metals. This abstract provides an overview of recent advancements in arc welding technology aimed at enhancing efficiency and weld quality. It explores innovative techniques such as pulsed arc welding, automation, and the use of advanced materials for electrodes and shielding gases. The paper also discusses the impact of these advancements on reducing environmental emissions and improving workplace safety. By examining the current state of arc welding technology and its evolving trends, this research contributes to a deeper understanding of how modern welding techniques are shaping various industries. Advancements Efficiency improvement Quality enhancement welding processes welding equipment welding automation welding materials welding industry welding innovation welding standards welding productivity welding applications welding research welding techniques.

**Keywords:** Arc welding, welding technology, shielding gases, Efficiency.

Paper ID: NCRAME - 50

**ADVANCEMENTS IN ROBOTICS: A COMPREHENSIVE STUDY**

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**Abstract:**

The field of robotics has witnessed remarkable progress in recent years, with an ever-expanding array of applications that range from industrial automation to healthcare and space exploration. This research begins by reviewing the foundational components of modern robotics, including hardware innovations in sensors, actuators, and materials. It explores the crucial role played by artificial intelligence, particularly deep learning and reinforcement learning, in enabling robots to perceive, reason, and make decisions autonomously. Furthermore, it explores the ethical dilemmas surrounding autonomous robots, addressing issues such as privacy, safety, and the delegation of decision-making authority to machines. It explores real-world case studies across industries, showcasing how robots are revolutionizing manufacturing, healthcare, agriculture, and space exploration. Ultimately, this research contributes to the ongoing dialogue on how robotics will shape our world in the years to come.

**Keywords:** Robotics, Advancement, Technology, Automation, Artificial Intelligence, Machine Learning, Computer Vision, Ethical Implications.

## **PERFORMANCE EVALUATION OF TWO-STROKE PETROL ENGINES**

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### **Abstract:**

Two-stroke petrol engines have been a staple in various industries for decades, known for their unique characteristics and versatility. This abstract delves deeper into the multifaceted realm of two-stroke engine performance evaluation. Power Output and Torque: Two-stroke petrol engines are renowned for their impressive power-to-weight ratios. Size and Weight Considerations: In applications where space and weight constraints are pivotal, understanding the dimensions and weight of these engines is indispensable. Smaller, lightweight engines are favored in scenarios such as handheld equipment and marine applications. This abstract underscores the multifaceted nature of two-stroke petrol engine performance, emphasizing the need for a holistic assessment that considers the diverse requirements of automotive, industrial, and recreational applications. By optimizing these performance aspects, two-stroke petrol engines can continue to play a vital role in various industries while meeting modern standards for efficiency, emissions, and sustainability.

**Keywords: Two-Stroke Engine, Petrol Engine, Combustion Efficiency, Exhaust Emissions, Power Output, Lubrication, Port Timing, Expansion Chamber.**

Paper ID: NCRAME - 52

## **PERFORMANCE ANALYSIS OF RECIPROCATING PUMP**

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*<sup>1</sup>Student, Department of Mechanical Engineering, 3<sup>rd</sup> year GIET, Ghangapatana, Bhubaneswar*

*<sup>2</sup>Assistant Professor, Department of Mechanical Engineering, GIET, Ghangapatana, Bhubaneswar*

### **Abstract:**

Reciprocating pumps are essential to many different industries because they provide a dependable means of compressing and moving fluids. An overview of reciprocating pumps is given in this abstract, which also explores their basic mechanics and highlights the variety of uses for them. We examine the basic principles underlying the operation of these pumps, focusing on the creation of pressure differentials and the reciprocating motion of plungers or pistons. We also go over the benefits and drawbacks of reciprocating pumps, including their capacity to withstand high pressures and their applicability for jobs ranging from chemical processing to water supply. When choosing and using these essential fluid-handling equipment, engineers and other professionals can make well-informed decisions if they have a solid understanding of the mechanics and applications of reciprocating pumps.

**Keywords: Reciprocating pump, Plunger pump, Positive displacement pump, Suction, Stroke length, Flow rate, Reciprocating motion, Pumping mechanism.**

## WORKING PRINCIPLE OF THERMAL POWER PLANT

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### Abstract:

Power plant engineering plays a pivotal role in meeting the ever-increasing global energy demand while addressing environmental concerns. This abstract provides a concise overview of recent advancements in power plant engineering, with a focus on enhancing efficiency and sustainability. It discusses innovations in various power generation technologies, such as gas turbines, steam turbines, and renewable energy sources. Additionally, it highlights the integration of digital technologies, predictive maintenance, and carbon capture methods to reduce emissions and improve operational performance. The abstract underscores the importance of interdisciplinary research and collaboration to drive the evolution of power plant engineering towards a cleaner and more efficient energy future.

**Keywords:** Power Generation, Energy Sources, Electricity Production, Renewable Energy, Nuclear Power, Thermal Power Plant, Hydropower, Energy Conservation.

Paper ID: NCRAME - 54

## PROJECTION ON WELDING PROCESS

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### Abstract:

In the field of resistance welding, projection welding is a crucial technique that provides accurate and durable solutions for joining metal parts. Using electrical resistance and specially crafted projections or embossments on the workpieces, this technique produces localized heat. These projections function as geometric enhancers, focusing the electrical current flow and producing heat at specific locations to aid in the safe fusion of metals. This abstract explores the basic ideas of projection welding and clarifies the physics behind heat generation and electrical resistance. Additionally, it looks at the real-world uses for projection welding, emphasizing its importance across a range of sectors with a focus on the automotive industry. In this situation, projection welding makes it possible to attach crucial parts like nuts, bolts, and brackets to metal sheets, ensuring structural integrity and durability in automotive assemblies.

**Keywords:** Projection Welding, Resistance Welding, Welding Current, Welding Pressure, Weld Strength, Electrode Design, Spot Welding, Metal Fabrication.

### 3 SPEED GEARBOX MECHANISM

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#### Abstract:

In industrial and automotive machinery, a 3-speed gearbox mechanism is essential for effective power transmission and versatile operation. It emphasizes how important 3-speed gearboxes are for striking a balance between power and fuel economy, which makes them essential for a variety of uses in the manufacturing and transportation sectors. A three-speed gearbox normally has three different gear ratios: a medium gear that balances speed and torque, a high gear that balances speed and torque, and a low gear that is for high torque and slow speed. At any given time, the driver or operator can switch between these gears to match the needs of the machine or vehicle. For example, when driving up steep hills in an automobile, you might shift into a lower gear and a higher gear for highway cruising. The gearbox contains a set of gears of different sizes. These gears are typically arranged in a manner that allows for different combinations and configurations to achieve the desired gear ratios.

**Keyword: Gearbox, Transmission, Automotive, Efficiency, Torque, Technology, Performance, Mechanism, Industrial, Power.**

Paper ID: NCRAME - 56

### AUTOMATED DOUBLE HACKSAW CUTTING MACHINE

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#### Abstract:

The world as we know it has changed these days due to automation. To expedite and simplify human tasks, we require an increasing number of automated systems. Thus, we are automating yet another laborious task here: hacksaw cutting. Cutting with a hacksaw by hand is very labor-intensive and time-consuming. Accurate and large-scale cutting is not feasible in this situation. Thus, our suggested system uses a double-sided hacksaw cutting technique to automate the process, operating two hacksaws with a single mechanism. Here, we make use of an attached shaft motor. We also hold the workpiece in place using a bed and holder. Now, we operate the motor and move the shaft by driving it with a supply circuit. In order for the saw to move perpendicular to the workpiece, we attach the shaft to the saw frames in this manner. We can operate two hacksaws simultaneously and in both directions by attaching two of them in either direction. Therefore, we present a clever and effective hacksaw that can be applied to precise mass productions.

**Keyword: Hacksaw cutting, single mechanism, hacksaw frame.**



## **THE FUTURE TRANSPORTATION: HYPERLOOP AND OTHER HIGH-SPEED SYSTEM**

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### **Abstract:**

The future of transportation holds exciting possibilities, including the development of technologies like the Hyperloop and other high-speed systems. These innovations aim to revolutionize the way people and goods are transported. Hyperloop, for instance, is a concept that involves vacuum tubes to propel pods at high speeds, potentially reducing travel times significantly. However, as of my last knowledge update in September 2021, these systems were still in the experimental and conceptual stages. The future of transportation is likely to be a combination of these technologies, tailored to the specific needs of different regions and routes. However, it's important to consider various factors like safety, cost, environmental impact, and regulatory challenges in implementing these systems. The adoption of high-speed transportation will likely be incremental and depend on local and global needs.

**Keywords:** Hyperloop, Urban mobility, Transportation infrastructure, Traffic congestion, Smart cities, Transportation technology, Transportation innovation.

Paper ID: NCRAME - 58

## **RECENT ADVANCES IN GAS WELDING**

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### **Abstract:**

The quality of welds has been enhanced through the optimization of welding gas mixtures. For MIG welding, for instance, argon and carbon dioxide blends can provide improved penetration and control. Gas welding has become more efficient and reliable thanks to the development of automatic and semi-automatic welding machines, particularly for industrial applications. Tungsten inert gas (TIG) and metal inert gas (MIG) welding: Because of their accuracy, control, and capacity to fuse a variety of materials together, these welding techniques have grown in popularity. Diminished Environmental Impact: Through the development of more environmentally friendly shielding gases and techniques, advancements have also been made in the effort to lessen the environmental impact of gas welding. Robotics and automation have been incorporated into gas welding procedures to allow for high-volume production with consistent quality. Please note that the welding industry is continually evolving, so there may have been further advancements beyond my last update.

**Keywords:** Gas Welding, Oxy-Fuel Welding, Combustion, Metal Joining, Welding Processes, Welding Safety, Welding Applications, Metal Fusion.

## PERFORMANCE ANALYSIS OF CENTRIFUGAL PUMP

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### Abstract:

Centrifugal pumps stand as indispensable devices in numerous industries, serving as efficient means for fluid transport and circulation. This abstract offers a concise overview of centrifugal pumps, elucidating their fundamental operational principles and illustrating their wide-ranging applications. The discussion revolves around the centrifugal force-driven motion of fluids within these pumps, emphasizing the role of impellers in imparting kinetic energy to the fluid. Furthermore, we explore the advantages and limitations of centrifugal pumps, including their capability to handle large volumes of fluids, their simplicity of design, and their suitability for applications spanning from HVAC systems to chemical processing plants. Grasping the core mechanics and applications of centrifugal pumps empowers engineers and practitioners to make informed choices when selecting and employing these pivotal fluid-handling devices.

**Keywords:** Centrifugal pump, Pump impeller, NPSH (Net Positive Suction Head), Discharge pressure, Centrifugal force, Shaft rotation.

Paper ID: NCRAME - 60

## PERFORMANCE ANALYSIS REFRIGERATION SYSTEM

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### Abstract:

The refrigeration cycle is an essential thermodynamic process that powers air conditioning and refrigeration systems and is vital to contemporary life. This abstract explores the fundamental ideas and importance of the refrigeration cycle in further detail. The four main parts of the refrigeration cycle are expansion, evaporation, condensation, and compression. The compressor is the first part of the system, increasing the temperature and pressure of a low-temperature refrigerant gas. The refrigeration cycle is important for a number of industries, including industrial processes, temperature control, and food preservation. It guarantees the safe transportation and storage of perishable items in the food business, minimizing waste and spoiling. Refrigeration's continuous quest for sustainability and efficiency promises to lessen its negative effects on the environment and guarantee its continued importance in the years to come.

**Keywords:** Refrigeration Cycle, Cooling Technology, Industrial Refrigeration, Food Preservation, Air Conditioning, HVAC, Energy Consumption.

## **TUNGSTEN INERT GAS (TIG) WELDING: PRECISION AND VERSATILITY IN METAL JOINING**

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### **Abstract:**

Tungsten Inert Gas (TIG) welding, a renowned arc welding technique, stands as a testament to precision and versatility in the realm of metal joining. This welding process employs a non-consumable tungsten electrode, an inert shielding gas (typically argon), and meticulous control to fuse base metals with remarkable accuracy. Welders meticulously control heat input, electrode position, and filler material deposition, ensuring a clean and strong weld. Upon cooling, the molten metal solidifies, resulting in a robust and durable bond between the base metals. TIG welding's enduring appeal lies in its capacity to yield clean, aesthetically pleasing welds with minimal spatter or splatter. This attribute makes it an indispensable technique in a multitude of applications, including aerospace, automotive, and various manufacturing processes. In conclusion, TIG welding's precision, versatility, and ability to produce high-quality welds establish it as a prominent welding methodology, contributing significantly to the world of metal fabrication and joining.

**Keywords: Precision Welding, TIG Welding Process, Inert Gas Shielding, Welding Precision, Welding Applications, High-Quality Welds, Welding Technology.**

Paper ID: NCRAME - 62

## **PERFORMANCE ENHANCEMENT AND EMISSION REDUCTION IN 2-STROKE DIESEL ENGINE**

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### **Abstract:**

This study investigates methods to enhance the performance and reduce emissions of 2-stroke diesel engines. 2-stroke engines have traditionally faced challenges related to fuel efficiency and emissions, but advancements in technology offer promising solutions. The research involves optimizing fuel injection systems, improving scavenging processes, and implementing advanced exhaust gas recirculation techniques. Experimental data and computational simulations are used to evaluate the effectiveness of these strategies in achieving higher efficiency and lower emissions. The findings provide valuable insights for the development of more sustainable and efficient 2-stroke diesel engines, addressing environmental concerns while maintaining power output.

**Keywords: Reduce emission, 2-stroke diesel engines, Exhaust gas recirculation techniques, Injection systems.**

## PERFORMANCE ANALYSIS OF SOLAR COOLING SYSTEM

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### Abstract:

Solar cooling refers to any cooling system that uses solar power. Solar energy, radiant light and heat from the sun, has been harnessed by humans since ancient times using a range of ever-evolving technologies. Solar radiation, along with secondary solar-powered resources such as wind and wave power, hydroelectricity and biomass, account for most of the available renewable energy on earth. Only a minuscule fraction of the available solar energy is used. Solar powered electrical generation relies on heat engines and photovoltaic. Solar energy's uses are limited only by human ingenuity. A partial list of solar applications includes space heating and cooling through solar architecture, potable water via distillation and disinfection, day lighting, solar hot water, solar cooking, and high temperature process heat for industrial purposes. Active solar techniques include the use of photovoltaic panels and solar thermal collectors to harness the energy. Passive solar techniques include orienting a building to the Sun, selecting materials with favourable thermal mass or light dispersing properties, and designing spaces that naturally circulate air.

**Keywords:** Solar cooling, Renewable Energy, Absorption Chiller, Thermal Storage, Sustainable Cooling, Green Technology, Solar Collectors, Solar Thermal System.

Paper ID: NCRAME - 64

## DESIGN OF SOLAR OPERATED VAPOUR ABSORPTION REFRIGERATION SYSTEM

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### Abstract:

A solar-powered vapor absorption refrigeration system's design must take into account a number of important factors. This kind of system works well in situations where the availability of electricity is expensive or scarce. Pumps, heat exchangers, storage tanks, control systems, absorption refrigeration units, and solar collectors are the parts of the system. A solar-powered vapor absorption refrigeration system's design can be intricate and call for knowledge of fluid dynamics, heat transfer, and thermodynamics. To ensure a successful design and implementation, it is advisable to consult with experienced engineers or professionals in the relevant field. In addition, the design of the system will be influenced by variables like the local climate, cooling load, and available budget.

**Keywords:** solar collectors, absorption refrigeration unit, pumps, heat exchangers, storage tank, control system, cooling load.

**DESIGN, DEVELOPMENT AND CFD ANALYSIS OF MIXED -MODE SOLAR  
DRYER USING SOLARENERGY**

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**Abstract:**

Drying with sun radiation is one of the first uses of solar energy. Since the beginning of time, it has been used mostly to preserve food, however it has also been used to dry other important items like textiles and building supplies. The first solar-powered drying device was discovered in South France and dates to around 8000 BC. The only energy source that could be used was solar heat. Before the discovery and usage of wood and biomass, humans. People still use sun radiation to dry and preserve modest amounts of food in isolated tiny villages, not just in the so-called third world but even in western nations. There haven't been many commercial solar dryers yet. Equipment such as solar dryers is typically limited in capacity and is more dependent on practical and semi-empirical data than on theoretical designs. Most of the many solar dryer models that are currently available are used. Mostly for drying a variety of crops for domestic consumption or small-scale industrial manufacturing. The main component of mixed mode solar dryer is Solar collector, Drying chamber, solar PV panel. Solar Collector is made up of Aluminium sheet which painted with black paint, was used as an absorber. The collector casing was made from wood and plywood. Main component of collector is transparent cover, absorber plate and insulation. The size of the collector was 60.9cm x 60.9cm. Drying chamber is made up of plywood with wood support. The size of the dryer was 40cm x40cm x50cm. In this way mixed mode solar was made. Here I will find out the boundary condition of CFD thermal analysis of solar dryer. Mix-mode Solar dryer gives most effective through thermal performance and drying duration, in terms of economic costs.

**Keywords: Solar dryer, Mixed mode solar dryer, Solar collector, CFD.**

**EXPERIMENTAL STUDIES ON PERFORMANCE AND EMISSION MEASURES  
OF A 4-STROKE COMPRESSION IGNITION ENGINE USING PALM BIODIESEL  
BLENDED WITH N-BUTANOL**

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**Abstract:**

The significant energy consumption, rising oil prices, and environmental concerns have led to severe fuel crises in developed nations. Despite the energy challenges and environmental regulations, Diesel engines remain a crucial choice for vehicles. However, elevated Diesel emissions and increased labour costs have prompted the exploration of N-butanol-blended Biodiesels as a solution to future fossil fuel issues. This study focuses on the performance and emissions of a 4-stroke Compression Ignition (CI) engine using N-butanol additive in conjunction with Palm Bio-diesel. The experiments encompass Diesel-only operation, varying proportions of Palm Bio-diesel (10%, 15%, and 20%) mixed with Diesel, and the addition of 10% N-butanol to the Palm Bio- diesel and Diesel mixture. These experiments are conducted using an eddy current dynamometer, assessing factors such as Brake specific fuel consumption (BSFC), Brake thermal efficiency (BTE), Brake specific energy consumption (BSEC), and Exhaust gas temperature (EGT) under varying engine loads (varying from 0-16 N). Additionally, regulated emission measures like Smoke opacity, Nitrogen Oxide (NO<sub>x</sub>), Carbon Monoxide (CO), Carbon Dioxide (CO<sub>2</sub>), and Hydrocarbons (HC) are evaluated. The study aims to determine the feasibility and advantages of these biofuel blends in CI engines. The inclusion of 10% N-butanol in Bio- diesel results in substantial reductions in HC, CO<sub>2</sub>, CO, and smoke opacity. N-butanol also effectively controls NO<sub>x</sub> emissions. Notably, the BA10 blend (10% Palm Bio-diesel, 10% N-butanol, 80% Diesel) exhibits 2% higher BTE and 1.33% lower BSFC compared to Diesel and B10 blend (10% Palm Bio-diesel, 90% Diesel). Moreover, the addition of N-butanol to Diesel reduces fuel density, kinematic viscosity, and cetane value, making it a promising substitute for Diesel engines.

**Keywords: Palm Bio-Diesel, N-Butanol, Blending, Engine Performance, Regulated Emission.**

**OPTIMIZATION OF COMBUSTION AND PERFORMANCE CHARACTERISTICS OF FOUR STROKE VCR DIESEL ENGINE BLEND WITH KARANJA BIODIESEL USING RESPONSE SURFACE METHODOLOGY (RSM)**

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**Abstract:**

Biodiesel is produced from renewable resources like vegetable oils and animal fats. It can be used as a fuel in diesel engines by blending with diesel or in pure form. Biodiesel blended diesel fuel emits less harmful gases compared to diesel fuel. India is developing country where more than 70% of petroleum products are import. Biodiesel production from local resources provides energy security; reduce import bills, generate employment and reduce emissions of harmful gases. Various non-edible oil seeds like Jatropha, Karanja, Mahua, Sal, Neem etc. Widely available in India. It is less costly compared to edible oils. Among them, Karanja has the potential to be used as a basic feedstock to produce biodiesel. Karanja trees can grow on sides of roads, canal and boundary portion of agricultural lands with minimum care. Its seeds contain 27–39% of the oil. Transesterification, Pyrolysis, Micro emulsion and Blending are four primary methods to produce biodiesel. Karanja oil (Pongamia Pinnata) is non edible in nature and is available abundantly in India. An experimental investigation was made to evaluate the performance and combustion characteristics of a diesel engine using different blends of Karanja biodiesel with pure diesel. Karanja biodiesel blended with diesel in proportions of 5%, 10%, and 15% by mass and studied under various load conditions in a compression ignition (diesel) engine. The performance parameters were found to be very close to that of pure diesel. The brake thermal efficiency and mechanical efficiency were better than pure diesel for some specific blending ratios under certain loads.

**Keywords: Biodiesel, Karanja oil, KOME, Transesterification, diesel, Engine performance, combustion, RSM.**

**INVESTIGATION OF COMBUSTION, PERFORMANCE AND EMISSION CHARACTERISTICS OF A SINGLE CYLINDER FOUR STROKE WCD-RIG HYDRAULIC DYNAMO METER ENGINE POWERED BY OCTANOL DIESEL BLENDED FUEL**

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**Abstract:**

The depletion of non-renewable energy sources and the engine exhaust emissions have become the cause for concern these days. Alcohol fuel had emerged as one of the viable candidates as a fuel substitute to reduce the use of fossil fuels in automobile engine. This study is an experimental study that investigates the performance and emission characteristics of WCD diesel engine when the engine is fueled with diesel and small percentage of alcohol blended fuels (10%,20%,30% and 50% by volume). The evaluation of blended fuel is also necessary for further understanding its emission performance characteristics. The mixing of alcohol with gasoline has an effect of lowering the weight. A lighter fuel improves the combustion quality and reduces the carbonated emission. This experimental setup consists of a single cylinder, water-cooled diesel test engine rig coupled with control panel. A smoke meter is also coupled with engine exhaust to measure the opacity. An emission analyzer is also used to capture the exhaust gases data from the engine exhaust. Octanol diesel blends have a lower in-cylinder pressure, rate of pressure rise and rate of heat release. The engine exhaust emissions show generally a reduction of nitrogen oxides, carbon monoxides and unburned hydrocarbon. The blends result in higher cylinder gas pressure, lesser heat release, higher rate of pressure rise and increased combustion duration. Increasing CR improve the combustion characteristics of engine.

**Keywords: WCD-RIG engine, Alcoholic fuel, Blending, smoke meter, emission analyzer.**



**INVESTIGATION OF EFFECT OF FLOW PARAMETER ON PERFORMANCE OF  
TUBE IN TUBE HELICAL COIL HEAT EXCHANGER**

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**Abstract:**

The helical tube heat exchanger has been a research hotspot in the heat transfer fields since a long time along various journals reported. There are all metals can transfer heat and copper is best from them. Copper has also been extensively studied in the heat transfer application for its extraordinary advantages including excellent thermodynamics properties, absence of corrosion, cheap raw materials and relative abundance. Here, the studies in helical tube heat exchanger research on development of heat transfer for enhance thermodynamics properties via method of convection are reviewed. Mainly Convection process, heat transfer method of helical tube heat exchanger, used instruments, and recent developments are discussed. There is also discussed for heat transfer from hot water to cold water and calculate the rate of water flow for both cold water and hot water. Heat transfer characteristics inside a helical coil for various parameters conditions are compared. It is found from research journals that the specification of a constant temperature or constant heat flux for an actual heat exchanger does not yield proper modelling. Tube in tube helical coil heat exchanger provides a compact shape with its geometry offering more fluid contact and eliminating the dead zone, increasing the turbulence and hence the heat transfer rate. An experimental setup is fabricated for validating the estimation of the heat transfer characteristics. On the other hand, nano-particles make an attraction to them for their extra ordinary properties.

**Keywords: Helical Coil, Heat Exchanger, Thermal conductivity, Compact shape, Nano particle.**

**ANALYTICAL REVIEW OF MULTI-OBJECTIVE FLEXIBLE JOB SHOP  
SCHEDULING FOR SUSTAINABILITY**

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**Abstract:**

Job shop scheduling or the job-shop problem (JSP) is an optimization problem in which various manufacturing jobs are assigned to machines at particular times while trying to minimize the make span. Scheduling has direct impacts on the production efficiency and costs of a manufacturing system; thus, it has attracted a great deal of research attentions since 1956. However, JSP is usually a NP combinatorial optimization problem. The flexible job-shop scheduling problem (FJSP) is an extension of JSP. When scaling up a problem, the existing optimization methods concentrated on centralized scheduling or semi-distributed scheduling meet great challenges in terms of computational stability and time. Now under the Industry 4.0 environment, the scheduling should deal with a smart manufacturing system supported by novel and emerging manufacturing technologies such as mass customization, Cyber-Physics Systems (CPS), Big Data, the Internet of Things (IoTs), Artificial intelligence (AI), Digital Twin, and SMAC (Social, Mobile, Analytics, Cloud). The scheduling research needs to shift its focus to smart distributed scheduling modelling and optimization. In this work the main aim to give analytical review of multi-objective flexible job shop scheduling which have less make span, optimize power utilization, minimize heat for sustainable manufacturing industries.

**Keywords: Job shop scheduling, Flexible job shop scheduling, JSP, FJSP, IoT, AI, Optimization.**

**FABRICATION APPROACHES AND PROPERTIES OF ALUMINUM MATRIX  
COMPOSITES WITH DIFFERENT REINFORCEMENT MATERIALS**

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**Abstract:**

Improving mechanical properties and maintaining the properties in aluminum matrix composites is important for industrial use. The properties of a composite depend not only on the reinforcing materials, but also on the manufacturing technology adopted for processing composites. This article discusses various technologies for manufacturing composites. It summarizes the different grades of aluminum used in industry and how its properties can be improved using various reinforcing materials such as carbides, oxides, organic compounds and industrial agricultural residues. It examines the effect of various reinforcing materials on mechanical properties such as hardness, porosity, tensile strength, density, erosion and corrosion behavior and percentage of elongation. The data results showed that with the addition of the agro waste as reinforcement material the mechanical properties like tensile strength, hardness has been increased and the weight of the prepared composite has been reduced due to less density of the reinforcement material.

**Keywords: Metal Matrix Composite; Industrial Waste; Mechanical Properties; Reinforcement.**

**ADVANCED LIGHTWEIGHT MATERIALS FOR AUTOMOBILES**

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**Abstract:**

The growing challenges on fuel economy improvement and greenhouse gas emission control have become the driving force for automakers to produce lightweight automobiles. Also, the weight reduction may contribute to superior recyclability and/or vehicle performance (e.g., improved driving economy, braking behaviours, and crashworthiness). One effective strategy is to develop and implement lightweight yet high-performance materials as alternative solutions for conventional automotive materials such as cast iron and steel. Herein, a systematic review of available lightweight materials to produce next generation automobiles is provided, including light alloys, high-strength steels, composites, and advanced materials in the ongoing research. By investigating the entire life cycle of automotive materials, physical/mechanical properties, characterization, manufacturing techniques, and potential applications of specific lightweight materials are discussed. Both the advantages and drawbacks of the reviewed materials are summarized, yielding the appropriate application scenarios for different lightweight materials. Given the future challenges, on expectations, the development of versatile advanced materials or improvement of the manufacturing/treatment techniques can be rather promising to resolve the possible bottlenecks and, in turn, enables more capable, safer, durable, and environmental-friendly vehicles.

**Keywords: Automotive Light alloy High strength steel Composites Advanced materials.**

**THERMO-HYDRAULIC PERFORMANCE ANALYSIS OF SOLAR AIR HEATER  
USING RIB ROUGHENED SURFACES**

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**Abstract:**

Solar air heaters are an eco-friendly and cost-effective means of harnessing renewable energy for space heating and drying applications. To enhance their performance, this study investigates the thermo-hydraulic characteristics of solar air heaters equipped with square rib roughened surfaces. In this research, numerical investigations were conducted on solar air heaters with different rib configurations ( $P/e = 7.14-35.71$  and  $e/D = 0.021-0.042$ ). The range of Reynolds number considered is 3800-18,000. The main objective of this research is to assess the impact of rib configurations on the heat transfer and fluid dynamics characteristics of the solar air heater, ultimately improving its overall performance. The results showed that rib roughening significantly increased heat transfer rates, but it also introduced higher pressure drops due to increased friction. By comparing the various rib configurations, it has been identified that the square rib roughened surface with  $P/e = 10.71$  and  $e/D = 0.042$  has highest thermo-hydraulic performance. This analysis provides valuable insights into the design and performance optimization of solar air heaters, contributing to the sustainable utilization of solar energy for heating purposes.

**Keywords: Solar air heater, rib roughness, heat transfer enhancement, pressure drop.**

**IMPLEMENTATION OF QUALITY CIRCLE AND FINANCING HEALTH  
PROMOTION IN HEALTH INDUSTRY OF INDIA**

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**Abstract:**

Implementing quality circles in the healthcare industry can be a valuable strategy for improving the quality of patient care and the overall efficiency of healthcare facilities. Small teams of workers known as "quality circles" collaborate to find, assess, and resolve issues pertaining to productivity and quality in a company. India has stepped up its efforts to create a cutting-edge, contemporary infrastructure for preventive and top-notch healthcare services since the formation of the new coalition government. The coalition agreement reflects the aspirations of the new government to establish a preventive, interconnected, and contemporary healthcare system in India while also placing a strong emphasis on innovation, sustainability, and climate change. Nevertheless, the agreement is devoid of specific information regarding the plans' implementation, particularly with regard to the issue of how those measures should be supported in view of the rising cost of healthcare. Therefore, the goals of this study are to evaluate the plans of the new government and provide an answer to the question of how India can guarantee and finance population-based prevention programs, health-promoting initiatives, and creative solutions in spite of growing healthcare costs in the new legislative period.

**Keywords: India, Healthcare systems, Health policy, Coalition agreements, Promotion of health, Resilience prevention, Innovation, and digitalization.**

**THE EFFECT OF PROCESS PARAMETERS WHILE TURNING ALUMINIUM IN  
CNC MACHINE IN WET CONDITION BY USING TAGUCHI OPTIMISATION  
TECHNIQUE**

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**Abstract:**

Machining is the process of removal of excess material from a workpiece. In today's rapidly changing scenario in manufacturing industries, applications of optimization techniques in metal cutting processes is one of the challenging tasks. In order to fulfil the demand, the manufacturing process is very much advanced. So, there is very much essential for a manufacturing unit to respond effectively to severe competitiveness and increasing demand of quality product in the market. The main objective of this study is to know under what parametric setting surface roughness is to be reduce in order to improve Surface finish and increase the tool life by changing the machining parameters of turning process and the parameter like metal removal rate has to improved. In this work, an attempt has been made to correlate the process parameter viz. Spindle Speed, feed and depth of cut. with output parameter through Taguchi optimization technique. Finally, 9 experiment was conducted the main plot of signal to noise ratio was predicted.

**Keywords: Turning, Optimization, Taguchi, S/N ratio and ANOVA.**

**SIMULATION OF FUNCTIONALLY GRADED THERMAL BARRIER COATING  
(TBC) OVER AL-SI PISTON USING FINITE ELEMENT METHOD**

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**Abstract:**

The piston is an essential part of an internal combustion engine which transfers force from gas expansion in cylinder to the crankshaft. Owing to its functionality, piston is subjected to high thermal gradients due to expansion of gases which often leads to development of high thermal stresses. Use of coating on engine components has been found to yield the efficiency of the engine as it entraps unwanted heat transfer to the engine components. Over the years functionally graded materials are gaining importance as thermal barrier coating owing to its spatial variation of constituent. FGM consists of metallic and ceramic phases which vary in composition from one end to other in a well-defined way. The effort to increase the performance of piston using thermal barrier coatings in form of Functionally graded materials have been the main aim of current work. Spatial variation of constituents in FGM has enabled it to be used as thermal barrier coatings as its ceramic constituent exposed to high-temperature acts as a barrier to heat transfer due to its lower thermal conductivity. Functionally graded Thermal barrier coating enhances high-temperature durability of the components by reducing heat transfer between the underlying piston metal. Current work focuses on finite element analysis of Al-Si piston using ANSYS workbench having different type of FGM coatings (MgZrO<sub>3</sub> + NiCrAl, YSZ + NiCoCrAlY, NiCrAlY + YSZ, La<sub>2</sub>Zr<sub>2</sub>O<sub>7</sub> + NiCoCrAlY). The major aim of this study is to predict the most suitable FGM coating after comparing the outcomes of the analysis performed using the Finite element method.

**Keywords: Functionally Graded Material, Finite Element Method, Piston, Coating.**



**INNOVATIVE METHODS FOR REDUCING ENGINE EMISSIONS AND  
IMPROVING HYBRID VEHICLE ENERGY EFFICIENCY**

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**Abstract:**

In addition to saving 40–50% on fuel, hybrid electric vehicles (HEVs) can produce the same amount of power as vehicles powered by gasoline and diesel. However, because of the intricate nature of the HEV system, power control strategies are employed to increase productivity, save fuel, and lower exhaust emissions. Four parameters are examined in this work, with the primary goal being the parallel hybrid vehicle's power system optimization. These variables represent how the fuzzy logic algorithm affects the power train of hybrid electric vehicles, specifically the engine's efficiency, emissions from exhaust, and ability to climb. First, the Advanced Vehicle Simulator (ADVISOR) is used to optimize the vehicle's power train. Secondly, the vehicle manufacturing cost is decreased by guaranteeing acceleration and climbing performance the vehicle's weight. Thirdly, the vehicle's fuel efficiency is improved by using two driving road test conditions: the Urban Dynamometer Driving Schedule (UDDS) and the Extra-Urban Driving Cycle (EUDC). Internal combustion engine operating range is optimized in the most efficient range by employing a fuzzy logic algorithm for random operations. The powertrain's operating efficiency is maximized to lower exhaust emissions and increase fuel efficiency by means of 121 distinct algorithms. According to the findings, the suggested approach can cut fuel consumption by 5%, CO emissions by 50%, and increase engine operating efficiency by 15%. This control strategy maximizes both the internal combustion engines and the powertrain's efficiency engine. Additionally, there is room for optimization of the battery pack and motor. These hybrid cars are the greatest replacement for traditional internal combustion engines because they can reduce fuel consumption.

**Keywords: Clean energy, Parallel hybrid electric vehicles, Energy management, Fuzzy logic algorithm, Optimization and CO emissions.**

**AN ANALYSIS OF TWO NUMERICAL TECHNIQUES USED FOR 3D LIQUID-LIQUID TAYLOR FLOW IN A MICROCHANNEL IN COMPARISON**

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**Abstract:**

Researchers have had to come up with creative ways to solve problems like reaction rate reduction and heat/mass transfer because of the laminar flow in mini and microchannels. One potential method to improve mixing within mini and microchannels with a suitable pressure drop in this regard is the application of Taylor flow. In this work, two distinct droplet generation techniques—the T-junction and patching methods—are used to quantitatively study the hydrodynamics of Taylor liquid-liquid flow. Towards this aim, a three-dimensional model of microchannel flow in rectangles is examined. ANSYS Fluent, a commercial programme, was used to simulate the computational domain after it was designed and constructed using ICEM CFD. Using the Volume of Fluid (VOF) approach, the interface between the two phases was captured. We go into great detail about the creation and growth process of water droplets scattered in an ethylene/propylene glycol carrier phase for both approaches. The findings indicate that, with only a small variation, both approaches work satisfactorily in terms of liquid film and droplet shape. In terms of processing time, the patching approach proved to be more cost-effective. This research would advance our grasp of two-phase flow simulation in microchannels and hence advance our comprehension of the hydrodynamics of Taylor flows.

**Keywords: CFD, Film thickness, Taylor flow, T-junction, Two-phase flow.**

**ENERGY-EXERGY ANALYSIS OF BIODIESEL FUELS PRODUCED FROM  
MAHUA SEED OIL**

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**Abstract:**

In this study the biodiesel produced from *Madhuca indica* seeds commonly known as mahua by using transesterification process using a lower capacity pressure reactor and by-product of transesterification is glycerol, which is used in preparation of soap. In the present work includes the production of six blends of biodiesel using mahua seed oil with methanol (99% pure) having NaOH/KOH (91% pure) as the catalysts. The kinematic viscosity, density, calorific value, flash point, cloud point, pour point of prepared bio-fuels were determined, there are consider some basic fuel properties such as calorific value, density and viscosity. The comparative energy-exergy analyses for six biodiesel fuels were conducted using a 4 inline-4stroke diesel engine with 2392 cc at 0%, 25%, 50%, and 100% load for constant/varying speed. The break-power (BP), heat taken by cooling water ( $Q_e$ ), heat taken away by exhaust gases ( $Q_{ex}$ ), and unaccountable losses were evaluated. It was found that the tested biodiesels offer competitive energetic performance to the diesel. The exergetic performance parameters followed similar trends with the corresponding energetic ones, but with increased brake specific fuel consumption and reduced exhaust emission due to higher oxygen content in biodiesel fuel. The results of analysis of variance clearly reflect that the B.P. is influenced most by the load, followed by the type of oil and speed has the least effect. It was also found that the biodiesels are having considerably lower CO emission than diesel. NO<sub>x</sub> emissions were least at higher load in diesel followed by mahua seed oils. Soot emissions were alike for diesel, mahua seed oils at low load, but at higher load diesel has an exponential increment in soot emissions.

**Keywords: Biodiesel, Fuel Properties Mahua Seed oil, Energy-exergy analysis, Exhaust emissions.**

### **360 DEGREE FLEXIBLE DRILLING MACHINE**

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#### **Abstract:**

In every industry, drill machines have been the central component. Hole drilling is a common industrial task for components, sheets, and structures. Strong, fixed drills are necessary for precise and well-aligned drilling. Because there is little space between the drill bit and the drill bed, some parts cannot be drilled with fixed drills. In these situations, hand drills are necessary, but they have alignment issues when drilling. Thus, we present a 360-degree flexible drill that can be used to drill holes in any direction—horizontally, vertically, or even upside down—and that can be fixed on a table or wall. This therefore enables simple drilling in even complex components and surfaces. As a result, we employ pivoting hinges and connectors with motor mounts and structural support to design and fabricate a mini-360-degree drill for easy drilling operations. It's important to note that the specific features and capabilities of 360-degree flexible drilling machines may vary depending on the manufacturer and model. When selecting a machine for your needs, consider factors such as the type of materials you'll be working with, the required hole size, and the available space for operation. Always follow safety guidelines and wear appropriate personal protective equipment when using drilling machines.

**Keywords: 360-degree flexible drill, drill bit, horizontally, vertically, hole size.**

## RECIPROCATING AUTO PNEUMATIC HACKSAW

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### Abstract:

Hacksaw's have a very wide usage in the manufacturing industry. Hacksaws are used for fast and efficient cutting of metal, wooden, plastic rods and pipes as per desired dimensions. Well manually operating a hacksaw is a quite strenuous and tiring process. So here we propose a fully automated pneumatic hacksaw that has the capability to automatically operate the cutting mechanism without any manual interference once set in process. The system uses a pneumatic piston to drive the hacksaw shaft which is connected to a connecting rod. The connecting rod is now screwed to the cutting frame in such a way so as to achieve the desired back and forth motion from the air pressure. The cutting frame is designed in a way to easily attach the saw blade to it. Now we toggle the air supply direction in order to transfer the movement to the blade holder. The other end of machine holds the holder that is used to hold the cutting part in place, so as to achieve desired cutting results. We use an arrangement of pneumatic piston, pipes and valves to drive high pressure compressed air in order to achieve this cutting motion since the cutting process delivers a lot of resistance. This is driven by an external compressed air source like compressor to run. We then build a supporting metal frame to support and hold the entire machine together. Thus, our system provides a fully automated motorized hacksaw that works on pneumatic air pressure.

**Keywords:** Hacksaw, tiring process, cutting mechanism, saw blade, cutting frame.





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## ABOUT THE INSTITUTE

Gandhi Institute of Excellent Technocrats (GIET), Ghangapatana, Bhubaneswar under the flagship of Gandhi Group of Institutions (G.G.I) is an AICTE approved institute established in the year 2009. The B.Tech, MBA and MCA programs of the institute are affiliated to Biju Patnaik University of Technology, Odisha and the Diploma programme is affiliated to State Council for Technical Education and Vocational Training, Govt. of Odisha, Bhubaneswar. The institute is set up by Venkateshwar Educational Trust and is being managed by distinguished Governing Council members comprising senior executives from Academics and Industries. The Institute works with a mission to provide quality education of international standards for producing technocrats and future leaders in a disciplined and conducive environment as an integral part of our societal commitment to promote education globally. It was started with an intake of 240 students in four branches with a motto of providing quality engineering education in a highly disciplined environment. In less than a decade it became a citadel of engineering education having 1080 intake with 7 B. Tech. Courses and 2 PG courses i.e. MBA and MCA. It has been regarded as Modern Gurukul by the students, alumni, faculty and all distinguished visitors for its learning environment, faculty, infrastructure and the facilities.

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