Research and Development Summary

Contents

IPRs developed by faculty

Sr. No.	Date	Name of Faculty	Nature of IPR developed	Title of IPR	Status
1.	29/04/2021	Mr. Yogesh Sonawane	Utility patent	An adjustable stirring and degassing system and method for use in a casting furnace	Published
2.	16/07/2021	Mr. Dattatray Doifode	Utility patent	Artificial Intelligence Based Smart Solar Tracking Technique for Uninterrupted Powering System	Published
3.	08/12/2021	Mr. Bhushan Behede	Utility patent	A novel acoustic fluidized bed device for heat transfer application	Granted
4.	26/12/2022	Dr. Nilesh Salunke	Design patent	Centrifugal pump	Granted
5.	14/12/2023	Mr. Bhushan Behede	Design patent	Apparatus for synthesis of pharmaceutical nanosuspension	Granted


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CERTIFICATE

COMPLETE PATENT FILED

& PUBLISHED

It is hereby to certify that a Complete Patent Application No. 202121019606 Has been successfully filled and published for the invention entitled

"AN ADJUSTABLE SIRRING AND DEGASSING SYSTEM AND METHOD FOR USE IN A CASTING FURNACE"

In the name of the following:

SANDHANSHIV RAHUL DILIP
PATIL DILIP MANGESH
SHARMA RAHUL SANJAY
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SHINDE NITIN GIRDHAR
SHINDE NILESH MOHAN
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SURYAWANSHI VIJAY KASHINATH
SONAWANE YOGESH DILIPRAO
PATHAK YOGESHKUMAR RAGHUNATH

As an applicant and inventor at the Indian Patent Gov. Office on dated

29th April 2021

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CERTIFICATE OF GRANT

INNOVATION PATENT

Patent number: 2021107426

The Commissioner of Patents has granted the above patent on 8 December 2021, and certifies that the below particulars have been registered in the Register of Patents.

Name and address of patentee(s):

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Title of invention:

A NOVEL ACOUSTIC FLUIDIZED BED DEVICE FOR HEAT TRANSFER APPLICATION

Name of inventor(s):

Gabhane, Mohitkumar; Wankhede, Uday; Awate, Nilesh; Raut, Ashish; Chakrabarty, Shyamal; Behede, Bhushan and Pitale, Amol

Term of Patent:

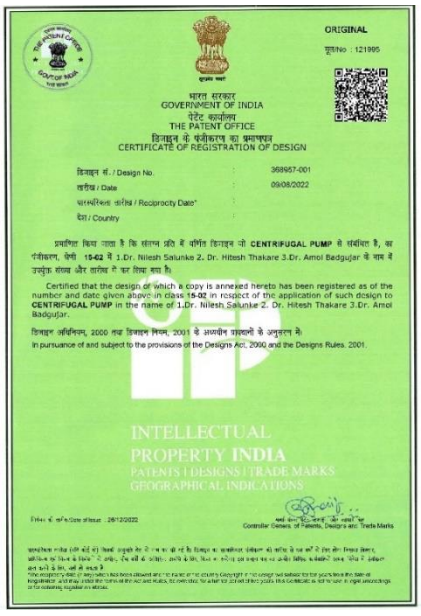
Eight years from 25 August 2021

NOTE: This Innovation Patent cannot be enforced unless and until it has been examined by the Commissioner of Patents and a Certificate of Examination has been issued. See sections 120(1A) and 129A of the Patents Act 1990, set out on the reverse of this document.

Dated this 8th day of December 2021

Commissioner of Patents

PATENTS ACT 1990


ORIGINAL

भारत सरकार
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THE PATENT OFFICE
डिजाइन के पंजीकरण का प्रमाणपत्र
CERTIFICATE OF REGISTRATION OF DESIGN

डिजाइन सं. / Design No. : 368957-001
तारीख / Date : 09/08/2022
पारस्परिकता तारीख / Reciprocity Date* :
देश / Country :

प्रमाणित किया जाता है कि संलग्न प्रति में वर्णित डिजाइन जो **CENTRIFUGAL PUMP** से संबंधित है, का पंजीकरण, वर्ग **15-02** में 1.Dr. Nilesh Salunke 2. Dr. Hitesh Thakare 3.Dr. Amol Badgujar के नाम में उपर्युक्त संख्या और तारीख में कर लिया गया है।

Certified that the design of which a copy is annexed hereto has been registered as of the number and date given above in class **15-02** in respect of the application of such design to **CENTRIFUGAL PUMP** in the name of 1.Dr. Nilesh Salunke 2. Dr. Hitesh Thakare 3.Dr. Amol Badgujar.

डिजाइन अधिनियम, 2000 तथा डिजाइन नियम, 2001 के अध्यधीन प्रावधानों के अनुसरण में।
In pursuance of and subject to the provisions of the Designs Act, 2000 and the Designs Rules, 2001.

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Date of Issue : 26/12/2022

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ORIGINAL

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पेटेंट कार्यालय, भारत सरकार The Patent Office, Government Of India
डिजाइन के पंजीकरण का प्रमाण पत्र | Certificate of Registration of Design

डिजाइन सं. / Design No. : 398362-001
तारीख / Date : 25/10/2023
पारस्परिकता तारीख / Reciprocity Date* :
देश / Country :

प्रमाणित किया जाता है कि संलग्न प्रति में वर्णित डिजाइन जो *APPARATUS FOR SYNTHESIS OF PHARMACEUTICAL NANOSUSPENSION* से संबंधित है, का पंजीकरण, वर्ग 24-02 में 1.Mr. Audumbar Digambar Mali 2. Miss. Sunayana Mallappa Mali 3.Mr. Kothapalli Sandeep 4.Mr. Shubham Chandrakant Karpe 5.Dr. Rajeev Ranjan 6.Miss. Tanu Shivhare 7.Miss. Urvashi Jaiswal 8.Dr. Neelam Pawar 9.Mr. Bhushan Chandrakant Behede 10.Dr. T. Senthilvelan 11.Dr. Hanumant Singh Rathore 12.Dr. Mukesh Kumar Meena के नाम में उपर्युक्त संख्या और तारीख में कर लिया गया है।

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डिजाइन अधिनियम, 2000 तथा डिजाइन नियम, 2001 के अध्यधीन प्रावधानों के अनुसरण में।
In pursuance of and subject to the provisions of the Designs Act, 2000 and the Designs Rules, 2001.

Date of Issue : 14/12/2023

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Snapshots of IPRs developed by faculty

Research papers publication - AY 2024 – 25

Sr. No.	Name of Faculty	Title of Research paper	Journal Details	Indexing	Journal Impact Factor / Citescore	DOI of research paper
1.	Mr. Dattatray Doifode	Experimental analysis of hybrid AM60 magnesium composites reinforced with TiC and TiB2 via stir casting	Materials Today: Proceedings Accepted – 03/07/2024	Scopus	Citescore 4.9	https://doi.org/10.1016/j.matpr.2024.07.004
2.	Mr. Satish Patil Dr. Nilesh Salunke	Optimizing Thermal Management in Electric Battery Packs through Heat Pipe-Based Systems and Aluminum Sleeve Integration	SSRG International Journal of Mechanical Engineering Volume 11 Issue 8, 122-133, August 2024 Accepted – 18/08/2024	Scopus	IF 1.1	https://doi.org/10.14445/23488360/IJME-V11I8P114
3.	Dr Hitesh Thakare	Computational investigation and exergy analysis of swirling flow in vortex tube	Journal of Thermal Engineering, Yildiz Technical University Press Accepted – 13/10/2024	Scopus ESCI	IF 1.1	Awaited

Research papers publication - AY 2023 – 24

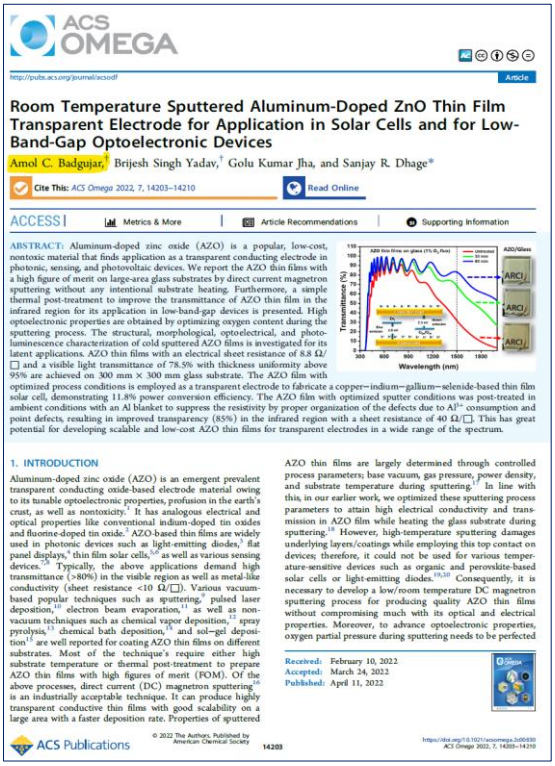
Sr. No.	Name of Faculty	Title of Research paper	Journal Details	Indexing	Journal Impact Factor / Citescore	DOI of research paper
1	Mr. Bhushan Behede	Development of rotary dehumidifier with silica-gel-based composite desiccant	Thermal Science (Vinca) Vol. 28, No. 5B, pp. 4223-4233, 25/12/2024	SCIE Scopus	IF 1.1	https://doi.org/10.2298/TSCI231016174B
2	Dr Hitesh Thakare	Enhancing energy conservation in power generation in a coal fired thermal power plant through comprehensive energy audit	Energy Volume 301, 13 May 2024, 131661, ELSEVIER	SCI SCIE Scopus	IF 9.0	https://doi.org/10.1016/j.energy.2024.131661
3	Mr. Bhushan Behede	Performance Analysis of Silica-Gel and Calcium Chloride Composite Desiccant Prepared by Varying Proportions: A Gravimetric Study	Tuijin Jishu/Journal of Propulsion Technology Vol. 44 No. 3 (2023) pp. 4446 – 4455	Scopus	Citescore 1.7	https://doi.org/10.52783/tjjpt.v44.i3.2417
4	Mr. Yogesh Sonawane	Effect of NOx and Mechanical Efficiency in Single Cylinder Diesel Engine using Multiple Injection of Biodiesel- An Experimental Investigation	Tuijin Jishu/Journal of Propulsion Technology Vol. 44 No. 4 (2023) pp. 6169 – 6178	Scopus	Citescore 1.7	https://doi.org/10.52783/tjjpt.v44.i4.2115

Research papers publication - AY 2022 – 23

Sr. No.	Name of Faculty	Title of Research paper	Journal Details	Indexing	Journal Impact Factor / Citescore	DOI of research paper
1	Mr. Yogesh Sonawane	Optimization and Modelling of EGR rate and MIS for POME fuelled CRDI diesel engine	Case Studies in Thermal Engineering, Volume 49, September 2023, 103170, ELSEVIER, Online ISSN 2214-157X	SCIE, Web of Science	IF 6.8	https://doi.org/10.1016/j.csite.2023.103170
2	Dr. Modassir Hussain	Tribological study of sunflower TMP ester and silica nanoparticles additives for hydrodynamic journal bearing application under boundary lubrication condition	Industrial Lubrication and Tribology, Vol. 75 No. 2, pp. 190-196, 29 November 2022 ISSN 0036-8792	SCIE Scopus	IF 1.489	https://doi.org/10.1108/ILT-08-2022-0251
3	Mr. Bhushan Behede	Review of Composite Dessicants and Their Properties for Rotary Dehumidifiers	European Chemical Bulletin Vol. 12 Issue 2, pp. 240-252 20/02/2023 ISSN 2063-5346	Scopus	CiteScore 2022 1.6	10.48047/ecb/2023.12.2.024
4	Dr. Nilesh Salunke	Multi objective optimization of diesel engine performance and emission characteristics using Taguchi-grey relational analysis	International Journal of Advanced Technology and Engineering Exploration Vol. 10 Issue 100, pp. 363-376 25/03/2023	Scopus	CiteScore 2022 1.0	http://dx.doi.org/10.19101/IJATEE.2022.10100018
5	Dr. Nilesh Salunke	Effect of nano materials for the nano fluids in solar thermal energy: A review on applications in solar collector	Materials Today: Proceedings Available online 27 April 2023 ELSEVIER, ISSN 2214-7853	Scopus	CiteScore 3.2	https://doi.org/10.1016/j.matpr.2023.04.344
6	Dr. Nilesh Salunke	Phase change materials (PCMs) in solar still: - a review of use to improve productivity of still	Materials Today: Proceedings Available online 5 May 2023. ELSEVIER, ISSN 2214-7853	Scopus	CiteScore 3.2	https://doi.org/10.1016/j.matpr.2023.04.499
7	Mr. Satish Patil	Predicting and forecasting building energy performance using RSM and ANN	Asian Journal of Civil Engineering Vol. 25, pp. 159–165 Accepted 10/06/2023 Electronic ISSN: 2522-011X Print ISSN: 1563-0854	Scopus	-	https://doi.org/10.1007/s42107-023-00765-4

Research papers publication - AY 2021 – 22

Sr. No.	Name of Faculty	Title of Research paper	Journal Details	Indexing	Journal Impact Factor / Citescore	DOI of research paper
1	Dr. Nilesh Saluke	A Comprehensive Review on Performance Improvement of Diesel and Biodiesel Fuelled CI Engines using Additives	International Journal of Performability Engineering, Volume 17, Issue 9, pp. 815-824, September 2021 ISSN No. 0973-1318	Scopus	IF 1.20	https://doi.org/10.23940/ijpe.21.09.p8.815824
2	Dr. Amol Badgujar	Room Temperature Sputtered Aluminum-Doped ZnO Thin Film Transparent Electrode for Application in Solar Cells and for Low-Band-Gap Optoelectronic Devices	ACS Omega, Vol. 7, pp. 14203−14210, April 2022 ISSN 2470-1343 (print) 2470-1343 (web)	SCI Scopus	IF (2021) 4.132 Citescore (2021) – 5.2	https://pubs.acs.org/doi/pdf/10.1021/acsomega.2c00830
3	Dr. Amol Badgujar	Solution-processed CIGS thin film solar cell by controlled selenization process	Materials Today: Proceedings, Volume 52, Part 3, pp. 829-833, 30 October 2021. ISSN 2214-7853	Scopus	1.8	https://doi.org/10.1016/j.matpr.2021.10.215
4	Mr. Bhushan Behede	Review on nanoporous inorganic desiccant materials in the context of application in rotary dehumidifiers	Materials Today: Proceedings, Volume 57, Part 5, pp. 2174-2179, 29 December 2021.	Scopus	1.8	https://doi.org/10.1016/j.matpr.2021.12.227
5	Dr. Hitesh Thakare	Application of mixed level design of Taguchi method to counter flow vortex tube	Materials Today:Proceedings, Volume 57, Part 5, pp. 2242-2249, 10 January 2022	Scopus	1.8	https://doi.org/10.1016/j.matpr.2021.12.444
6	Dr. Hitesh Thakare	Techno-economic assessment of manufacturing process in small scale industry to evaluate energy saving potential	Materials Today:Proceedings Volume 57, Part 5, pp. 2317-2324, 31 January 2022.	Scopus	1.8	https://doi.org/10.1016/j.matpr.2022.01.105



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Article

Room Temperature Sputtered Aluminum-Doped ZnO Thin Film Transparent Electrode for Application in Solar Cells and for Low-Band-Gap Optoelectronic Devices

Amol C. Badgujar,[‡] Brijesh Singh Yadav,[†] Golu Kumar Jha, and Sanjay R. Dhage*

Cite This: ACS Omega 2022, 7, 14203−14210 Read Online

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ABSTRACT: Aluminum-doped zinc oxide (AZO) is a popular, low-cost, nontoxic material that finds application as a transparent conducting electrode in photonic, sensing, and photovoltaic devices. We report the AZO thin films with a high figure of merit on large-area glass substrates by direct current magnetron sputtering without any intentional substrate heating. Furthermore, a simple thermal post-treatment to improve the transmittance of AZO thin film in the infrared region for its application in low-band-gap devices is presented. High optoelectronic properties are obtained by optimizing oxygen content during the sputtering process. The structural, morphological, opto-electrical, and photoluminescence characterization of cold sputtered AZO films is investigated for its latent applications. AZO thin films with an electrical sheet resistance of 8.8 Ω/□ and a visible light transmittance of 78.5% with thickness uniformity above 95% are achieved on 300 mm × 300 mm glass substrate. The AZO film with optimized process conditions is employed as a transparent electrode to fabricate a copper−indium−gallium−selenide-based thin film solar cell, demonstrating 11.8% power conversion efficiency. The AZO film with optimized sputter conditions was post-treated in ambient conditions with an Al blanket to suppress the resistivity by proper organization of the defects due to Al^{3+} consumption and point defects, resulting in improved transparency (85%) in the infrared region with a sheet resistance of 40 Ω/□. This has great potential for developing scalable and low-cost AZO thin films for transparent electrodes in a wide range of the spectrum.

1. INTRODUCTION

Aluminum-doped zinc oxide (AZO) is an emergent prevalent transparent conducting oxide-based electrode material owing to its tunable optoelectronic properties, profusion in the earth's crust, as well as nontoxicity.[1] It has analogous electrical and optical properties like conventional indium-doped tin oxides and fluorine-doped tin oxide.[2] AZO-based thin films are widely used in photonic devices such as light-emitting diodes,[3] flat panel displays,[4] thin film solar cells,[5,6] as well as various sensing devices.[7,8] Typically, the above applications demand high transmittance (>80%) in the visible region as well as metal-like conductivity (sheet resistance <10 Ω/□). Various vacuum-based popular techniques such as sputtering,[9] pulsed laser deposition,[10] electron beam evaporation,[11] as well as non-vacuum techniques such as chemical vapor deposition,[12] spray pyrolysis,[13] chemical bath deposition,[14] and sol−gel deposition[15] are well reported for coating AZO thin films on different substrates. Most of the technique's require either high substrate temperature or thermal post-treatment to prepare AZO thin films with high figures of merit (FOM). Of the above processes, direct current (DC) magnetron sputtering[16] is an industrially acceptable technique. It can produce highly transparent conductive thin films with good scalability on a large area with a faster deposition rate. Properties of sputtered AZO thin films are largely determined through controlled process parameters; base vacuum, gas pressure, power density, and substrate temperature during sputtering.[17] In line with this, in our earlier work, we optimized these sputtering process parameters to attain high electrical conductivity and transmission in AZO film while heating the glass substrate during sputtering.[18] However, high-temperature sputtering damages underlying layers/coatings while employing this top contact on devices; therefore, it could not be used for various temperature-sensitive devices such as organic and perovskite-based solar cells or light-emitting diodes.[19,20] Consequently, it is necessary to develop a low/room temperature DC magnetron sputtering process for producing quality AZO thin films without compromising much with its optical and electrical properties. Moreover, to advance optoelectronic properties, oxygen partial pressure during sputtering needs to be perfected

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Tribological study of sunflower TMP ester and silica nanoparticles additives for hydrodynamic journal bearing application under boundary lubrication condition

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Abstract

Purpose – This study aims to study the tribological performance of sunflower TMP ester and silica nanoparticles additives as a biolubricant alternative to the conventional lubricants for hydrodynamic journal bearing applications.

Design/methodology/approach – Nanolubricants were synthesized using an ultrasonicator and a homogenizer. A pin-on-disk tribometer was used to simulate the boundary lubrication condition for hydrodynamic journal bearing application in the presence of the studied lubricants. Surface analysis of the pin (bearing material) was done using scanning electron microscopy and energy dispersive X-ray spectroscopy.

Findings – The sunflower TMP ester performed well in terms of the coefficient of friction compared to commercial lubricants, but its wear performance was poor. The silica nanoparticles improved the wear and friction performance of the sunflower TMP ester. With the addition of 1% silica nanoparticles to sunflower TMP ester, the reduction in the coefficient of friction was 27.92% and the reduction in specific wear rate was 54.79%, making it the best lubricant out of all studied lubricants.

Originality/value – Although there are various available studies on vegetable oil-based lubricants for hydrodynamic journal bearing applications, the studies on the use of vegetable oil-based TMP esters for hydrodynamic journal bearing applications are limited. Also, the effect of silica nanoparticles on the tribological performance of TMP esters under boundary lubrication condition has not been studied extensively in the available literature.

Keywords Biolubricant, Nanolubricant, Silica nanoparticles, Wear, Friction

Paper type Research paper

1. Introduction

Hydrodynamic journal bearings use lubricants to reduce friction between mating parts while supporting the load. These bearings are designed to run in a hydrodynamic lubrication regime, and no metal-to-metal contact between bearing and journal takes place in this regime as both are set apart by a lubricant film. Hence, in this regime, wear does not takes place. But, when hydrodynamic journal bearing operates, it also encounters mixed lubrication regime and boundary lubrication regime where a considerable amount of wear happens. This happens because in these regimes, lubricant film diminishes and metal-to-metal contact takes place. The maximum wear happens in the boundary lubrication regime which is experienced during start and stop conditions or during shock loading conditions. These thin film bearings in modern machinery such as engines are nowadays subjected to higher loads and an increased number of start-stop cycles which is forcing bearing arrangements to operate more in boundary and mixed lubrication regimes (Hernández-Peña *et al.*, 2019; Sander *et al.*, 2017; Hussain *et al.*, 2021a).

The lubricants used in hydrodynamic journal bearings are mostly made up of petroleum mineral oils. These mineral oil-based lubricants are harmful to the environment as they are toxic in nature as well as nonbiodegradable (Luther, 2017; Rasep *et al.*, 2021). Also, the antiwear additives added to these

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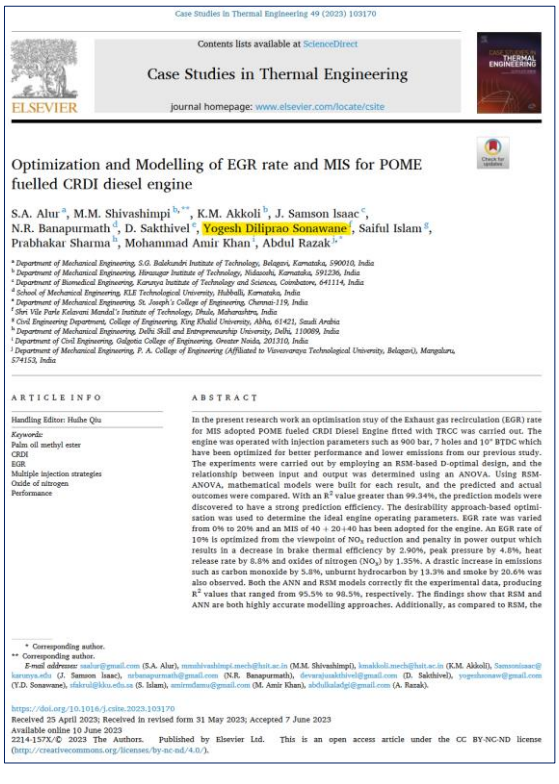

Case Studies in Thermal Engineering 49 (2023) 103170

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Optimization and Modelling of EGR rate and MIS for POME fuelled CRDI diesel engine

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ARTICLE INFO

Handling Editor: Huihe Qiu

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CRDI
EGR
Multiple injection strategies
Oxide of nitrogen
Performance

ABSTRACT

In the present research work an optimisation stuy of the Exhaust gas recirculation (EGR) rate for MIS adopted POME fueled CRDI Diesel Engine fitted with TRCC was carried out. The engine was operated with injection parameters such as 900 bar, 7 holes and 10° BTDC which have been optimized for better performance and lower emissions from our previous study. The experiments were carried out by employing an RSM-based D-optimal design, and the relationship between input and output was determined using an ANOVA. Using RSM-ANOVA, mathematical models were built for each result, and the predicted and actual outcomes were compared. With an R^2 value greater than 99.34%, the prediction models were discovered to have a strong prediction efficiency. The desirability approach-based optimisation was used to determine the ideal engine operating parameters. EGR rate was varied from 0% to 20% and an MIS of 40 ± 20 ±40 has been adopted for the engine. An EGR rate of 10% is optimized from the viewpoint of NO_x reduction and penalty in power output which results in a decrease in brake thermal efficiency by 2.90%, peak pressure by 4.8%, heat release rate by 8.8% and oxides of nitrogen (NO_x) by 1.35%. A drastic increase in emissions such as carbon monoxide by 5.8%, unburnt hydrocarbon by 13.3% and smoke by 20.6% was also observed. Both the ANN and RSM models correctly fit the experimental data, producing R^2 values that ranged from 95.5% to 98.5%, respectively. The findings show that RSM and ANN are both highly accurate modelling approaches. Additionally, as compared to RSM, the

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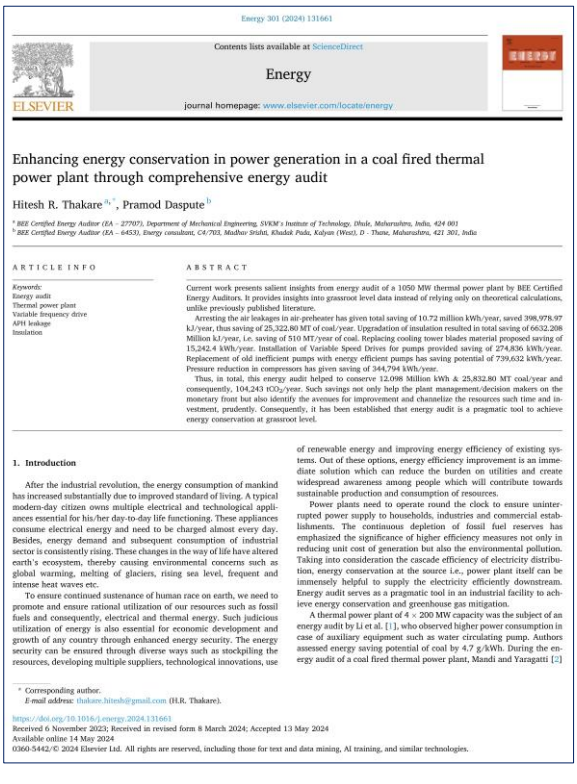

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Enhancing energy conservation in power generation in a coal fired thermal power plant through comprehensive energy audit

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ABSTRACT

Current work presents salient insights from energy audit of a 1050 MW thermal power plant by BEE Certified Energy Auditors. It provides insights into grassroot level data instead of relying only on theoretical calculations, unlike previously published literature.

Arresting the air leakages in air-preheater has given total saving of 10.72 million kWh/year, saved 398,978.97 kJ/year, thus saving of 25,322.80 MT of coal/year. Upgradation of insulation resulted in total saving of 6632.208 Million kJ/year, i.e. saving of 510 MT/year of coal. Replacing cooling tower blades material proposed saving of 15,242.4 kWh/year. Installation of Variable Speed Drives for pumps provided saving of 274,836 kWh/year. Replacement of old inefficient pumps with energy efficient pumps has saving potential of 739,632 kWh/year. Pressure reduction in compressors has given saving of 344,794 kWh/year.

Thus, in total, this energy audit helped to conserve 12,098 Million kWh & 25,832.80 MT coal/year and consequently, 104,243 tCO_2/year. Such savings not only help the plant management/decision makers on the monetary front but also identify the avenues for improvement and channelize the resources such time and investment, prudently. Consequently, it has been established that energy audit is a pragmatic tool to achieve energy conservation at grassroot level.

1. Introduction

After the industrial revolution, the energy consumption of mankind has increased substantially due to improved standard of living. A typical modern-day citizen owns multiple electrical and technological appliances essential for his/her day-to-day life functioning. These appliances consume electrical energy and need to be charged almost every day. Besides, energy demand and subsequent consumption of industrial sector is consistently rising. These changes in the way of life have altered earth's ecosystem, thereby causing environmental concerns such as global warming, melting of glaciers, rising sea level, frequent and intense heat waves etc.

To ensure continued sustenance of human race on earth, we need to promote and ensure rational utilization of our resources such as fossil fuels and consequently, electrical and thermal energy. Such judicious utilization of energy is also essential for economic development and growth of any country through enhanced energy security. The energy security can be ensured through diverse ways such as stockpiling the resources, developing multiple suppliers, technological innovations, use of renewable energy and improving energy efficiency of existing systems. Out of these options, energy efficiency improvement is an immediate solution which can reduce the burden on utilities and create widespread awareness among people which will contribute towards sustainable production and consumption of resources.

Power plants need to operate round the clock to ensure uninterrupted power supply to households, industries and commercial establishments. The continuous depletion of fossil fuel reserves has emphasized the significance of higher efficiency measures not only in reducing unit cost of generation but also the environmental pollution. Taking into consideration the cascade efficiency of electricity distribution, energy conservation at the source i.e., power plant itself can be immensely helpful to supply the electricity efficiently downstream. Energy audit serves as a pragmatic tool in an industrial facility to achieve energy conservation and greenhouse gas mitigation.

A thermal power plant of 4 × 200 MW capacity was the subject of an energy audit by Li et al. [1], who observed higher power consumption in case of auxiliary equipment such as water circulating pump. Authors assessed energy saving potential of coal by 4.7 g/kWh. During the energy audit of a coal fired thermal power plant, Mandi and Yaragatti [2]

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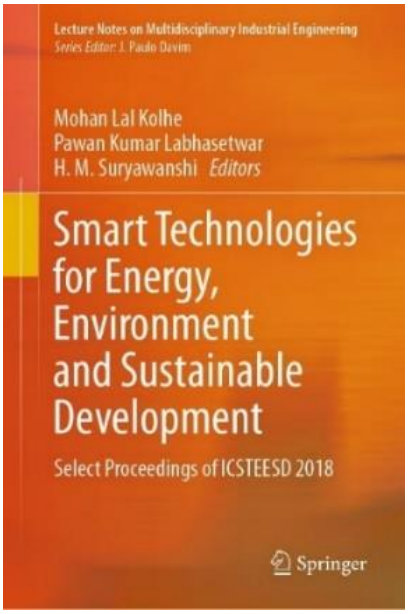
0360-5442/

Snapshots of papers published by faculty in SCI / SCIE Indexed Journal

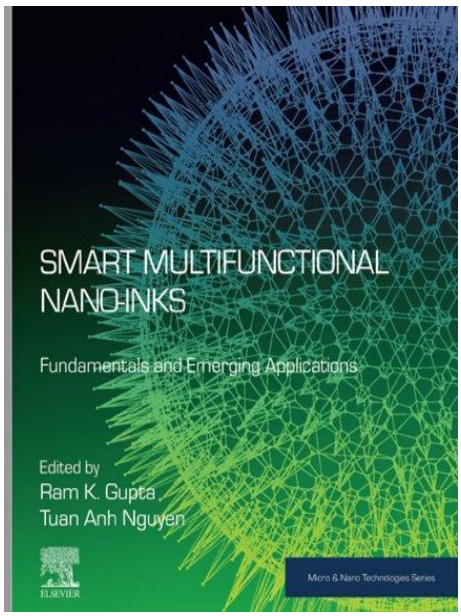
Books / Book Chapters publication by faculty

Sr. No.	Name of Faculty	Title of Book / Book Chapter	Book/Book Chapter Details	Indexing	URL / DOI
1.	Mr. Bhushan Behede	Development of Finned Tube Type Adsorber Bed for Adsorption Cooling System	Smart Technologies for Energy, Environment and Sustainable Development, Part of the Lecture Notes on Multidisciplinary Industrial Engineering book series **Publisher – Springer** pp 533–552, 03rd July 2019 Hardcover ISBN - 978-981-13-6147-0 Series E-ISSN - 2522-5030	INSPEC	https://doi.org/10.1007/978-981-13-6148-7_52
2.	Mr. Bhushan Behede	Performance Analysis of Desiccant Material Prepared by Simple Mixing of Silica Gel and Calcium Chloride	Book series "Recent Advances in Mechanical Infrastructure" published by Springer as a part of Book series "Lecture Notes in Intelligent Transportation and Infrastructure" **Publisher – Springer** E ISSN – 2523-3459, Print ISSN – 2523-3440 01st January 2022	Scopus	https://doi.org/10.1007/978-981-16-7660-4_1
3.	Dr. Amol Badgujar	Nano-inks based on metal oxides for electronic industries	Smart Multifunctional Nano-inks, Fundamentals and Emerging Applications, Pages 249-276 **Publisher – Elsevier** 1st Edition - October 26, 2022 Editors: Ram K. Gupta, Tuan Anh Nguyen Paperback ISBN 978-0-323-91145-0 eBook ISBN: 9780323984959	Scopus	Book DOI https://doi.org/10.1016/C2020-0-04563-9 Chapter DOI https://doi.org/10.1016/B978-0-323-91145-0.00005-0
4.	Dr. Hitesh Thakare	Analysis of Vortex Tube	**Publisher:** Notion Press Ltd. Chennai 10th April 2023	-	ISBN No. 9-798890-028136
5.	Mr. Yogesh Sonawane & Mr. Dattatraya Doifode	A Textbook on Electrical Vehicles Technology	**Publisher** Scientific International Publishing House 11th November 2023.	-	ISBN 978-93-5757-585-0
6.	Dr Amol Badgujar	Monolithic Integration of Cu (In, Ga) Se_2 Thin Film Solar Modules by all Nanosecond Laser Scribing	Recent Advances in Materials and Manufacturing Technology Pages 907 – 915 **Publisher – Springer (Lecture Notes in Mechanical Engineering)** First Online: 05 July 2023 Print ISBN 978-981-99-2920-7 Online ISBN 978-981-99-2921-4	Scopus	Book DOI https://doi.org/10.1007/978-981-99-2921-4 Chapter DOI https://doi.org/10.1007/978-981-99-2921-4_81

7.	Dr. Hitesh Thakare Dr. Nilesh Salunke	Role of Energy and Materials in Industry 4.0 - A Pragmatic Deliberation	Advancements in Materials Processing Technology, Volume 1 **Publisher – Springer Proceedings in Materials** First Online: 01 October 2024 Print ISBN 978-981-97-4957-7 Online ISBN 978-981-97-4960-7	Scopus	https://link.springer.com/book/9789819749577
8.		Computational analysis of various fin configurations – a comprehensive assessment			https://link.springer.com/book/9789819749577
9.	Dr Amol Badgujar	Thin-Film Photovoltaics Using Cu (In, Ga) Se_2 Nanomaterials	Thin Film Nanomaterials: Synthesis, Properties and Innovative Energy Applications, Publisher: Bentham Science ISBN: 978-981-5256-09-3 (Print) ISBN: 978-981-5256-08-6 (Online)	Scopus	https://doi.org/10.2174/9789815256086124010005
10.	Dr. Hitesh Thakare	Energy Performance Assessment of Industries and Buildings: A Review of State of the Art	Advancements in Materials Processing Technology, Volume 2 **Publisher – Springer Proceedings in Materials** First Online: 02 October 2024 Print ISBN 978-981-97-6874-5 Online ISBN 978-981-97-6875-2	Scopus	https://doi.org/10.1007/978-981-97-6875-2_4
11.		Computational Analysis of Pin Fin to Study the Effect of Temperature and Fin Material			https://doi.org/10.1007/978-981-97-6875-2_10



Snapshot of book chapters published by faculty Dr. Bhushan Behede




CHAPTER 10

Nano-inks based on metal oxides for electronic industries

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1. Introduction

Miniaturization and flexibility have become essential features for developing electronic devices in the modern world, which stimulates a new strategies to fabricate them. Printed flexible electronics have emerged as the fastest-growing market due to rapid production and inexpensive electronic devices utilizing conductive inks and flexible substrates [1,2]. Flexible printed electronics are distinct from typical microelectronics in two ways. Firstly, the manufacture of electronic devices uses low cost, simple, benign, and rapid approaches owing to the direct deposition of material on the substrate with minimal material wastege [3]. Secondly, it provides flexibility in substrate selection from polymers to the paper, permitting additional attributes for the electronic devices [4]. Paper and plastic substrates, for example, make electronic devices flexible, while fabric materials add wearability [3]. Printing on flexible substrates enables electronics to be placed on curved surfaces, such as solar cells on vehicle roofs or integrating buttons and switches into a single part, such as a vehicle door; lowering material, assembly and overall part count costs [4]. Although the cost is not reduced under some circumstances, such as with traditional semiconductors, the increased cost is compensated by significantly improved performance. Printed electronics on flexible substrates lower production costs and enable mechanically flexible circuit fabrication. In the medical and health sectors, printed electronics are crucial for enhancing health outcomes by addressing cleanliness, infection, and transmission and developing nonintrusive wearables and monitoring devices [5]. It also facilitate the creation of integrated touch-less interfaces using hygienic materials, enabling the construction of easily cleaned and disinfected surfaces such as keypads, controllers, and light switches [6]. These switches can also be integrated directly into furniture or walls, allowing for monitoring of occupancy and cleaning events.

Additionally, printed electronics are exclusively being used in circuit boards [7], new generation thin-film solar cells [8], flexible displays [8], and various kinds of sensors [9], targeting applications ranging from medicine and biology to electronics and energy technology [10], and in space exploration [11]. Other areas where these flexible electronics

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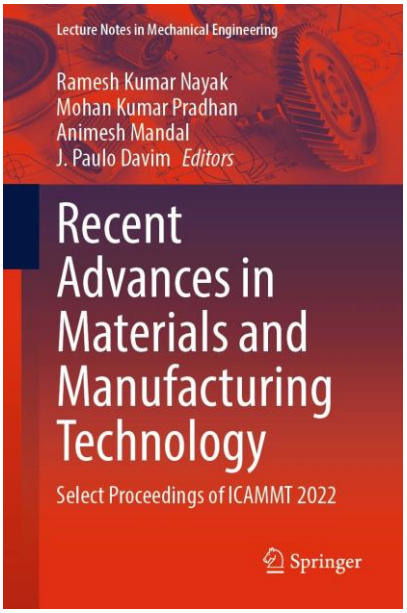
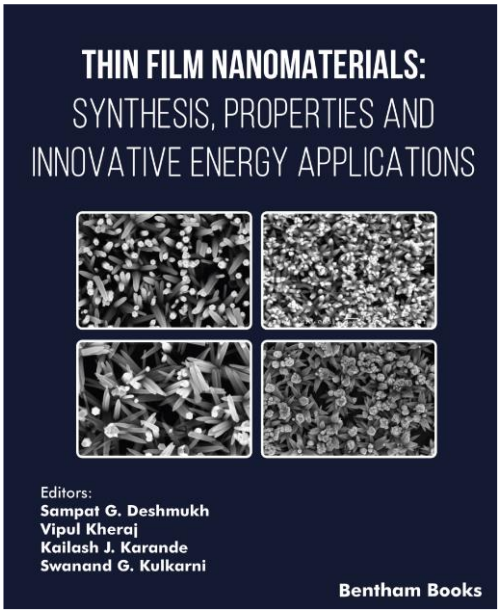
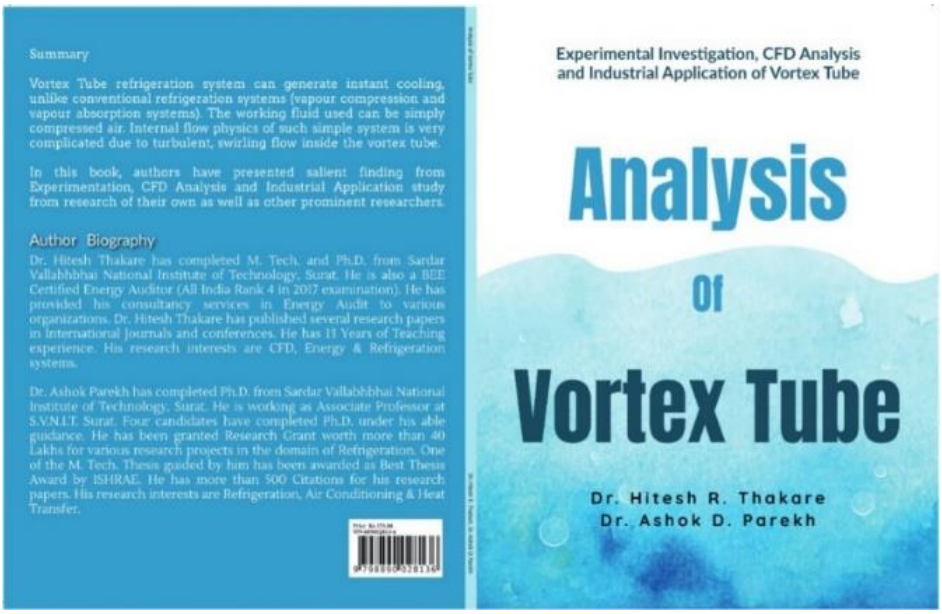


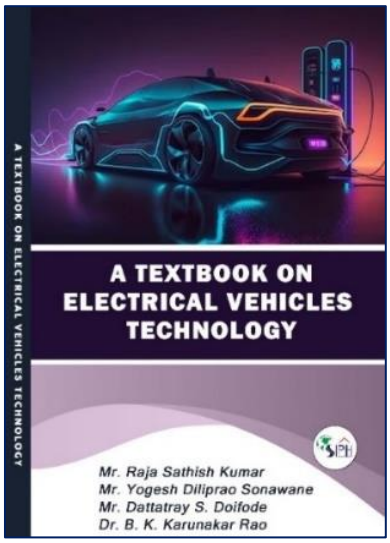


Snapshot of book chapters published by faculty Dr. Amol Badgujar

Snapshot of book chapters published by Dr. Hitesh Thakare & Dr. Nilesh Salunke

Snapshot of book chapters published by Dr. Hitesh Thakare





Books published by faculty Dr. Hitesh Thakare, Mr. Yogesh Sonawane and Mr. Dattatray Doifode

Citation details of department faculty

Sr. No.	Name of faculty	Citations	H-Index	i10-Index	Link to Google Scholar Profile
1	Dr. Nilesh Salunke	93	5	1	Dr. Nilesh Salunke - Google Scholar
2	Dr. Hitesh Thakare	419	7	7	Dr. Hitesh Thakare - Google Scholar
3	Dr. Amol Badgujar	236	9	9	Amol C. Badgujar - Google Scholar
4	Dr. Modassir Hussain	23	3	1	Md Modassir Hussain - Google Scholar
5	Mr. Mohd. Juneduddin	0	0	0	Mohammed. Juneduddin - Google Scholar
6	Mr. Dattatray Doifode	0	0	0	Dattatray Doifode - Google Scholar
7	Mr. Yogesh Sonawane	6	2	0	Yogesh Diliprao Sonawane - Google Scholar
8	Mr. Satish Patil	0	0	0	Satish Patil - Google Scholar
9	Mr. Dhiraj Bhandarkar	20	2	1	Dhiraj Bhandarkar - Google Scholar
10	Mr. Bhushan C. Behede	16	3	0	Bhushan Chandrakant Behede - Google Scholar

Ph. D Guided

Sr. No.	Name of Ph.D. Guide	Name of PhD Scholar	Regn. Date	Date of Approval of Research Title (RRC)	Application No.	Research Topic
1	Dr. Salunkhe Nilesh Pitambarrao	Mr. Juber Ahamad Mo. Salim Khatik	02-11-2020	28-08-2021	PHD-2019-XYNLP5	Performance Analysis of Absorber Plate Of Solar Flat Plate Collector Using Nanoparticles
2		Mr. Kailas Dhanraj Deore	02-11-2020	28-08-2021	PHD-2019-37A8KW	Performance Enhancement of Solar Still with Integration of Phase Change Material
3		Mr. Bhushan Youraj Patil	02-11-2020	28-08-2021	PHD-2019-FHGK0V	Experimental Investigation Of Solar Absorption Refrigeration System Using Phase Change Materials (Pcms)
4		Mr. Rohan Rajendra Ozarkar	02-11-2020	28-08-2021	PHD-2019-D1TQKI	Development of Displacement Amplification Mechanism using Microfabrication Technique for Microactuation
5		Mr. Yogeshkumar Raghunath Pathak	02-11-2020	28-08-2021	PHD-2019-4I6G5P	Experimental Investigation on the Performance Improvement of Flat Plate Solar Collector using Organic Nanofluids
6		Mr. Kiran Dinkar Chaudhari	02-11-2020	28-08-2021	PHD-2019-0CRLSQ	Experimental Investigation of Performance Enhancement Of C.I. Engine Using Biodiesel Blend with Organic Additive

Ph.D. awarded

Sr. No.	Name of faculty	PhD Award / Defence Date	University	Research Topic
1	Dr. Md Modassir Hussain	23/09/2022	Institute of Chemical Technology, Mumbai	Tribological study of sustainable biodegradable lubricant and its hydrodynamic journal bearing application
2	Dr. Bhushan Behede	18/06/2024	OP Jindal University, Raigarh, C.G.	Design and performance analysis of rotary desiccant wheel dehumidifier
3	Dr. Yogesh Sonawane	08/11/2024	KBC North Maharashtra University, Jalgaon.	Energy and Emission Analysis of Partially Premixed Combustion using Biofuels by Multiple Injection in Compression Ignition Engine

Faculty members pursuing Ph.D.

Sr. No.	Name of faculty	PhD registration date	University	Research Topic
1	Mr. Mohd. Juneduddin	17/01/2024	NMIMS, Mumbai	Development of ML Driven Predictive Maintenance Model for the Reciprocating Compressor with IoT and Cloud Technology
2	Mr. Dattatraya Doifode	04/03/2022	Dr BAMU, Aurangabad	Experimental Investigation to Evaluate the Performance Characteristics of RCCI engine Fuelled with Blends of Nanobiodiesel
3	Mr. Satish Patil	04/12/2020	NMU, Jalgaon	Design and Experimentation of Heat Pipe to Enhance Battery Thermal Management for EV
4	Mr. Dhiraj Bhandarkar	08/10/2020	ICT, Mumbai	Mechanical Characterisation and Behaviour Study of Hybrid Composite Material for Automotive Applications

Sponsored research

Sr. No.	AY	PI & Co-PI	Project Title	Funding Agency	Amount	Duration
1	2022-23	Mr. Mohd. Juneduddin	Unnat Bharat Abhiyaan 2.0	Rural Energy Systems (IIT DELHI)	1,00,000/-	17/03/2023 to 17/09/2023
2	2022-23	Dr. Amol Badgujar & Mr. Yogesh Sonawane	Development of Dome Shaped Passive Solar Desalination System using 3D Printer	Maharashtra Solvent Extraction (P) Limited, Dhule	6,35,000/-	11/01/2023 to 30/11/2023
3	2021-22	Mr. Mohd. Juneduddin	Unnat Bharat Abhiyaan	Ministry of Education, Government of India	50,000/-	14/11/2019 to 30/04/2022

Consultancy services offered

Sr. No.	Project Title	Funding agency	Amount	Duration
AY (2023-24)				
1	ISO 21001:2018 Consultancy Project	Amrutvahini Institute of Pharmacy, Sangamner	₹ 23,600.00	31/03/2023 to 20/11/2023
2	ISO Internal Audit	Pimpri Chinchwad College of Engineering & Research, Ravet, Pune	₹ 4,720.00	30/09/2023
3	ISO Internal Audit	Sanjivani Arts, Commerce & Science College, Kopargaon	₹ 5,900.00	07/11/2023 to 08/11/2023
4	Green audit of engineering institution	MIT Academy of Engineering, Alandi, Pune	₹ 17,700.00	21/12/2013 to 15/01/2024
5	Value Added Course on Energy Management System	MIT Academy of Engineering, Alandi, Pune	₹ 11,800.00	31/01/2024 to 01/02/2024
		Total amount for CAY	**₹ 63,720.00**	
AY (2022-23)				
1	Green audit of engineering institution	MIT Academy of Engineering, Pune	₹ 23,600.00	Apr-23
2	Green audit of engineering institution	Late G. N. Sapkal College of Engineering, Nashik	₹ 23,600.00	May 23 - July 23
3	Green audit of engineering institution	Atma Malik Institute of Technology and Research, Mohili - Aghai, Tal. Shahapur, Dist. Thane.	₹ 23,600.00	Jul-23
		Total amount for CAYm1	**₹ 70,800.00**	
AY (2021-22)				
1	Green Audit of Medical College	JMF's ACPM Medical College, Dhule	₹ 10,000.00	Jul-21
2	Green audit of engineering institution	St. John College of Engineering and Management, Palghar.	₹ 5,000.00	Dec-21
		Total amount for CAYm2	**₹ 15,000.00**	
		Total amount till date	**₹ 1,49,520.00**	