सीएसआईआर
CSIR
भारत का नवाचार इंजन
The Innovation Engine of India

सी एस आई आर - भारतीय पेट्रोलियम संस्थान
CSIR- Indian Institute of Petroleum

भापेसं

2024-25

वार्षिक प्रतिवेदन
ANNUAL REPORT



सीएसआईआर - भारतीय पेट्रोलियम संस्थान

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The Director
CSIR-Indian Institute of Petroleum



From the Director's Desk

Greetings from CSIR-IIP, Dehradun



It gives me immense pleasure to present Annual Report of the Institute for the year 2024–25. It was a period of focused scientific advancement and strategic alignment of CSIR–IIP with national priorities in energy security, sustainability, and technological self-reliance. This report presents a comprehensive account of the Institute's scientific and technological achievements, human resource development, knowledge dissemination, outreach activities, and financial performance during 2024–25.

First, I would like to express my sincere gratitude to Hon'ble Vice President of India Shri Jagdeep Dhankar and Hon'ble Governor of Uttarakhand Lt. General Gurmit Singh, for visiting the institute on August 31, 2024. I would also like to express my gratitude to Padma Bhushan Dr V K Saraswat, Hon'ble Member NITI Ayog and Mentor CSIR-IIP for gracing CSIR-IIP Foundation Day Event as Chief Guest on 27th April 2024. This year we organized the 3rd Indian Analytical Congress along with Indian Society for Analytical Scientists during June 5-7, 2024 on "Role of Science and technology in green transitions". A very important R&D-Industry meet on "Prospects and Challenges in Petrochemicals and Biochemicals" was organized on July 18, 2024 to mark successful completion of "One Week One Theme" celebration for CLP (Chemicals including Leather and Petrochemicals) theme. A National Workshop on "Advanced Carbon Materials for Next Generation Energy Solutions (NWCM2025) was organized in association with The Indian Carbon Society (ICS) and CSIR-NPL during February 20-21, 2025.

During 2024-25 in technology development and translation, CSIR-IIP has made great strides and we have added 5 numbers of new licensees for improved Jaggary making plant thereby increasing the total licensee of this technology to 60 and also transferred the technology for conversion of Diesel Genset to dual fuel mode genset to M/s Upcharge Energy Solutions LLP. In other significant development we have commercialized our advance VPSA technology for conversion of raw biogas to PNG quality bio gas at Haibowal Dairy Complex, Ludhiana. This technology was also transferred to M/s Organic Recycling System Limited, Navi Mumbai. Significant advancements were achieved in our unique Single-step process to convert plant-derived oil and animal derived fats into Sustainable Aviation Fuel (SAF). CEMILAC has given provisional certificate to CSIR-IIP's SAF upto 10% blending in ATF for use in IAF aircraft. A pilot plant of 1 TPD feed capacity has been commissioned at UPL Bharuch, Gujarat for production of green diesel and another demo plant of ~35 KLPD is planned at ONGC-MRPL Refinery, Mangalore.

I feel happy to report that this year CSIR-IIP has made significant contribution in several areas of fundamental sciences also. CSIR-IIP has published 175 research papers in peer reviewed journals having average impact factor of 4.45, filed 7 Indian and 6 International patents which 3 Indian and 1 international patent were granted in 2024-25. CSIR-IIP has vibrant young research community with 94 research scholars. During 2024-25, 14 research students completed their Ph.D. Additionally, to nurture young talent and develop scientific temperament in them, CSIR-IIP conducted regular skill development programmes for school students under Jigyasa, where over 1000 students have been benefited. Lastly, with the support of collaborators and sponsors, this year we have achieved an ECF of Rs 17.47 Cr.

I take this opportunity to express my sincere thanks to all staff of CSIR-IIP and CSIR Hqrs, collaborators, ministries, industry partners and sponsors for their continued support.

With your help and support we commit ourselves to nation building and keep serving the society.
Jai Hind

Dr. H S Bisht
Director

निदेशक की कलम से

Greetings from CSIR-IIP, Dehradun



मुझे वर्ष 2024–25 का संस्थान का वार्षिक प्रतिवेदन प्रस्तुत करते हुए अत्यंत हर्ष हो रहा है। यह अवधि वैज्ञानिक प्रगति तथा ऊर्जा सुरक्षा, संवहनीयता एवं तकनीकी आत्मनिर्भरता से संबंधित राष्ट्रीय प्राथमिकताओं के अनुरूप सीएसआईआर–आईआईपी की रणनीति पर केंद्रित थी। यह प्रतिवेदन वर्ष 2024–25 के दौरान संस्थान की वैज्ञानिक एवं प्रौद्योगिकीय उपलब्धियों, मानव संसाधन विकास, ज्ञान प्रसार, जनसंपर्क गतिविधियों तथा वित्तीय प्रदर्शन का व्यापक विवरण प्रस्तुत करता है।

सर्वप्रथम, मैं भारत के माननीय उपराष्ट्रपति श्री जगदीप धनखड़ एवं उत्तराखंड के माननीय राज्यपाल लेफ्टिनेंट जनरल गुरमीत सिंह के प्रति हार्दिक कृतज्ञता व्यक्त करता हूँ, जिन्होंने दिनांक 31 अगस्त 2024 को संस्थान का भ्रमण कर हमें गौरवान्वित किया। मैं, पद्म भूषण डॉ. वी. के. सारस्वत, माननीय सदस्य, नीति आयोग एवं मार्गदर्शक, सीएसआईआर–आईआईपी का भी आभार व्यक्त करता हूँ, जिन्होंने दिनांक 27 अप्रैल 2024 को सीएसआईआर–आईआईपी के स्थापना दिवस समारोह में मुख्य अतिथि के रूप में अपनी गरिमामयी उपस्थिति से कार्यक्रम की शोभा बढ़ाई। इस वर्ष संस्थान द्वारा दिनांक 05 से 07 जून, 2024 के दौरान "हरित संक्रमण में विज्ञान एवं प्रौद्योगिकी की भूमिका" विषय पर इंडियन सोसाइटी ऑफ एनालिटिकल साइंटिस्ट्स के साथ मिलकर तृतीय भारतीय विश्लेषणात्मक सम्मेलन का आयोजन किया गया। इसके अतिरिक्त, रसायन (चर्म सहित) और पेट्रोरसायन (सीएलपी) विषय पर "एक सप्ताह एक थीम" उत्सव के सफल समापन के उपलक्ष में दिनांक 18 जुलाई, 2024 को "पेट्रोरसायन तथा जैवरसायन में संभावनाएँ एवं चुनौतियाँ" विषय पर एक महत्वपूर्ण अनुसंधान एवं विकास-उद्योग सम्मेलन का आयोजन किया गया। दिनांक 20 से 21 फरवरी, 2025 तक इंडियन कार्बन सोसाइटी (आईसीएस) और सीएसआईआर-एनपीएल के सहयोग से "भविष्य के ऊर्जा समाधान (नेक्स्ट जनरेशन एनर्जी सॉल्यूशंस) के लिए उन्नत कार्बन सामग्री (एनडब्ल्यूसीएम2025)" विषय पर एक राष्ट्रीय कार्यशाला का आयोजन किया गया।

वर्ष 2024-25 के दौरान प्रौद्योगिकी विकास तथा अंतरण मेंसीएसआईआर-आईआईपी ने उल्लेखनीय प्रगति की है और उन्नत गुड़ निर्माण संयंत्र प्रौद्योगिकी के 05 नए लाइसेंसजारी किए गए, इससे अब इस प्रौद्योगिकी के कुल लाइसेंसधारियों की संख्या बढ़कर 60 हो गई है। इसके साथ ही डीजल जेनसेट को दोहरे ईंधन मोड-जेनसेट में परिवर्तित करने की प्रौद्योगिकी को मेसर्स अपचार्ज एनर्जी सॉल्यूशंस एलएलपी को हस्तांतरित कर दिया गया है। अन्य महत्वपूर्ण विकास कार्यों में, हमने हैबोवाल डेयरी कॉम्प्लेक्स, लुधियाना में कच्चे बायोगैस को पीएनजी गुणवत्ता वाले बायोगैस में परिवर्तित करने के लिए अपनी उन्नत वीपीएसए प्रौद्योगिकी का व्यावसायीकरण किया है। यह प्रौद्योगिकी मेसर्स ऑर्गेनिक रीसाइक्लिंग सिस्टम लिमिटेड, नवी मुंबई को भी हस्तांतरित की गई थी। वनस्पति-व्युत्पन्न तेल और पशु-वसा को संवहनीय विमानन ईंधन (SAF) में परिवर्तित करने के हमारे अनूठे एकल-चरण प्रक्रम संबंधी महत्वपूर्ण प्रगति दर्ज की गई। CEMILAC ने भारतीय वायु सेना के विमानों में उपयोग के लिए एटीएफ में 10% तक सीएसआईआर-आईआईपी के SAF के सम्मिश्रण का अनंतिम प्रमाण पत्र दे दिया है। यूपीएल भरूच, गुजरात में ग्रीन डीज़ल के उत्पादन के लिए 1 टीपीडी की फीड क्षमता का एक प्रायोगिक संयंत्र चालू किया गया है और ओएनजीसी-एमआरपीएल रिफाइनरी, मैंगलोर में लगभग 35 केएलपीडी का एक और डेमो संयंत्र लगाने की योजना है।

मुझे यह बताते हुए प्रसन्नता हो रही है कि इस वर्ष सीएसआईआर–आईआईपी ने मूल विज्ञान के कई क्षेत्रों में भी महत्वपूर्ण योगदान दिया है। औसत 4.45 प्रभाव गुणांक (इम्पैक्ट फैक्टर) वाली प्रतिष्ठित पत्रिकाओं में सीएसआईआर – आईआईपी के175 शोध-पत्र प्रकाशित हुए। इसके अतिरिक्त संस्थान ने 7 भारतीय एवं 6 अंतरराष्ट्रीय एकस्व फ़ाइल किए, जिनमें से वर्ष 2024–25 के दौरान 3 भारतीय एवं 1 अंतरराष्ट्रीय एकस्व प्राप्त हुए। सीएसआईआर–आईआईपी 94 शोधार्थियों के साथ एक ऊर्जावान युवा शोध-समुदाय है। वर्ष 2024 -25 में 14 शोधार्थियों ने अपनी पीएच.डी. पूर्ण की। सीएसआईआर–आईआईपी द्वारा युवा प्रतिभाओं को प्रोत्साहित करने तथा उनमें वैज्ञानिक अभिरुचि विकसित करने के उद्देश्य से विद्यालयी छात्रों हेतु 'जिज्ञासा' कार्यक्रम के अंतर्गत नियमित कौशल विकास कार्यक्रम आयोजित किए गए, 1000 से अधिक विद्यार्थी इन कार्यक्रमों से लाभान्वित हुए। अंत में, यह उल्लेखनीय है कि संस्थान ने सहयोगियों एवं प्रायोजकों के सहयोग से इस वर्ष 17.47 करोड़ रुपये का ईसीएफ अर्जित किया।

मैं, इस अवसर पर सीएसआईआर–आईआईपी एवं सीएसआईआर मुख्यालय के समस्त कर्मचारियों, सहयोगियों, मंत्रालयों, औद्योगिक साझेदारों तथा प्रायोजकों के प्रति उनके निरंतर सहयोग के लिए हार्दिक आभार व्यक्त करता हूँ।

आपके सहयोग एवं समर्थन से हम राष्ट्र निर्माण और समाज की सतत सेवा हेतु अपनी प्रतिबद्धता को दोहराते हैं।
जय हिंद

डॉ. हरेन्द्र सिंह बिष्ट
निदेशक

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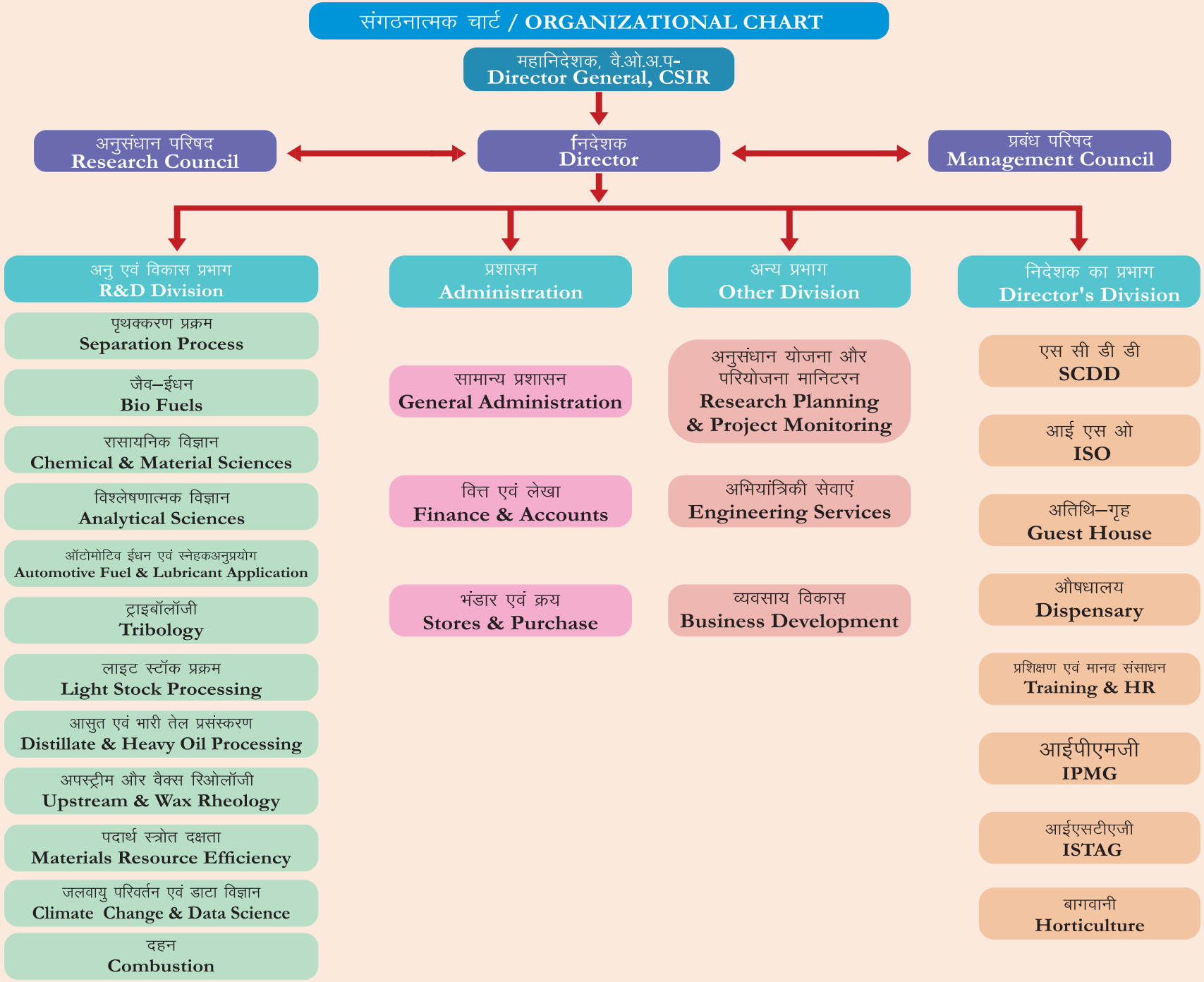


उपलब्धियाँ एक नजर में-शोध पत्र एवं एकस्व

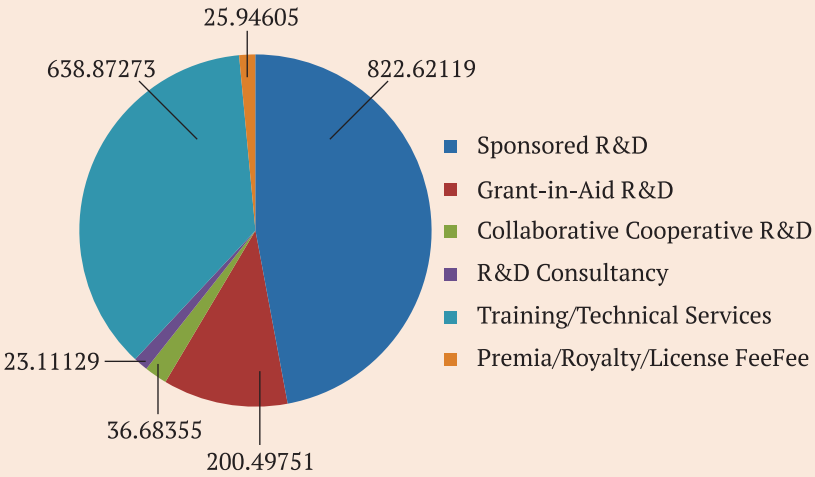
ACHIEVEMENTS AT A GLANCE: PAPERS & PAENTS

Papers in Journals	175
Papers in International Journal	175
Papers in SCI Journal	175
Average Impact Factor	4.45
Papers in Conference	128
Number of Persons Attended Seminar/Conference	352
No. of Patents Filed in India	7
No. of Patents Filed Abroad	6
No. of Patents Sealed in India	3
No. of Patents Sealed Abroad	1
No. of Training Programmes	12
No. of Persons attended Training Programmes	110
No. of Sponsored Training Programme	07
Skill Development Programme	09
No. of Persons who attended Skill Development Programme	85
No. of Ph.D Awarded	14 Nos
No. of Foreign Visits	03

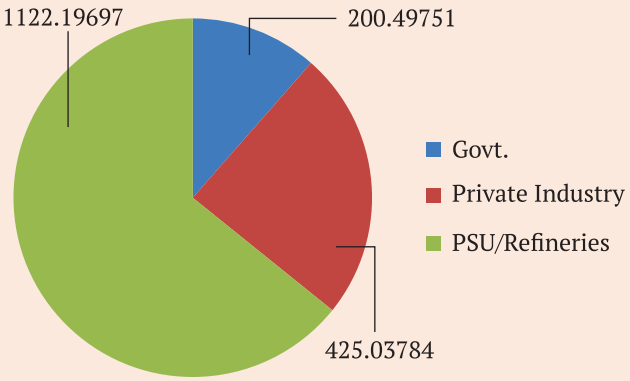
बाह्य नकदी प्रवाह से वित्तीय वर्ष 2024–25 के दौरान सीएसआइआर–भापेसं की आय : / रू0 1747.73232 लाख /

The CSIR-IIP's ECF during the Financial Year 2024-25 : Rs. 1747.73232 lakhs.

परियोजना-वत् / **Project-wise**



क्षेत्र-वत् / **Sector-wise**



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विज्ञान एवं प्रौद्योगिकी में योगदान

Contributions to Science & Technology

1.0 विज्ञान एवं प्रौद्योगिकी में योगदान / Contributions to Science and Technology

1.1 पृथक्करण प्रक्रम प्रभाग / Separation Processes Division

1.1.1 अधिशोषण तथा झिल्ली पृथक्करण क्षेत्र / Adsorption and Membrane Separation

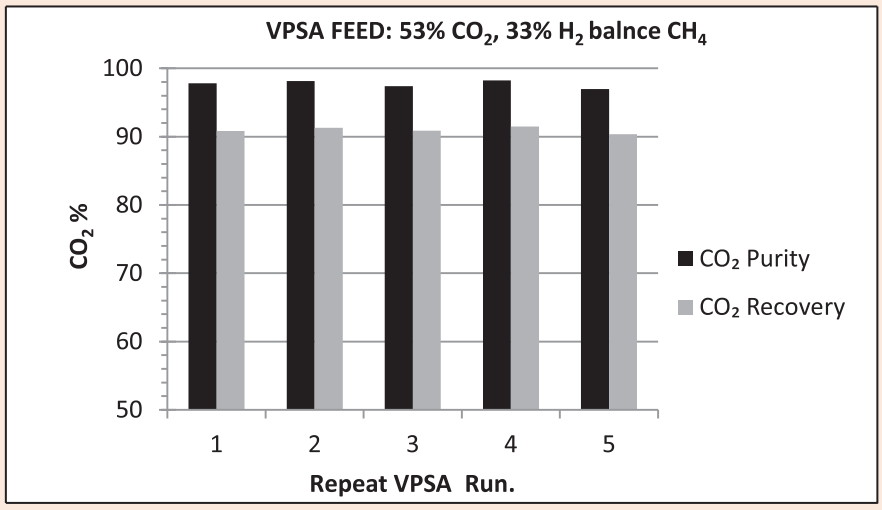
Development of Adsorptive Process for Argon Recovery and Purification

Argon can be produced, along with nitrogen and oxygen by multiple-column cryogenic fractional distillation of air in an Air Separation Unit (ASU). Since, oxygen and argon have similar physical properties such as kinetic diameter (3.46 Å and 3.70 Å) and very close boiling points (90.2 K. and 87.3 K respectively), the separation of oxygen and argon by fractional distillation of air is both capital and energy-intensive process. The conventional ASUs have an estimated energy consumption of 280-460 kWh/ ton oxygen due to very close boiling points of oxygen and argon.

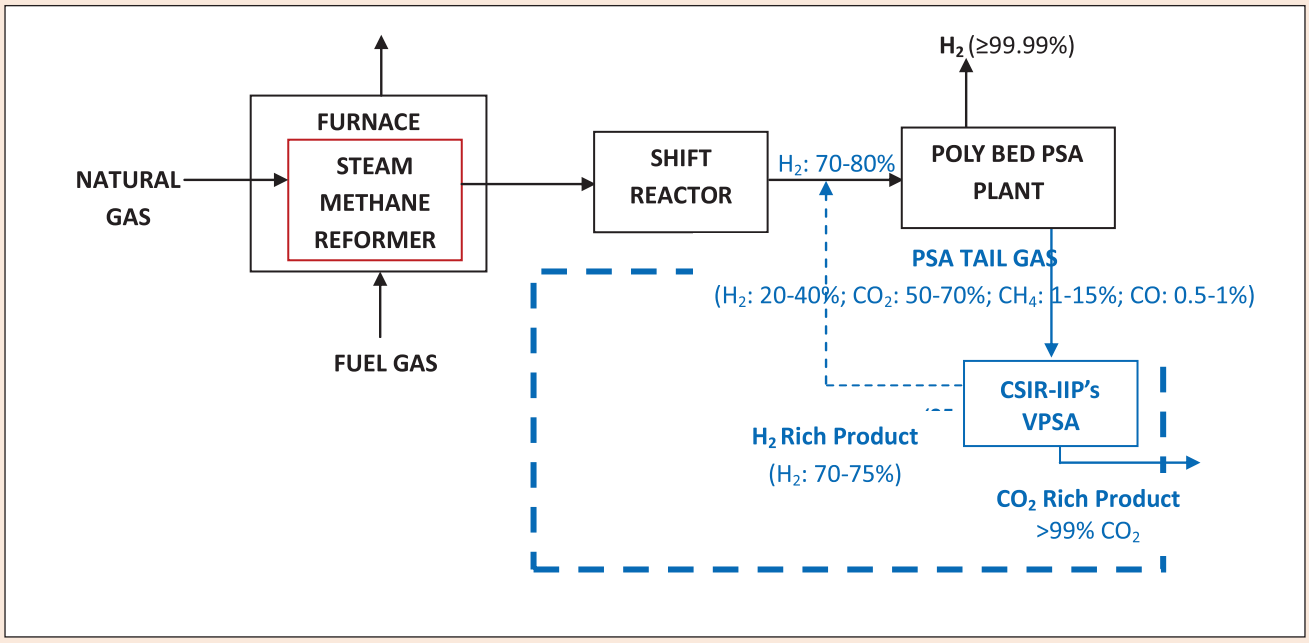
Within an ASU fractional distillation column, the argon concentration is maximum in the so-called 'Argon Belly (10-12% Ar balance O_2) of the low-pressure column. This stream is sent to the crude argon column for the production of oxygen-free argon or the crude argon can be further purified by catalytic removal of oxygen by reaction with Hydrogen or a cryogenic adsorption system. Another industrial source of argon is the oxygen product of an industrial oxygen VSA plant where zeolite molecular sieves are used to separate oxygen. As zeolites have similar adsorption equilibrium capacities for oxygen and nitrogen, all the argon in feed air is recovered with oxygen product. The VSA oxygen product contains 95% oxygen and 5% of argon. Other sources of crude argon are the used argon streams in the semiconductor and steel manufacturing industries (80-90% argon content). Since argon production is an energy intensive process, recovery of argon at point of usage such as semiconductor manufacturing (80-90% Ar), steel industry is economically attractive.

Adsorption-based separation is an alternate technique where one gas is preferentially concentrated (adsorbed) on an adsorbent surface (equilibrium or kinetic selectivity) compared to another gas. The main two-fold problem is to design an adsorptive process comparable/competitive with the cryogenic separation to achieve high purity and to reduce the operating costs at comparable scales. However, lower CAPEX, ease of operation and modular design are the factors favorable to the adsorptive separation option.

The Adsorption and Membrane Separation Area is working on development of Adsorptive separation process for purification and recovery of argon from above described sources. The solution for these problems will involve judicious selection of adsorbent, operating conditions while minimizing the operating energy costs through suitable process development. Initial results show the feasibility of producing >99% pure argon from Crude argon feed (~90% argon in O_2). Development of argon recovery process from argon bearing gases specific to semiconductor and steel industries are ongoing.



Repeatability of the VPSA experiments for CO_2 enrichment from the PSA tail gas



The possible integration of the proposed VPSA process with the poly-bed PSA of the SMR coupled hydrogen generation unit

1.1.2 अनुकरण एवं प्रतिरूपण क्षेत्र / Modelling and Simulation Area

Energy and Process Optimization of Pulp and Paper Mill's Processes using Simulation and Pinch Analysis Tools (Sponsored Project)

The main objective of the study was to improve the performance of two energy-intensive processes namely 'Pulping Process' and the 'Chemical Recovery Process) to reduce their energy cost/consumption. CSIR-IIP conducted a study on the Chemical Recovery Section (CRS) and Pulping Section (PS) based on the data and information provided by SPB. The simulation models of different subsections of CRS and PS were developed and analyzed to identify energy-saving opportunities. The air preheating subsection of chemical recovery section was optimized and a minor modification and loss of insulation were identified to improve the energy savings. One more energy-saving opportunity in CRS was also identified by routing the LP steam The main objective of the study was to improve the performance of two energy-intensive processes namely 'Pulping Process' and the 'Chemical Recovery Process) to reduce their energy cost/consumption. CSIR-IIP conducted a study on the Chemical Recovery Section (CRS) and Pulping Section (PS) based on the data and

information provided by SPB. The simulation models of different subsections of CRS and PS were developed and analyzed to identify energy-saving opportunities. The air preheating subsection of chemical recovery section was optimized and a minor modification and loss of insulation were identified to improve the energy savings. One more energy-saving opportunity in CRS was also identified by routing the LP steam condensate from the BL-Indirect heater to the MEE subsection's SCFTs. The simulation model of the MEE section was developed using the data/information provided by SPB and composition of BL taken from literature in terms of water and salt mixture. The existing pulping section was modified with respect to filling and displacement cycles/methodologies. The monetary savings in the proposed scheme of CRS will result in reduced heat losses to the environment because of the lower temperature of vessels and pipelines and shifting the energy load from MP and HP steam in the air preheating system to LP steam in the dearator/alternate tanks. In the proposed scheme of the pulping section, MP steam will be reduced by 2.37 tonnes per hour (TPH) and 1.75 TPH LP steam in the hot water tank. A Techno-economics Analysis was also conducted for identified energy savings opportunities.

Total monetary savings by implementing proposed recommendations in the chemical recovery section are Rs. 117.08 Lakhs per annum. The total monetary savings by implementing the proposed modifications to improve the pulping section is Rs. 636.2 lakhs per annum. The total monetary saving by implementing the proposed modifications in SRC and pulping sections is Rs. 753.28 lakhs per year and Rs. 2260 lakhs for 3 years period. Even if there are challenges in heating the mill water in the chemical recovery section, the study still reveals savings of Rs. 513.9 lakhs per year and Rs. 1541.7 lakhs for three years by implementing the modifications in SRC and pulping sections.

1.1.3 एरोमेटिक्स निष्कर्षण/ Aromatic Extraction

Feasibility Studies for the Pre-Treatment of Plastic Waste Using SEMR (Solvent Extraction and Molecular Refinement) Process (In-house Project)

The main objective of the study was to evaluate the technical feasibility of applying the SEMR process for selective extraction, separation and molecular refinement of valuable hydrocarbons and polymeric fractions from mixed plastic waste with the aim of enabling downstream recycling or up cycling into value-added products

In this study, investigations were carried out to examine the applications of the Solvent Extraction and Material Recovery (SEMR) technique for treating pure and mixed plastic waste. Targeted materials included polyethylene films and multilayer packaging waste (e.g., Lays and Ashirwad packets). IIP has developed a process schematic employing various solvents: Toluene, DMSO, NMP and Ethanol. Conducted dissolution trials to achieve up to 60% dissolution efficiency of plastic content. FT-IR analysis of the extracts confirmed the presence of polyethylene, indicating partial recovery of target materials. SEMR shows promise for recovering polymer fractions from plastic waste. Mixed packaging waste is partially processable using tailored solvent combinations. Current efforts focus on characterizing the dissolved fractions to evaluate recyclability and potential for material recovery. Further optimization is underway to improve dissolution efficiency and selectivity.

Feasibility Studies for the Pre-treatment of Biomass (via base hydrolysis) and Bio-crude Oils using Solvent Extraction Method (In-house Project)

The goal of this investigation is to examine the effectiveness of base hydrolysis combined with solvent extraction in depolymerizing and separating key components from lingo cellulosic biomass and bio-crude oils for the purpose of improving their processability and yield of desirable chemical intermediates or fuels.

In this project solvent extraction was carried to remove oxygenates from bio-crude oils and biomass using THF, ethyl acetate, hexane, methanol and ethanol. GC-MS analysis of extracts confirmed the presence of methyl esters indicating successful partial extraction of oxygenated compounds. Base hydrolysis was carried out bagasse biomass using NaOH followed by acid neutralization. About ~60–65% biomass dissolution was

achieved demonstrating the method's effectiveness in depolymerizing lignocellulosic structure. Solvent extraction facilitates partial separation of oxygenates, improving bio-crude quality for downstream processing. Base hydrolysis is effective in breaking down biomass; however, the neutralization step may hinder downstream chemical separation. Current work includes aqueous phase analysis and exploration of non-neutralization-based approaches for direct recovery of organics and sugars. This work supports the institute's Biomass-to-Chemicals initiative by contributing improved separation methodologies.

Evaluation of LCO-derived Naphthalene Derivatives for Naphthalene Sulfonate Formaldehyde (NSF) Condensate Synthesis (In-house Project)

The main goal of this study was to assess the suitability and performance of naphthalene derivatives obtained from Light Cycle Oil (LCO) as raw materials in the synthesis of NSF condensates, with a focus on optimizing reaction conditions, product yield, and performance parameters for applications such as superplasticizers in concrete admixtures.

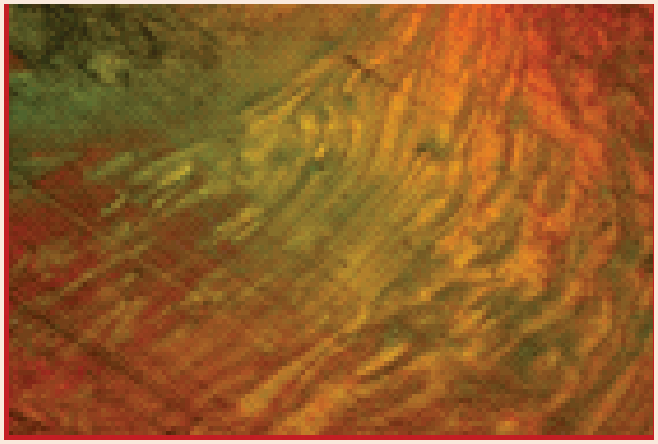
In this project, synthesized naphthalene sulfonate formaldehyde (NSF) condensate from pure naphthalene. FT-IR analysis confirmed the formation of desired NSF product. Attempts were made to synthesize NSF from LCO-derived hydrocarbons, following similar sulfonation and condensation pathways. NSF synthesis was done from pure naphthalene successfully and reproducible. LCO-derived feed stocks, however, resulted in the formation of char-like degradation products during acid sulfonation. Results suggest LCO-derived naphthalene derivatives are not directly suitable for NSF synthesis due to instability or impurities. The study identifies a critical limitation in using refinery streams for value-added chemical applications without prior purification.

1.1.4 ल्यूब्स, वैक्स, बिटुमिन, विस्फाल्टन एवं कार्बन पदार्थ क्षेत्र / Lubes , Wax , Bitumen, Deasphalting and Carbon Material Area

Study to Examine Possibility of Producing Needle Coke from Aromatic Rich Streams (Sponsored Project)

In recent years, petroleum refining industry is facing a number of challenges such as deteriorating crude quality, problems in processing of heavier crudes in existing refinery configuration, generation of significant amount of residues during various petroleum refining processes, demand for better product quality and stringent environmental norms etc. All these factors have forced petroleum refiners to look into the options to up-grade low-value petroleum aromatic streams into high-value products. 'Needle Coke' is a very important carbon product. It is a basic raw material for making Graphite Electrodes used in Electric Arc Furnaces for making Steel, for making Carbon Anodes used in Aluminium production and for making Li-ion Battery Anodes for Electric Vehicles (EV) etc.

In this project, one feed stock from petrochemical plant was evaluated for making Needle Coke. Generally, feed stocks having tendency to form mesophase are likely to produce Needle Coke. The study showed that petrochemical stream is rich in aromatics and produce bulk 'Mesophase' having lamellar texture. The lamellar structure ultimately leads to Needle Coke formation.



Lamellar texture in bulk Mesophase

Study for De-oiling of DAO produced for Production of Microcrystalline Waxes (MCW) (Sponsored Project)

Microcrystalline Wax (MCW)' is a specialty product which is composed of mainly 'Isoparaffins' and 'Naphthenes' Hydrocarbons unlike 'Paraffin Wax' which contains straight chain 'Paraffin' Hydrocarbons. MCW are mainly used in cosmetics and high-end products such as anti-aging formulations, skin products, in making jewellery, sculptures etc. In this project, de-oiling study was carried on De-asphalted Oil (DAO) being produced at one Indian Refinery under different process conditions such as different Solvent-to-Feed ratio, Crystallization Temperatures, Filtration Rate etc. to examine the possibility of production of Microcrystalline Wax (MCW). Study revealed that DAO feed give higher yield of MCW. Now, Petroleum Refinery is considering for setting up of a new grass-root Wax De-oiling Plant for production MCW based on CSIR-IIP's lab study.

Technology Transfer

One Technology for Up-gradation of Raw Bio-gas to Bio CNG Application was licensed to Organic Recycling Systems Limited (ORSL) Navi Mumbai on 28th June 2024 during inaugural function of the One Week One Theme (OWOT) Program – Energy and Energy Devices (EED) Theme of CSIR.



Technology Licensing Function

1.2 रसायन और पदार्थ विज्ञान प्रभाग / Chemical and Material Science Division

1.2.1 संश्लेषित रसायन विज्ञान और पेट्रोरसायन क्षेत्र / Synthetic Chemistry and Petrochemicals Area

One-step Conversion of CO_2 to Diphenyl Carbonate
Sponsor: BPCL R&D

Objective of the Project

The prime objective of the project is to develop a process for the direct synthesis of diphenyl carbonate from phenol and CO_2.

Work Done

CSIR-IIP has successfully developed a process for the direct synthesis of DPC from phenol and CO_2 and demonstrated the process in the presence of the BPCL, personals. Following lab experiments were carried out as a part of validation of the process developed. The details of the experiments carried out are given below:

Non-photochemical Reaction

A 500 mL RB flask was charged with Phenol (5.17 g, 55 mmol), DBU (8.37g, 55 mmol) and CCl4 (100 ml) and the mixture was purged with CO_2 for 40 minutes. Then CuBr (2.75 g, 35 mmol) and $ZnCl_2$ (1.3 g, 9.55 mmol) were added, and the mixture was stirred at room temperature for 24 hours. Post completion of the reaction, the mixture was filtered, and the solvent was removed under vacuum. The crude product was dissolved in ethyl acetate and washed with 1N NaOH. The organic layer was dried to get the crude product (2 g). GC analysis of the crude product indicated ~ 60% DPC in the crude mixture. The crude material was dissolved in dichloromethane and washed with 1N NaOH. The resulting organic layer was dried over anhydrous sodium sulphate and concentrated under reduced pressure to get the pure DPC (1.2 g). The GC analysis indicated the diphenyl carbonate (DPC) with 96% purity.

Photochemical Reaction

A 50 mL RB flask was charged with Phenol (188 mg, 2 mmol), DBU (304 mg, 2 mmol) and CCl4 (as solvent, 8 ml) and the mixture was purged with CO2 for 40 minutes. Then CuBTC (100 mg,) and ZnCl2 (50 mg) were added, and the mixture was irradiated under 30-watt LED for 24 hours. Post completion of the reaction, the mixture was filtered, and the solvent was removed under vacuum. The crude product was dissolved in ethyl acetate and washed with 1N NaOH. The organic layer was dried. GC analysis indicated ~ 30% yield of DPC.

Key Findings of the Study/Project

Process developed and demonstrated to BPCL at 10 g scale of DPC synthesis via direct non-photochemical route.

1.2.2 पॉलिमर सामग्री / Polymeric Materials

Studies on the Development of the Additive for Diesel Methanol Blend and Engine Testing (Phase-I)
Sponsor : OIL, India

Objective of the Project

The prime objective is to develop an additive for diesel methanol blend (Phase-I). The scope of the Phase-I study includes understanding the phase separation behaviour of the diesel methanol blend and feasibility of controlling the phase separation of diesel methanol blend by use of CSIR-IIP synthesized additives. Testing of physiochemical properties of the optimized methanol blended diesel fuel will be performed at both CSIR-IIP and NRL

Work Done in the Project

In this project, the physicochemical properties of the feed samples such as diesel and methanol were carried out. The feed samples, diesel, and methanol were characterized for various physicochemical properties like kinematic viscosity, dynamic viscosity, density, API density, flashpoint, and pour point and the results are summarized in the Table.

Table - Physico-chemical Characterization of Diesel and Methanol

Feed	Kinematic Viscosity (mm2 s-1)		Dynamic Viscosity (mPa s)		Density (g cm-3)		API Density (kg m-3)		Flash Point (°C)	Pour Point (°C)
Temperature (°C)	40	25	40	25	40	25	15	15		
HSD	2.552	3.466	2.109	2.903	0.826	0.838	844.0	844.7	54	-3
EX HCU	3.341	4.699	2.771	3.950	0.829	0.841	847.1	847.7	57	+9
MeOH	0.579	0.651	0.417	0.497	0.720	0.763	742.8	772.1	13.7	-97.6

Synthesis and Characterization of Additives

To prepare a diesel and methanol blend, the development of a suitable additive is an essential component. For the development of additive, we are mainly focused on the bio-feed stocks. The synthesis of this additive was conducted through an esterification reaction using bio-oil. The resulting castor oil and alcohol-based ester exhibit unsaturation, allowing further transformation into an epoxide through peroxide. Subsequently, the epoxide ring can be opened with alcohol, leading to the formation of the desired additive. The synthesized 37 additives are thoroughly characterized using FT-NMR and FT-IR studies.

Diesel and Methanol Blending with Synthesized Ester

The blend was prepared using 95 parts diesel, 5 parts methanol, and 0.5 parts an additive. This mixture was sonicated for 20 minutes. Once sonication was complete, the blend was allowed to rest at room temperature. The stability of the blend was then assessed, and the stability time was tabulated in Table 8. The blends were prepared with different synthesized esters.

Table 8 showed that the stability time varied at room temperature; DM1 showed the highest stability of 5h 10 minutes with the surfactant, i.e., Tween 20 at 1 wt% concentration. In a similar way, blends were prepared, and instead of sonication, the stirring was carried out with the help of an overhead stirrer at a speed of 8000 rpm. The blends were placed for as at 40 °C. At 40 °C, the DM1 with surfactant was stable for up to 4h 17 min. Another blend prepared using DM5 and surfactant shows the stability of 4h 30min at 40 °C. The summary of the different additives used in the stability study and the stability time is tabulated in Table 2.

Table - Different Diesel Methanol Diesel Blends, Dosages, and Stability at Room Temperature and 40 °C

Name of additive	Dosages of additive and surfactant (wt%)	Blend stability at room temperature (sonication)	Blend stability at 40 °C (Blend at 8000 rpm)
Dm1	0.5	15 min	
DM1+T20	1	20 min	
DM1+T20	1	5h 10 min	4h 17min
Dm2	0.5	15 min	
DM2+T20	1	20min	
DM2+T20	1	3h 55min	2h
DM3+T20	1	15 min	
DM3+T20	1	1h	47min
Dm4	0.5	NA	4h
DM4+T20	1	NA	
DM4+T20	1	2h	6h
Dm5	0.5	1h 42 min	
DM5+T20	1	1h 45min	4h 30 min
DM6+T20	1	15min	
DM7+T20	1	1h 25 min	3h
DM9 +T20	1	4h 30min	4h
DM10+T20	1	30 min	
DM11+T20	1	1h 20 min	
DM12+T20	1	1h	
DM13 +T20	1	1h 30 min	
DM14+T20	1	2h	1h

Diesel and Methanol Blending with DMEP

A blend was prepared by carefully weighing 95 parts diesel, 5 parts methanol, and 0.5 to 1 parts of the additive (different synthesized epoxide from DM1EP to DM6EP). The blend underwent sonication for 20 minutes to ensure proper dispersion and interaction of the components. After sonication, the blend was left to rest at room temperature. To evaluate its stability, the blend was monitored, and the findings were displayed in Table 3. The results indicated that the DM1EP additive, when combined with the surfactant Tween 20, demonstrated remarkable stability, remaining effective for up to 105 hours under room temperature conditions.

Table - Different Diesel Methanol Diesel Blends, Dosages, and Stability at Room Temperature

Name of additive	Composition of additive and surfactant ppm	Blend Stability at Room Temperature (sonication)
DM1EP	0.5	1h 20min
DM1EP+T20	1	1h 50 min
DM1EP1+T20	1	105 h
DM2EP	0.5	30min
DM2EP+T20	1	2h 55min
DM2EP+T20	1	6h
DM3EP+T20	1	3h 5min
DM4EP+T204	1	3h
DM5EP	0.5	1h 14min
DM5EP+T20	0.5	3h 20min
DM5EP+T20	1	4h 5min
DM6EP+T20	1	3h 5min

1.2.3 संक्षारण / Corrosion

Impact Studies of LPG Quality Parameters on Pipeline Corrosion: Experimental and CFD Simulation Activities
Sponsor: GAIL(India) Limited (3 years duration)

Objective of the Project

- Impact studies of LPG with individual impurities and their cumulative mixture on the corrosion of carbon steel subject to the various temperature (5-40°C) and pressure (2- 60 bar), considered impurities are moisture, H_2S, total sulphur, and odorants.
- CFD study to understand the effect of impurities like moisture, H_2S, sulfur, etc in LPG pipeline corrosion and to supplement the experimental team for carrying out bench scale experiments.
- Based on the studies, the limits for quality parameters like moisture, H_2S, total sulphur, and odorants in LPG will be prescribed.

Work Done in the Project

The main work was to analyze the effect of LPG and its impurities on the corrosion of carbon steel pipelines (API 5L X65). The well-polished API 5L X65 carbon steel was used for gravimetric analysis and it was placed in the reactor which was filled with the LPG (8-9 bar). After 168h of exposure, API 5L X65 carbon steel coupon was removed, and washed with water

followed by toluene - isopropyl alcohol mixture (1:1). These steel coupons were photographed. After taking photographs, the corroded surface of the coupons was cleaned using a de-rusting solution. The weight of each coupon was recorded, and tabulated in Table 1. The corrosion rate of each coupon was calculated in (mm/year). The following formula was used for calculating d the corrosion rate (mm/year)

$$Corrosion\ rate = \frac{(87.6\,\Delta W)}{(A\,T\,D)}$$

Where:

- ΔW= (Initial weight – final weight) weight loss (mg)
- A = surface area (cm^2)
- T = time (hours)
- D = density (g/cm^3)

Table - Gravimetric Analysis Details

Test solution	Gravimetric analysis	Weight loss	Pressure & temp.	Corrosion rate (mm/y)	Observation
Liquid petroleum gas	Initial weight:14.5887 g Final weight: 14.5886 g	0.1 mg	8-9 bar, 30 °C	0.0005	No significant corrosion
Liquid petroleum gas + H_2O (1000 ppm)	Initial weight: 13.0623 g Final weight:13.0589 g	3.4 mg	8-9 bar, 30 °C	0.0199	some pits were observed

Development of Corrosion Inhibitor Formulation for up and Mid Stream Applications
Sponsor: In-house (CSIR) (Duration - 3 years)

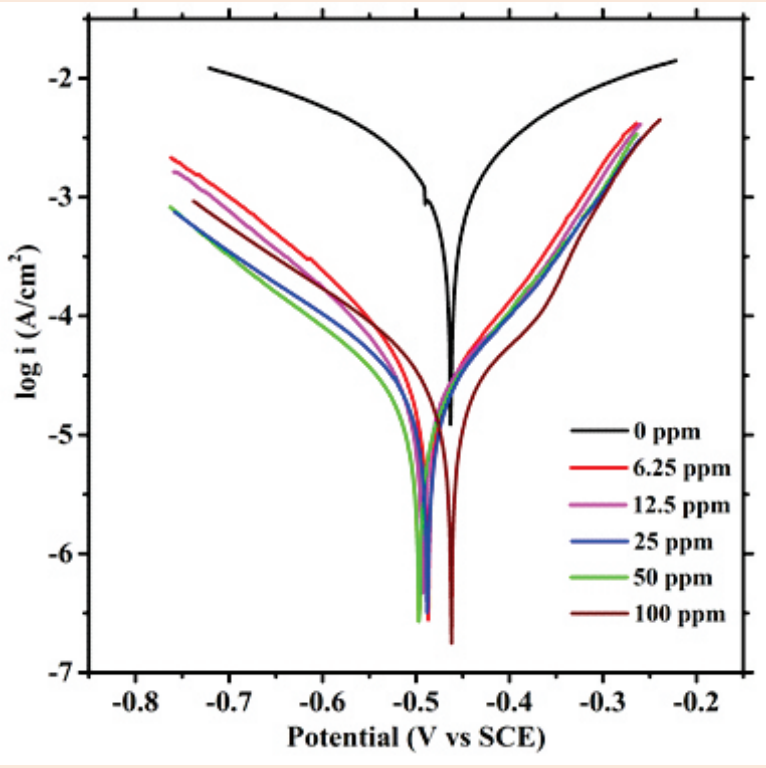
Objective of the Project

- Development of corrosion inhibitor molecules using 4-(dimethylamino) benzaldehyde, alkyl bromide, and thiosemicarbazide/hydrazine carboxamide/thiocarbazide/carbazide for carbon steel (API 5CT N 80, API 5CT J 55 & API 5L X 60) corrosion protection.
- Corrosion performance evaluation of synthesized corrosion inhibitor molecules on various carbon steel under upstream and midstream operating conditions, namely, 15 % HCl and CO_2 saturated 3.5 % NaCl at different temperatures (30-80°C) and pressure (10 – 60 bar) under static and dynamic conditions.
- After preliminary studies, the cost of the synthesized inhibitor formulation will be optimized with the suitable addition of other molecules in the solvent for achieving better synergistic effects for corrosion protection.
- Benchmarking the performance with the commercial inhibitor formulation.

Work Done in the Project

Anticorrosion performance of the developed novel amine based surfactants as corrosion inhibitors for the carbon steel in acidic environment was tested and the results are sumamrized in the Table below.

Concentration of inhibitor (ppm)	Ecorr (V)	icorr (A CM-2)	Linear polarization (Ω)	θ	Corrosion inhibition efficiency η%
0	-0.4631	1.77E-03	23	-	-
6.25	-0.4866	2.37E-05	869	0.9865705	98.657
12.5	-0.4918	2.17E-05	1034	0.987725	98.7725
25	-0.4964	1.54E-05	1490	0.9913016	99.1302
50	-0.4866	2.24E-05	1185	0.9873514	98.7351
100	-0.4614	1.63E-05	1122	9.91E-01	99.0792



Anticorrosion performance of amine based surfactant corrosion inhibitor on carbon steel

1.2.4 सतह विज्ञान एवं प्रौद्योगिकी प्रयोगशाला / Surface Science and Technology Laboratory

Development and Certification of New Generation Lubricant Formulations for Aerospace Surfaces and Components, CSIR Mission Mode Project

Objective of the Project

- To develop indigenous MoS_2 solid powder-based lubricants for Aerospace Surfaces and Components
- To develop a process to synthesize the MoS_2 solid powder at a batch size of >100 gm and total quantity: 1 kg
- To certify the developed product by CEMILAC

Work Done in the Project

Nanostructured MoS_2 powder was synthesized by varying the precursor ratio, reaction conditions, and volume of the reactor; optimized a batch of >240 gm against the proposed batch of 100 gm; Total 7 batches (batch size: >200 gm) of nanostructured MoS_2 powder are completed; Synthesized >1.5 Kg MoS_2 in 7 different batches of single-step chemical route against the target of 1 kg. Detailed chemical (XPS), structural (Raman), and crystalline (XRD), morphological (HRTEM) characterizations were completed to confirm the synthesis of nanostructured 2H-MoS_2. The evaluation of lubrication properties of synthesized nanostructured MoS_2 powder-based thin film was compared with commercially available MoS_2 Powder using ball-on-disc contact geometry. Successfully synthesized a batch of graphene oxide (batch size: 10 gm); Converted graphene oxide in to reduced graphene oxide via chemical reduction route; Graphene oxide and Reduced graphene oxide have been characterized by FTIR, Raman, HRTEM, XRD; Synthesized the blend of reduced graphene oxide and MoS_2; Detailed characterization and lubrication performance evaluation tests of reduced graphene oxide and MoS_2 blend are completed. As per desired specifications, the evaluation of synthesized MoS_2 powder (different batches) is under progress for the certification.

Key Findings of the Study/ Project

- Nanostructured MoS_2 powder was synthesized via single-step chemical approach at a batch size of >240 gm
- Synthesized >1.5 Kg nanostructured MoS_2 powder in 7 different batches
- Synthesized the reduced graphene oxide-MoS_2 nano-composite for superior tribological properties
- Presently, working on detailed evaluation of the desired specifications of synthesized MoS_2 powder (different batches) for the certification.



Digital photographs of MoS_2 powder prepared by single-step chemical route in five different batches (Batch size: >200 gm). Total quantity of synthesized MoS_2 powder in these 5 batches is ~1.1 Kg

Evaluation of Turbine and Compressor Oils, An Industry Sponsored Project by Hindalco Innovation Center, Mumbai

Objective of the Project

- Evaluation of compressor oils as per the IS 13256:1992 standard method
- Evaluation of turbine oils as per the IS 1012:2002 standard method
- Evaluation of turbine oils as per the ASTM D2272 and ASTM D943 standard methods for oxidation stability

Work Done in the Project

A number of compressor and turbine oil samples as received from HIC Mumbai have been evaluated as per the IS 13256:1992, IS 1012:2002, ASTM D2272, and ASTM D943 standard test methods, including oxidation stability.

1.2.5 स्वीटनिंग / Sweetening

Reformulation of the LPG Sweetening Catalyst

Details of Translational Work Done

After acceptance of our catalyst in ARAMCO for regular consumption in 2020. Till now we have received 1500 kg in last one and a half year. Since Saudi Aramco is a very important client, we felt the need to have supply security of our catalyst to the middle east. Accordingly a proposal was put up to the BPCL Management for developing a few more reformulations. BPCL Management readily agreed to support this activity in the form of sponsored projects. Presently work for scale up and trials of the new formulation is under progress at KRL.

New Variants of the Re-formulated LPG Sweetening Catalyst – Thoxcat ES for the M.E. Market – BPCL (SSP -0092)

The sweetening catalyst – Thoxcat ES has been commercialized in the Middle East (M.E.). The reformulated catalyst has the capability to handle carryover issues and has been accepted in ORPIC, Oman and Aramco, Saudi Arabia for regular consumption in 2020. Due to large market share of the catalyst particularly in the M.E., CSIR IIP and BPCL jointly agreed to develop an alternative variant for supply security to the middle east. Accordingly, the project was sponsored by BPCL

Achievements

- After rigorous evaluations one more variant has been identified for scale up.
- This formulation has been successfully scaled up at LONA in August 2022. Level 50 kg catalyst solution.
- It has been transported to the BPCL KRL refineries in the first week of September 2022.
- The trials have started at KRL (BPCL) in September 2022 their Coker LPG Sweetening Unit for its evaluations. Expected to run till March 2024. Closing report from BPCL is expected after this.

About the Contribution

For supply security of sweetening catalyst in the middle east

Outcome

An e-mail from BPCL R&D received on 14th March 2024 saying that verbal feedback of KRL has been received and the performance of reformulation is satisfactory and comparable to previous formulation. Project extended till 11 June' 24. A plan to do the second phase trials suggested

1.3 मोटरवाहन ईंधन और स्नेहक अनुप्रयोग प्रभाग / Automotive Fuels & Lubricants Application Division

Performance Evaluation of New Engine Lubricants Formulated for Motorcycles (The Project was Sponsored by an Oil Company)

Objective of the Project

To study the performance of engine oil formulations developed for a motorcycle against a reference product under typical real driving conditions with respect to the following parameters:

- Power retention
- Vehicle fuel economy
- Extended drain interval
- Performance of vehicles under Stop and Go driving conditions (city driving)

Work Done in the Project

The field trial involved two wheelers. Different oils were studied during the trial, with testing carried out over different drain intervals to understand the impact of oils on fuel consumption, oil consumption, power retention and engine deposits. In this project, over 5 lakh km mileage was accumulated across the tested vehicles, and the trials included two specific driving routes. In addition, 10 million data points on speed and location were analysed.

Key Findings of the Study/Project

This project provided valuable insights into the performance of various oils, the impact of driving conditions and routes on oil degradation and engine durability, as well as the effect of oil drain intervals on fuel consumption, oil consumption, and maximum power output.



Vehicles ready to go on field trials



Engines dismounted from vehicles after completing the field trials

Electric Retrofitment of a Polluting Diesel Auto-Rickshaw into Electric Auto-Rickshaw in Imphal using an EV Kit (of India parts) and Kit Roadworthiness Trials (In-house Project)

Objective of the Project

- Retrofitted electric-auto rickshaw (D+5 seater) with a top speed of 48 km/h and range of 80 km / full charge using Indian products in 6 months.
- Hand-holding process for interested local startups and retrofit-kit type approval, and know-how transfer of retrofitment of diesel autos into electric autos in Imphal City by the end of 12 months.

Work Done in the Project

In November 2022, CSIR-IIP signed a MoU with Transport Dept., Govt. of Manipur to find a solution to convert diesel autos into electric autos as there are about 20,000 diesel autos operating in Manipur, which causes air and noise pollution to the city residents. CSIR-IIP has conducted a project for electrification of an in-use diesel auto (of L5 category) into electric auto using indigenous components. A diesel auto was provided by Manipur Transport Dept. for the project. The diesel auto was electrified with a prototype Kit and demonstrated to the Joint Secretary and other transport officials of the State. The electric auto was put on field trial

for about 100 km in the real-world in Imphal and generated on-road data for further analysis and study for improvement. The kit will undergo compliance checks as per the Govt. gazette notification no. G.S.R 167 (E) dated 1st March 2019 and AIS-123 (Part-3) procedure. The notification allows for retrofitment of the existing diesel and petrol vehicles into Evs.

As an extended work of the project, CSIR-IIP has already developed a prototype intelligent vehicle control unit (iVCU) with built-in GPS and indigenous algorithm, and a new customised gearbox by a partner company. We have also received a 'Letter of Intent' from an industry partner. Some of the Govt. MSME centres have also approached us for collaboration for the 3W EV Kit and its associated HR training programs.

Key Findings of the Study/Project

The diesel auto was retrofitted into electric auto and demonstrated, during the road worthiness trials, the following observations were made.

- Battery Management System (BMS) needs to be a single unit
- Vehicle speed reached a little less than 45 km/h, however, it needs to reach min. <=50 km/h.



The electric auto with the Kit and prototype intelligent vehicle control unit.

Study and Prototyping of a Super Capacitor Management System (SMS) for EV Application
(CSIR Funded Project IHP-240009)

Objective of the Project

- Designing and developing control algorithm for SMS in Simulink environment
- Performance evaluation of various SMS technique in Simulink and try to achieve at least 10% energy share from the supercapacitor bank along with possible best fail-safe feature. Hardware implementation i.e., a demo prototype of SMS.

Work Done in the Project

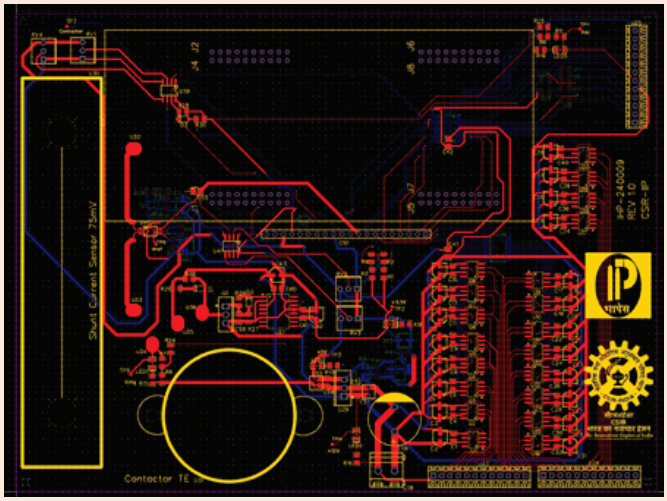
The well-known limitation of battery is that their internal resistance is sufficiently high when compared with super-capacitors also known as ultra capacitors and hence they are not suitable for quickly sinking and sourcing high currents. Whenever EV accelerates it demands a high amount of current from the battery in a very short moment and in the case of regenerative braking as well the energy has to be fed back to the battery in a very short span which deteriorates the battery life. Being one of the costliest components of EVs, the battery life needs to be improved for making EVs economically viable and efficient. Hence for such current hogging modes, Ultracapacitors are combined with battery.

Since ultracapacitors are sensitive to voltage and current variations, they need to be protected in order to safeguard. A SMS is designed by validating the concept in simulation. The target application as of now is for 48 V systems having 20 supercapacitor cells in series with each of 2.85 Volts. One of the biggest challenges was to take 20 voltage signals to processor, so mux was used along with active high common mode voltage differential opamp. A very high accuracy current-sensing ic was used to sense the current accurately using 75mv shunt.

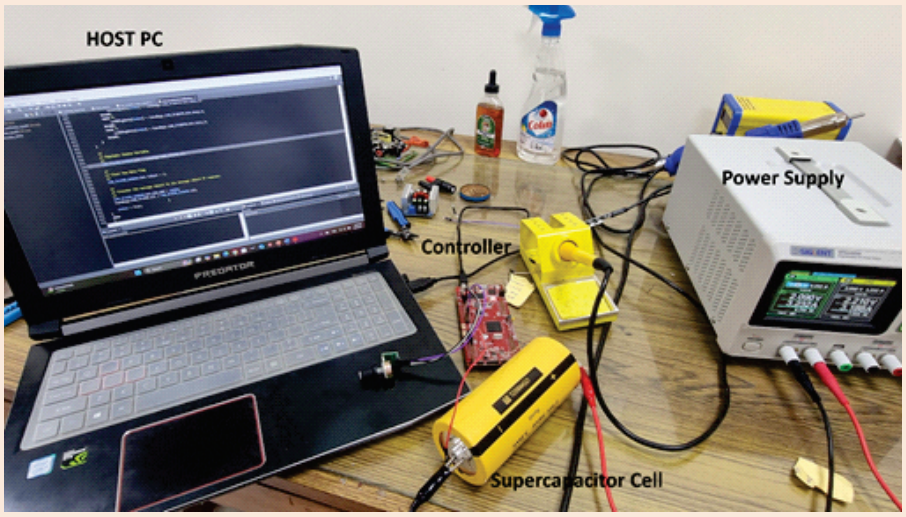
Key Findings of the Study/Project

The important observations so far from this project as follows:

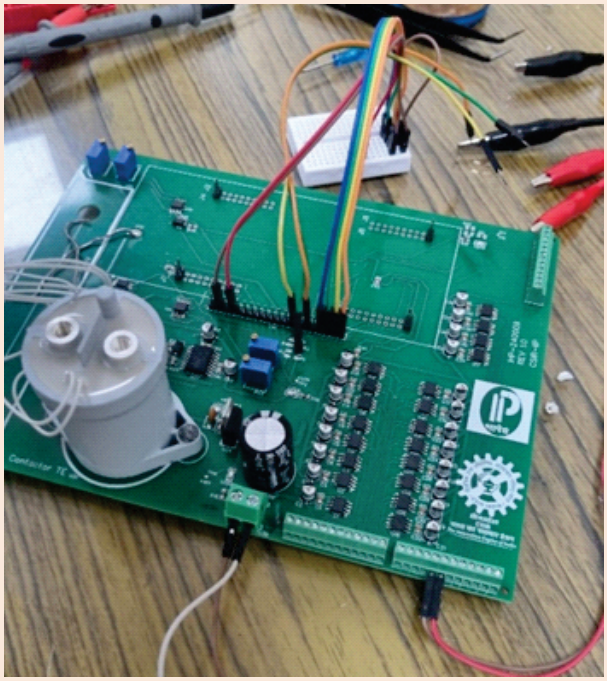
- The SMS has to continuously check SOC of Capacitors to avoid any overcharge conditions in order to avoid deterioration or permanent damage caused by overvoltage/over current.
- Current error can cause a huge error in SOC estimated overtime due to accumulation of error. Resetting and recalibration of system may be required at definite intervals.
- Since the current born by capacitors are huge hence fast isolation is a challenge, since MOSFET have limited current capacity and contactors are slow in operation.



Layout of the Designed PCB



Bench Level Validation of Single Cell



Designed PCB (Assembled)

Conversion of a Diesel Genset to a Dual-fuel Mode and Performance and Emissions Study of the Converted Genset
Collaborative Project with Upcharge Energy Solutions, New Delhi

Objective of the Project

To convert a diesel genset to a dual-fuel mode and performance and emissions study of the converted genset

Work Done in the Project

An indigenous dual fuel engine system has been developed and the technology has been transferred to Upcharge Energy Solutions LLP, New Delhi. This technology is based on a novel combustion mode control system and method. In CSIR IIP's dual fuel engine technology, gaseous fuel is fumigated at the intake manifold in addition to the direct injection of diesel into the combustion chamber This technology helps in achieving reduction of particulate matter emissions from in use gensets.

Key Findings of the Study/Project

- Environmental benefits by reducing PM emissions from stationary power generation. Laboratory test on an in use genset showed over 70% PM emissions reduction.
- The system can be integrated seamlessly into in-use genset and ensure smooth operation of genset even during frequent load changes
- The technology provides benefits not only in terms of emissions reduction but estimates show a Return on Investment opportunity as PNG is cheaper than diesel. For gensets with moderate loading and operation hours, it is estimated that the ROI is achievable in about 3 5 years



Dual-Fuel Engine System

1.4 जलवायु परिवर्तन एवं डाटा विज्ञान प्रभाग / Climate Change and Data Science Division

The Climate Change and Data Science (CCDS) division at CSIR-Indian Institute of Petroleum focuses on using data science, AI, and machine learning to evaluate and reduce the environmental impact of the institute's technologies. The division specializes in GHG emissions assessment, GIS mapping, life cycle analysis, molecular modelling, and advanced materials. CCDS ensures technology development aligns with climate goals by validating greenhouse gas impacts, performing environmental assessments, and enhancing technology efficiency through data-driven solutions.

National Greenhouse Gases Inventory for Road Transport Sector for BTR-1, BUR-4, and FNC
Sponsor: MoEFCC

Objective of the Project

Systematically prepare the Greenhouse Gas Inventory of India's road transport sector. Prepare the Biennial Transparency Report (BTR1), Biennial Update Report (BUR4), and Fourth National Communication

Work Done in the Project

A Life Cycle Assessment model (LCA) was developed for the CSIR-IIP DILSAAF™ process for converting used cooking oil (UCO) to sustainable aviation fuel (SAF), as well as for the RT-Biodiesel process for UCO-based biodiesel production. The study involved detailed analysis of GHG emissions across individual process steps, along with an assessment of emissions associated with each material and energy input. Furthermore, a comprehensive Environmental Impact Assessment (EIA) was carried out for both the CSIR-IIP DILSAAF™ and RT-Biodiesel processes, evaluating their overall environmental performance and sustainability impacts.

Key Findings of the Study/Project

- GHG emission of SAF produced from UCO via DILSAAFTM process has ~ 15% lower than conventional HEFA SAF process and ~ 90 % lower than petroleum-derived Jet Fuel.
- GHG emission of Biodiesel produced from UCO via RT-Biodiesel process is ~25% lower than conventional transesterification process and ~93 % lower than petroleum-derived diesel.
- A detailed GHG estimation report on SAF production from UCO via DILSAAFTM process has been submitted to Mangalore Refinery and Petrochemicals Limited (MRPL), India.
- Use of SAF and biodiesel derived from UCO can significantly reduce India's National GHG emission in the aviation and road transport sector.

To Study the Deposits & Distresses Characteristics of Automobile Engine Components, as per ASTM 20/21 Rating Manuals,
Sponsor: Original Equipment Manufacturers (OEMs)

Objective of the Project

To Evaluate the Product's Quality of Automotive OEMs & Fuel and Lubricants Industries.

Key Findings of the Study/Project

- Enhanced Engine Performance and Reliability.
- Improved Fuel Efficiency
- Optimized Engine Life.
- Optimized Oil Change Intervals.
- Lower Maintenance Costs.
- Extended Catalytic Converter Life.
- Reduced Emissions.
- Optimized carbon footprints by enhancing engine efficiency and selecting above parameters.

Design and Development of High-entropy Alloys using Artificial Intelligence for Gas Turbine Applications
Sponsor: CSIR, New Delhi

Objective of the Project

The work will lead to the development of high entropy alloy with a tensile strength 40% higher and ductility 20% higher than the existing Inconel alloy used in a gas turbine application.

Work Done in the Project

A comprehensive High Entropy Alloy (HEA) database was prepared and utilized to predict strength and ductility using various machine learning algorithms. To enhance and validate the ML model, multiscale and multiphasic simulations were incorporated, refining the predictions with experimental data. Through a multi objective optimization approach, optimal compositions were determined for achieving target properties, by designing more than 10 HEA sets with strength and ductility exceeding nickel-based alloys. This design was experimentally verified, followed by high-temperature mechanical testing and micro structural characterization. In addition, a high-temperature strength map was developed for HEAs and an algorithm capable of generating similar maps ware created for various alloy compositions. To make this research accessible, a graphical user interface (GUI) was designed for a material informatics software tool that predicts strength and ductility for any HEA composition. This tool empowers researchers and industry experts to explore custom HEA properties efficiently, advancing material design and broadening the application potential of high-performance alloys in demanding environments.

Key Findings of the Study/Project

- Achieved bulk synthesis of High Entropy Alloys (HEAs) in the range of 5 kg to 30 kg, enabling scalability for practical applications.
- Developed High Temperature strength map-using database of stress-strain of HEA at elevated temperature.
- Developed Graphical user interface material informatics software for predicting strength and ductility.



Graphical User Interface Material Informatic Software for HEA

30 kg high entropy alloy

Audit/Certification of Registered Vehicle Scrapping Facility as per GSR653 (E) and Subsequent Amendments

Sponsors: Pineview Technology Pvt. Ltd.,
AA1 Scrappers Pvt. Ltd., UP;
M/s Garhwal Scrappers Pvt. Ltd, Uttarakhand

Objective of the Project

To carry out annual regulatory and compliance audit of Registered Vehicle Scrapping Facility.

Work Done in the Project

The document verification for RVSFs was carried out in accordance with the established procedures. This process involved a thorough physical verification of the RVSFs, ensuring compliance with the laid-down guidelines. Following the verification, an audit report was issued to document the findings and results of the review.

Key Findings of the Study/Project

- The audit report for non compliances observed during the physical audit.
- Enhancement of audit compliance by improving the facility as per CPCB guidelines.

1.5 अपस्ट्रीम एवं मोम प्रवाहिकी प्रभाग / Upstream and Wax Rheology Division

1.5.1 अपषिष्ट प्लास्टिक रूपांतरण-प्रक्रम प्रौद्योगिकी क्षेत्र / Waste Plastic Conversion–Process Technology Area

- **Increasing the TRL of CSIR-IIP-GAIL process for conversion of waste plastics to diesel**
- **Analysis and Up-gradation of Pyrolysis oils for meeting fuel specification as per BS-IV/VI (fractionation & finishing)**
- **Synthesis of detergent range linear alkyl benzenes and Oxo-alcohols from linear alpha-olefins derived from polyolefin waste**

DEPOLUP Mission mode project
Name of the Sponsor: Council of Scientific & Industrial Research (CSIR)

Objective of the Project

- Production of diesel with >80% throughput and 63% conversion using segregated plastic waste comprising majorly of polyolefins in CSIR-IIP's 1 TPD pilot plant
- To assess the pyrolysis oils from various commercial polyolefin recyclers for potential to produce automotive grade fuel and develop a suitable methodology for upgrading in to fuel grade in compliance to BS-IV/VI specifications through fractionation followed by chemical treatment/hydro finishing
- To explore the feasibility to synthesis of surfactant range linear alkyl benzenes by alkylation and high-value Oxo-alcohols by hydro formylation of linear alpha-olefins of carbon range C9-C13 and C8-C16 respectively derived from thermal pyrolysis of polyolefin.

Work Done in the Project

- CSIR-IIP together with GAIL has set up a 1 TPD pilot plant in the CSIR-campus for converting waste plastics to diesel after developing the process at lab scale and subsequent validation at bench scale. For optimizing the process and based upon initial experimental runs, certain modification was planned and executed in the plant. The pre-treatment process for obtaining feedstock from MSW, including waste water treatment, was also optimized. A number of feed cut sere were undertaken with MSW derived waste plastics, where a conversion of 58-60 % to diesel was achieved.
- Many plastic pyrolysis plants have been set up, which produce pyrolysis oil, however these pyrolysis oils do not meet any standard specifications. A methodology based on fractionation and chemical treatment, without the aid of hydrogenation, has been developed that can upgrade the pyrolysis oil with improved colour, smell and reduced sulphur and metals impurities. The upgraded oil can meet the commercial LDO specifications.
- A lab scale proof-of-concept has been developed using commercially available catalyst support for Linear Alkyl Benzene (LAB) from waste polyolefins involving alkylation of alpha-olefins (C9-C13) rich pyrolysis oil with benzene with olefin conversion 60-65% and LAB selectivity up to 70%.



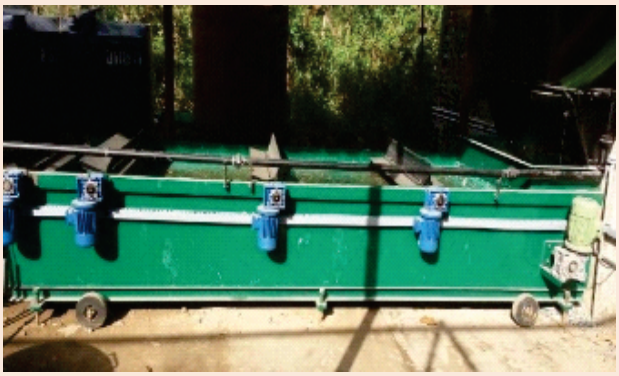
1TPD Waste Plastic Plant at CSIR-IIP



Blower



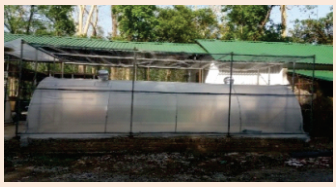
Shredder



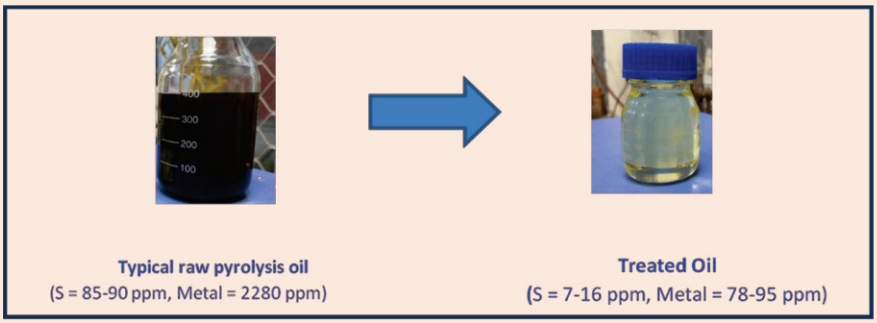
Washing& segregation tank



Conveyor system



Solar tunnel dryer



Similarly, a lab scale proof-of-concept has been developed for hydroformylation of olefin rich pyrolysis oil with syngas to synthesize alcohols and aldehydes with olefin conversion up to 100% and oxygenate selectivity 80-90%, yield of 45-47% with respect to the olefin present in the feed at temperature 160oC and pressure 50 bar. The hydroformylation process has been developed with an in-house developed catalyst and the performance has also been benchmarked with commercial Wilkinson and Dicobalt Octacarbonyl catalysts.

These alkylates can be utilized as feedstock for surfactant as well as lubricant additives, while the mixed alcohols as feedstock for surfactant as well as paint industries. Linear alkyl benzenes are priced at a market of Rs.140-150/kg with a demand of 3.5 MT per annum and the Oxo-alcohols are Rs.150-190/ kg with a demand of 3.3 MT per annum and hence the above processes can have good market potential.

1.5.2 उत्प्रेरक डी-पोलीमराइजेशन क्षेत्र / Catalytic De-polymerisation Area

(a) Feasibility of producing benzene-rich aromatics from waste cooking oil (WCO) - CSIR Sponsored Mission Mode Project

(b) Development of catalyst(s) based on nano concepts for the Dehydrogenation of Propane to Propylene - SERB/ANRF Sponsored

(c) Investigation of defect-rich zeolite-based catalyst(s) in the catalytic cracking of tree-borne oils to produce sustainable aromatics - DST Sponsored

(d) Analysis and up-gradation of pyrolysis oils for meeting fuel specification as per BS-IV/VI (by hydro-treatment)- DEPOLUP Mission Mode Project- CSIR Sponsored

(e) Enhanced production of alpha olefins by thermo-catalytic degradation of high density polyolefins- DEPOLUP Mission Mode Project- CSIR Sponsored (HCP-046)

Objective

(a) To develop a proof of concept consisting of a catalyst and process for the production of benzene-rich BTX by utilizing WCO at a throughput level of 1.6 -2.4 litres/ day with >80% paraffin-rich UCO conversion to >65% benzene-rich aromatics (with a benzene selectivity of ⩾20%).

(b) Design and development of noble metal free catalyst for the low temperature non-oxidative dehydrogenation of propane to propylene.

(c) Develop a simple strategy for the preparation of (a) defect-rich zeolites (b) three catalytically important materials: size-selected Cr, Zn, and Ga nanoparticles (NP) deposited on defect-rich zeolite support, to produce aromatic-rich hydrocarbons from TBOs. The developed catalyst is used in an alternative process to produce monoaromatics (i.e. BTEX) by single-stage aromatisation.

(d) Development of Indigenous catalyst for hydrocarbon value addition and demonstration of process upto 250 gm / day feed

(e) To explore the feasibility and demonstrate the process at lab scale for converting waste plastics to alpha olefins

Work Done

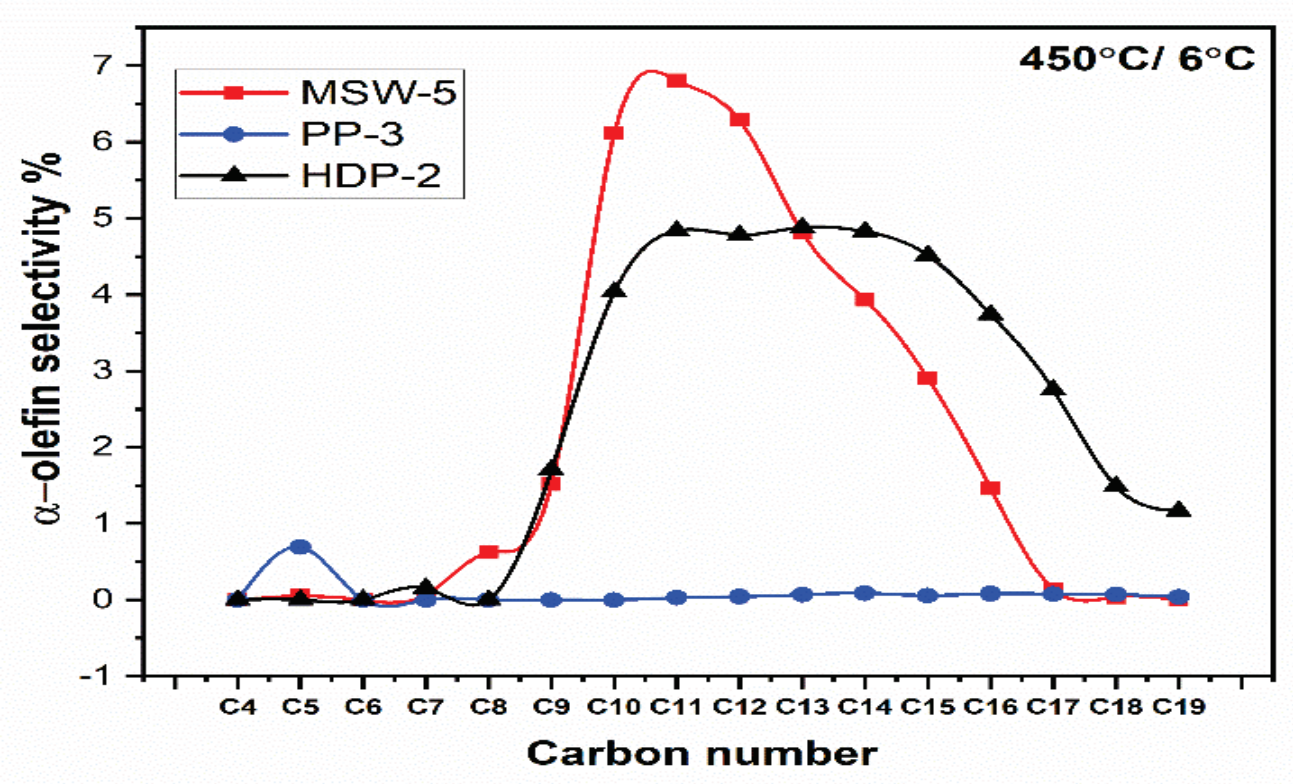
(a) Near 70-80% conversion of WCO to>15% benzene rich aromatics were obtained with Zn based Zeolites at a rector loading of 5g catalyst.

(b) Various bi-metallic Sn-based nano-zeolites have been synthesized. Near 52% conversion with 32% propylene yield was obtained at 450°C under atmosphere pressure. Steady conversion and yield till 24h time-on-steam

(c) Identified the suitable catalyst compositions and established the proof of concept for preparing defect rich zeolite at a 2-3g scale

(d) Pyrolysis oils were collected from multiple plastics recycling industries, characterized in details and fractionated. An indigenous catalyst was developed for hydro-treating of this oil, and a standard operating procedure (SOP) was prepared at a batch scale of 200g. This achieved low sulphur grade fuel, which can be fractionated to get low sulphur diesel.

(e) The thermal degradation of HDPE, PP and Waste Mixed Plastic (MSW) were performed at varying temperatures and different ramping rates and the amount of α-olefins in the range of C_5-C_20 as obtained by DHA analysis is given in the following figure.



1.5.3 अपस्ट्रीम क्षेत्र / Upstream Area

(i) CO_2 Sequestration in Subsea Sediments as Gas Hydrates (CSIR-CCUS Program)

Name of the Sponsor : Council of Scientific & Industrial Research (CSIR) Duration: 36 months (2023-2026)

Objective

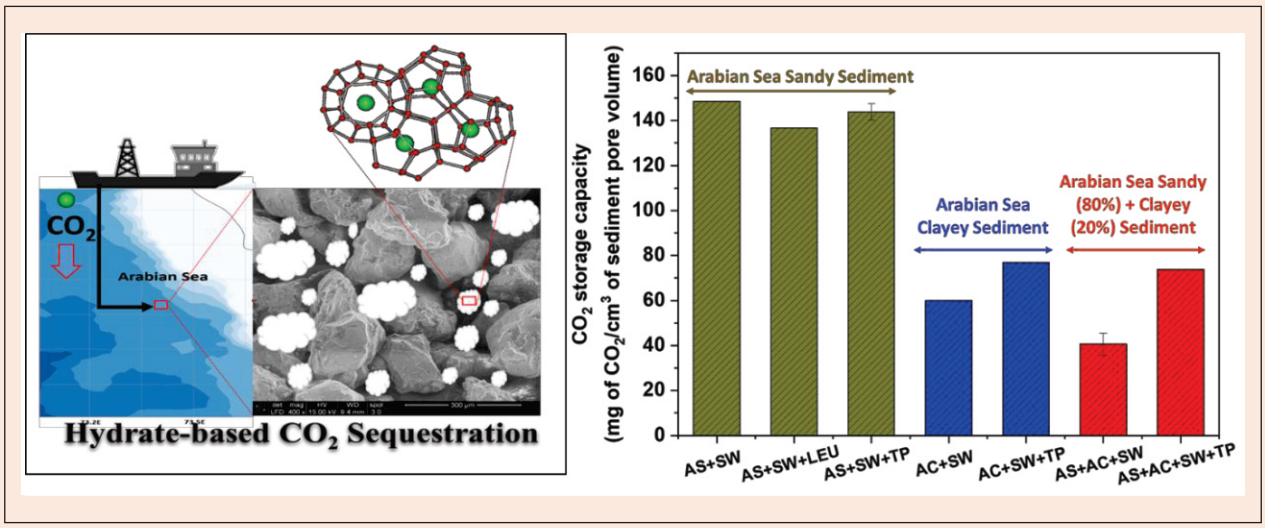
To demonstrate the feasibility of hydrate based CO_2 sequestration and stability (CO_2 seepage) in subsea sediments collected from the northern and eastern Arabian Sea. Moreover, to understand the influence of CO_2 injection/ CO_2 seepage from hydrate sediments on oceanic organisms (e.g. Diatoms, Foraminifera, Seaurchins, Phytoplankton composition etc.).

Work Done

To understand the CO_2 storage capacity and kinetics in actual sandy and clayey sediments collected from the Arabian Sea, we perform various experiments in a high-pressure reactor facility mimicking the actual subsea environment in the laboratory. Further, to enhance the kinetics of hydrate formation, we evaluate the performance of various biocompatible Amino Acids like L-Tryptophan (TP), L-Leucine (LEU), L-Histidine, etc. Based on our findings, we can draw the following conclusions and recommendations:

- The hydrate formation kinetics and CO_2 storage capacity in clayey sediments are significantly lower compared to the sandy sediments. Sandy sediments can store ~148-150 mg of CO_2/cm3of pore volume of sediment, while in clayey sediments it is ~45 mg of CO_2/cm3.
- The L-Tryptophan and L-Leucine amino acids were found to enhance the hydrate formation kinetics and Co_2 storage capacity compared to the other amino acids studied in this work.

Our results offer important insights into the deployment of hydrate-based CCS in deep sea sediments.



Co2 hydrate formation kinetics in Arabian Sea sediments/Comparison of Gravimetric CO2 uptake (mg of CO2/cm3 of sediment pore volume) for Arabian sandy sediment(Adapted from Negi et al., 2024)3

(ii) Novel in-situ Microbial Thermal Stimulation Approach of Methane Recovery from Natural Gas Hydrate-bearing Sediments and Simultaneous Carbon Dioxide Sequestration: Experimental Investigations and Modelling

Name of the Sponsor: Council of Scientific & Industrial Research (CSIR) (CSIR-FBR Project)

Objective

To explore in-situ microbial thermal simulation for CO_2 sequestration and CH_4 recovery from gas hydrate.

Unlike the conventional fossil fuel reserves, the natural gas hydrate reserves (Non-conventional energy resources) are distributed across the globe. Despite their occurrences at multiple locations across the continental margins and Arctic regions, still its continuous recovery at a large scale has still not been attained. Researchers across the globe are working on various approaches to recover natural gas in an efficient/continuous way. In this direction, we are proposing a novel hybrid gas recovery technique using natural sources of energy along with CO_2 injection, which can offer enhanced recovery along with CO_2 sequestration. In this approach, we are exploring in situ microbial thermal stimulation that can be utilized to cross the hydrate stability region and ensure continuous methane recovery. Moreover, the in-situ production of bio-surfactants is supposed to enhance the CO_2 hydrate formation and improve CH_4-CO_2 replacement efficiency. Furthermore, we aim to develop a rigorous chemical potential-based dynamic model to predict the hybridized CH_4 recovery kinetics at simulated subsea conditions.

(iii) Ramanujan Fellowship and Research Grant: Clathrate Hydrates: Opportunities for Innovative Technologies

Name of the Sponsor: Science and Engineering Research Board (SERB)/ANRF, India

Objective

The objective of the Ramanujan Fellowship research grant is to conduct research and development in the gas hydrate domain. This may involve exploring various innovative approaches, including: Hydrate-based gas separation and storage; Flow assurance in oil and gas pipelines; Potential recovery methods for extracting natural gas from hydrates and fundamental studies to characterize gas hydrate samples.

Key Findings of the Study/Project

i. Locations in the Arabian Sea where sediments are sandy and porous are more susceptible to enhanced hydrate formation and CO_2 storage.

ii. To enhance the CH_4-CO_2 hydrate replacement process, we produce a low-cost Bio-surfactant (Rhamnolipid) using CSIR-IIP Cafeteria UCO (yield ~15.53 g/L).

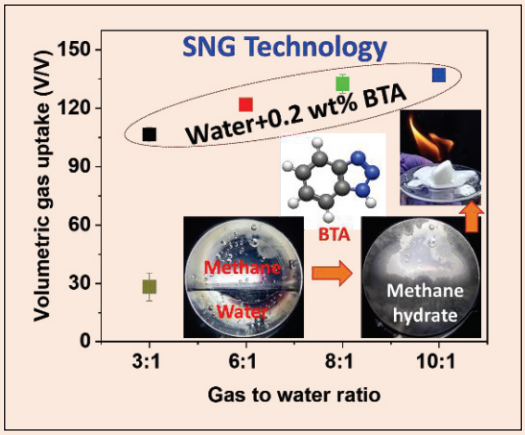
iii. Benzotriazole (BTA), a commercial corrosion inhibitor, has been identified as a new kinetic hydrate promoter, increasing methane hydrate formation by about 4.5 times compared to the baseline.

Great Impact Work

Solidified Natural Gas (SNG) Technology for Gas Storage and Transport as Clathrate Hydrates

Natural gas (Mainly methane) plays a crucial role in the energy transition and decarbonization, as it is abundantly available through both conventional and unconventional resources and emits less CO_2 compared to coal and oil. With global momentum shifting towards a natural gas-based economy, there is a growing demand for effective technologies to store and transport natural gas efficiently. Various methods for transporting natural gas have been explored worldwide. The most common method is transportation via gas pipelines. However, this approach isn't always practical due to factors like long distance, cost, and feasibility. An alternative method for transporting and storing natural gas in smaller volumes is compressed natural gas (CNG). This method has drawbacks, including safety concerns (~200 bar pressure) and limited volumetric storage capacity. For large-scale and long-distance transportation, liquefied natural gas (LNG) has been recognized as the most suitable option, as it offers a high volumetric storage capacity (600 times greater than under standard temperature and pressure conditions). Currently, LNG tankers are utilized to transport natural gas from production sites to areas of demand. While LNG is widely regarded as the most effective method for transporting natural gas, its use for large-scale, long-term storage is limited by the extremely low temperatures (-162 °C) required to maintain LNG stability, as well as ongoing boil-off issues. Another promising approach is adsorbed natural gas (ANG), which involves adsorbing natural gas onto porous materials such as metal-organic frameworks (MOFs). Many materials for ANG are currently under active research and development.

An alternative method for storing and transporting natural gas is through clathrate hydrates, also known as Solidified Natural Gas (SNG) technology. This approach presents several advantages that make it a promising option. Notably, the hydrate formation process is environmentally benign, as it utilizes only water or seawater. Additionally, it requires moderate temperature and pressure conditions during both formation and storage. SNG offers a highly compact storage mode with relatively high energy content per unit volume. It is also considered an extremely safe storage method due to its non-explosive nature, and the recovery of natural gas from clathrate hydrates is easy and cost-effective. Irrespective of several benefits of SNG technology, sluggish kinetics of hydrate formation is one of the major constraints to its commercial deployment. Therefore, to address the sluggish kinetics issue, we have investigated the hydrate-promoting performance of a commercially available corrosion inhibitor. We have demonstrated that the addition of a small amount (0.1-0.5 wt%) of BTA enhanced the methane hydrate formation kinetics as well as storage capacity by a factor of ~4.5 compared to the no-additive test. The gas-to-liquid ratio above 6:1 was found to be the optimum, offering the highest volumetric gas storage capacity of ~138v/v. The gravimetric storage capacity of ~120 mg of CH_4/g of water was attained in just 30 min of the hydrate formation test. Our results of rapid hydrate formation kinetics would enable the commercial deployment of solidified hydrate-based natural gas storage (SNG) technology.



Methane storage capacity with BTA at various gas-to-liquid ratios. (Adapted from Sutradhar et al., 2024)4

Industry Stakeholder Interactions

Interaction with ONGC:

The GHRTC and KDMIPE, ONGC team, visited our upstream laboratory and highlighted the potential areas for technical collaboration.



Interaction with GAIL India Ltd.

A team from GAIL India Ltd. visited our upstream laboratory and discussed the potential areas of collaboration.



1.6 सामग्री संसाधन दक्षता प्रभाग / Material Resource Efficiency Division

Fisheries Waste Utilization and Product Development for Growth and Propagation of Microorganisms

Introduction

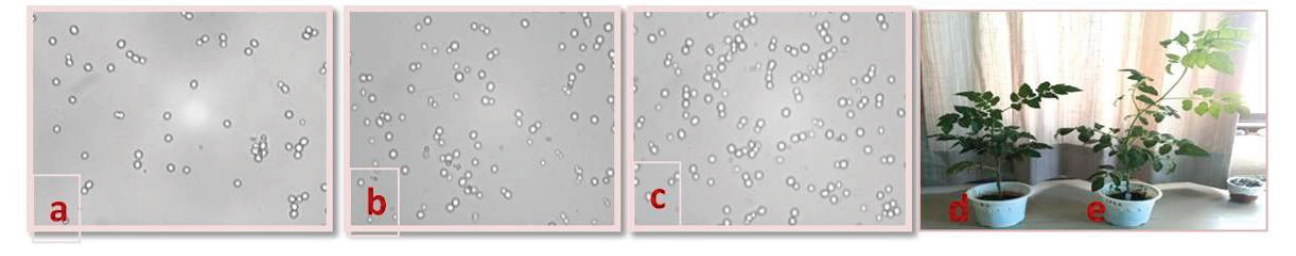
India is the second largest fish-producing country globally, accounting for 7.56 percent of global production. The fisheries sector has demonstrated an outstanding double-digit average annual growth of 10.87 percent since 2014-15, with record fish production of 145 lakh tons in 2020-21. Fish and its products are considered an affordable source of animal protein and a variety of essential micro and macronutrients. However, the massive production of fish and its products generates tremendous fishery waste that leads to environmental pollution. The presence of fish waste in water bodies depletes the dissolved oxygen as it decomposes, leading to reduced water quality, strong unpleasant odours, and adverse effects on aquatic life. Therefore, to minimize the associated environmental hazards, we are targeting developing new technology and processes to manage and develop sustainable solutions to recycle them into marketable products.

About the S&T Achievement

We have developed proof-of-concept (PoC) for sustainable technologies aimed at the effective management and valorization of fishery waste, addressing a critical environmental challenge emerging from India's rapidly expanding fisheries sector. The approach converted nutrient-rich fish waste into value-added products, specifically microbial culture media supplements and biological inputs for the agricultural sector. Various classes of microbes were evaluated for their growth performance and kinetics on the developed culture media, yielding promising and encouraging results. As a biological input, the fish waste-derived product demonstrated biostimulant properties, significantly enhancing plant growth, productivity, stress tolerance, and soil microbiome quality. This work exemplifies the integration of waste management with resource recovery.

Outcome

The project resulted in the successful development of a sustainable and eco-friendly approach for managing fishery waste generated from the rapidly growing fisheries sector in India. The project enabled the transformation of nutrient-rich fish waste into valuable products such as culture media supplements, and bio-based material for plant and soil health enhancer. The project promoted circular economy principles by turning waste into marketable resources, thereby opening new income-generating opportunities for coastal and fishing communities and supporting sustainable development in the sector.



1A 1B

Figure 1 A. Cell growth and morphology study in presence of Fish waste derived culture media supplement compared with commercial component (a) Xylose as a carbon source (b) Glucose as a carbon source (c) Fish waste derived component.

Figure 1 B. Comparative assessment for growth in presence of biological input in tomato plant (C) without biological input (d) with biological input

Anaerobic Conversion of De-oiled Yeast Biomass Fractionation Waste to Biomethane and Biohydrogen for Resource Efficiency in Biorefineries

Introduction

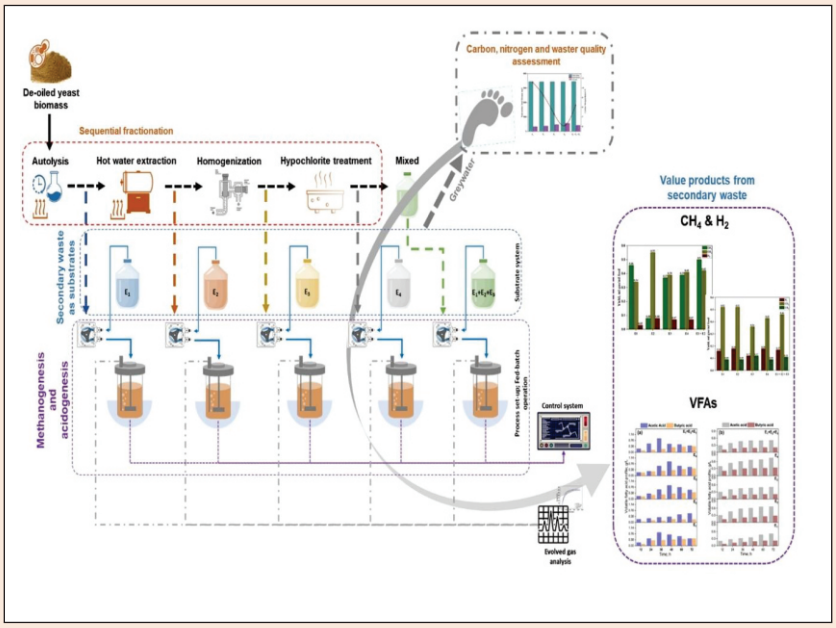
High-value intracellular bio-compounds are extracted from microbial biomass through cell fractionation processes, which generate discharge streams. These discharges are rich in organic carbon and nitrogen that are derived from the soluble and insoluble protein and carbohydrate polymers. The present study investigated the anaerobic conversion of such a tertiary waste stream generated during the production of glucan-chitin complex through fractionation of de-oiled yeast biomass (a type of spent microbial biomass, which is the solid leftover residue of yeast lipid production process).

About the S&T Achievement

Fed-batch anaerobic processes of methanogenesis and acidogenesis were investigated for the generated discharge streams. An average COD removal of 47 % with 294 and 323.51 mg VFA/g COD, with a maximum yield of 133.61 mL CH_4/g COD and 53.45 mL H_2/g COD in methanogenic and acidogenic fermentation was achieved. Considering CH_4 production and COD removal, methanogenesis performed better, while in terms of VFA production and subsequent COD removal, acidogenesis was suitable. The investigation indicated the relevance of anaerobic processes for the conversion of de-oiled biomass fractionation discharge streams and suggested a route for integrating aerobic downstream waste to anaerobic fermentation systems, subsequently eliminating a greywater footprint of 5233.04 g/L and opening a prospect for an industrial symbiosis system.

Outcome

The findings highlighted the potential of these systems in process integration for fermentation-based process chains to achieve circularity and resource efficiency in production.



Bio-CH4 and Bio-H2 production from yeast biomass fractionation waste

Lipase Production from Renewable Resources and its Application in Bioremediation

Introduction

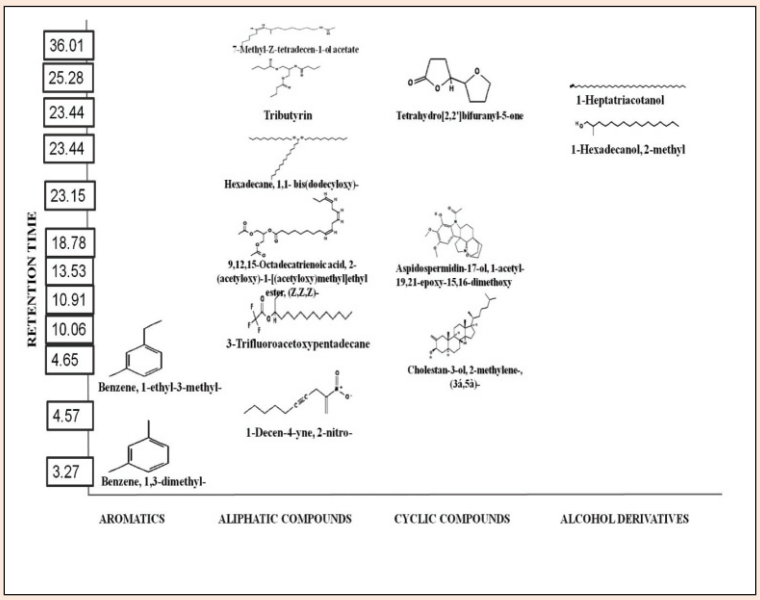
The biodegradation of petroleum fractions is a significant environmental challenge, requiring effective bioremediation strategies. This study investigates the potential of lipase, produced by a mesophilic yeast, cultured in detoxified lignocellulosic corncob hydrolysate with used cooking oil as an inducer, to degrade used engine oil.

About the S&T Achievement

Optimization of lipase production through statistical design of experiments showed that key factors like used cooking oil, incubation time and yeast extract significantly impacted enzyme activity. Under optimized conditions, lipase activity of 70 ± 0.05 U/mL was achieved . Biodegradation experiments revealed that the lipase had a high affinity for hydrolyzing hydrocarbons in used engine oil, with a degradation efficiency of 46 ± 0.70% % over 15 days. Detailed analysis (through GC-MS) revealed significant reductions in hydrocarbon concentrations and the formation of new functional groups, confirming the enzyme's ability to break down complex hydrocarbons into less toxic compounds.

Outcome

These findings suggest that lipase could serve as a promising biocatalyst for the bioremediation of oil-contaminated environments, including soils and water surfaces, in an environmentally friendly manner.



Compounds in Used Engine Oil degraded by the lipase enzyme

Biomass to Bio-bitumen/Bio-binder

Introduction

Every year India import 40-45% of its total bitumen consumption which cost around 1.3 billion in 2024. As an agrarian economy, India has produced 682.6 MMT of biomass in 2017-18 and out of which 178 MMT was surplus biomass. Rice has the highest share in total biomass generated (225.4 MMT) and surplus (43.8 MMT) biomass followed by Wheat and sugarcane. If only half of the rice surplus biomass (22 MMT) processed, it would be helpful to reduce India's bitumen import bill significantly, dependency on conventional bitumen and it would also be supportive for inclusive growth in a sustainable way.

CSIR-Indian Institute of Petroleum, Dehradun (CSIR-IIP) has developed a process for converting waste agricultural biomass to produce bio-oil through pyrolysis process in a screw reactor (3 kg/h). The produced bio-oil is then processed further to make it suitable as bio-bitumen/binder, which can be blended with conventional bitumen in the range of 10-25%. All the Physico-chemical characterization and laboratory testing has been done by CSIR-Central Road Research Institute, New Delhi (CSIR-CRRI)to find it as a potential substitute for conventional bitumen. CSIR-IIP, CSIR-CRRI with the support of M/s. Sekura Pvt. Limited, and NHAI, Ministry of Road, Transport and Highway (MoRTH), Government of India, has successfully demonstrated the field trail of bio-bitumen (produced from Rice straw) for the construction of World's First 100-meter road on National High-6, Jorabat to Shillong (Barapani) Section on 26th October 2024.



World's first road laying activity with Bio binder

1.7 ट्राइबॉलॉजी / Tribology

Characteristic Property Evaluation of Fire-Resistant Hydraulic Fluid
Sponsor: M/s. Quaker Chemical India Ltd.

Objective

To evaluate the wear resistance properties of hydraulic fluid.

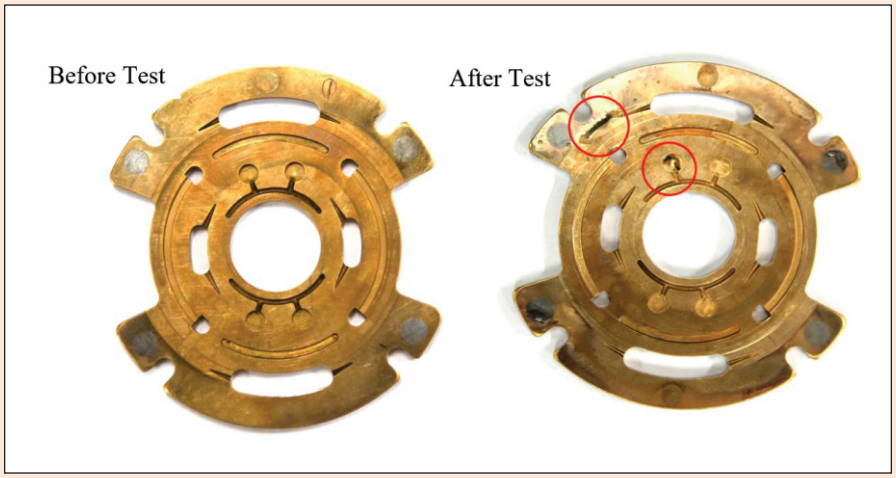
Work Done

Hydraulic fluid is an essential component of a hydraulic system. It influences crucial performance parameters such as power transmission, lubrication, heat dissipation, debris transport, contamination and sludge formation. Hence, selecting the appropriate hydraulic fluid for a given application is essential to ascertain the best performance and efficiency of the system. The hydraulic fluids are specified by their characteristic properties: viscosity, suitable operating conditions, anti-wear properties, etc.

Hydraulic oil is a non-compressible fluid that transfers power within hydraulic machinery and equipment. Hydraulic oil can be synthetic- or mineral-based. Although this helpful fluid is commonly used to transfer energy, hydraulic fluid can act as a sealant, coolant and lubricant within machinery and equipment. The critical role of hydraulic oil in a hydraulic system is to transfer power from one end of the system to another through the various hydraulic components.

A single hydraulic oil cannot usually meet all the desired characteristics; therefore, these oils are specially formulated based on the conditions in which they will be applied. Considering the importance and significance of hydraulic oils, it is essential to ascertain the quality and applicability of hydraulic oil. This calls for rigorous quality testing and evaluation of the hydraulic oil. Hence, M/s. Quaker Chemical India Pvt. Ltd. approached CSIR-IIP to test and evaluate its hydraulic oil sample.

The work scope involves testing and evaluating the hydraulic oil sample "HOUGHTOSAFE 620E"supplied by M/s. Quaker Chemical India Pvt. Ltd., per the standard test specifications proposed in IS 10532 Part III and the 35VQ Pump Test. The tests proposed in IS 10532 Part III include i) Appearance, ii) Kinematic viscosity, iii) Foaming stability, iv) Pour point, v) Relative density, vi) Water content, and vii) Rust preventive characteristics.



Side plates of Vane Pump before and after the Test

Key Findings of the Study/Project

The FRHF sample caused cavitation and erosion damage to the side plates of the vane pump, thereby aborting the test in between. The sample observed phase separation, causing damage to the pump parts.

Testing of Fire-Resistant Hydraulic Fluid
Sponsor : M/s. Lubrichem, New Delhi

Objective

To test and evaluate the characteristics of fire-resistant Hydraulic fluid using standard test procedures.

Work Done

Lubricants are an integral part of the machinery used in industrial, mine, marine, construction and domestic applications. Apart from lubricating the contacting surfaces, it helps reduce friction and wear between them. The lubricant performs many functions depending on the machinery and application where it is used. The specialised operations of lubricants involve transferring heat, sealing action, carrying away wear debris, cleaning and cleansing the system, etc.

Hydraulic fluids have a significant share in the fire-resistant lubricants category. The types of hydraulic fluids are categorised and defined within the ISO 6743-4:2015 standard. Those with fire-resistant properties, commonly called fire-resistant hydraulic fluids (FRHF), are of six categories: HFAE, HFAS, HFB, HFC, HFDR and HFDU. These fire-resistant hydraulic fluids are formulated as oil-in-water emulsions, water-in-oil emulsions, water-glycol solutions or

phosphate esters. Other than these, other synthetics such as polyol ester, polyether glycols, and natural esters are also used as fire-resistant hydraulic fluids.

Due to their chemical composition, fire-resistant hydraulic fluids display unique characteristics. Hence, M/s Lubrichem, New Delhi wanted their FRHF of the category HFDU 68 to be tested and evaluated as per standard test procedures prescribed in IS 10532 Part V. The lubricant sample was tested for its Appearance, Water content, kinematic viscosity, Viscosity Index, Air release properties, relative density, emulsion characteristics, acidity, foaming characteristics, corrosion and rust prevention characteristics, ash content, seal compatibility, flash, fire and pour points, hydrolytic stability, and auto ignition temperature characteristics.

Key Findings of the Study/Project

The HFDU 68 lubricant sample from M/s. Lubrichem, New Delhi, meets the norms and standards for the FRHF fluids as per Indian Standards.

Friction and Wear Behaviour of Friction Wedge Material for Railways
Sponsor : M/s. Mandeep Industries, Lucknow

Objective

To evaluate the friction and wear characteristics of the developed friction wedge material.

Work Done

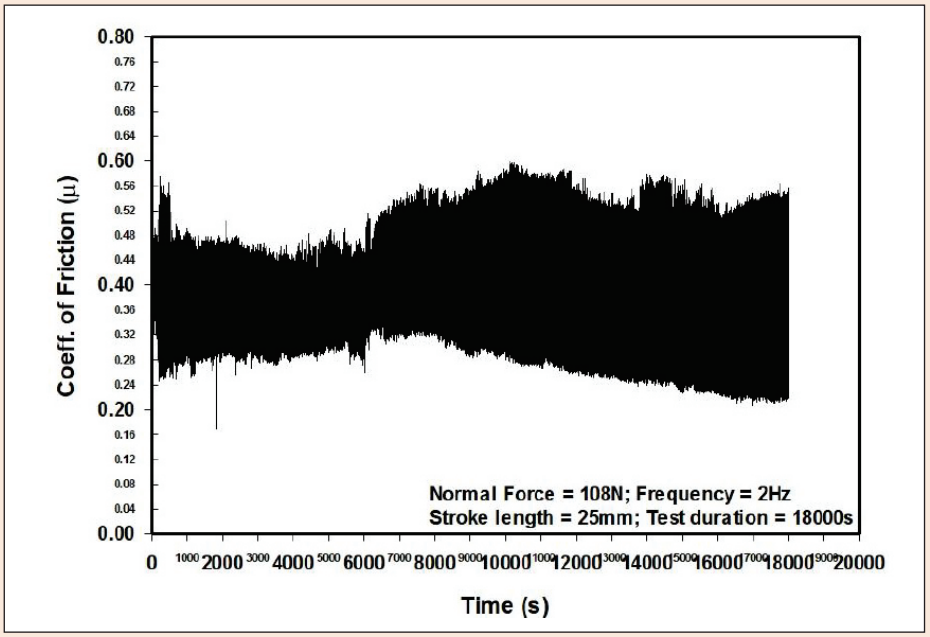
A friction wedge with a metallic/composite liner is often desired to enhance damping characteristics and improve railway applications' dynamic behaviour and speed potential. In Indian Railways, the Metallic friction wedge is fitted in CASNUB bogies of the freight cars. The friction wedge dampens the system through Coulomb Damping. These wedges are placed between a moving bolster and a fixed side frame so they are left with a single degree of freedom, i.e. vertical oscillation. They rub against the metallic liner welded on the column of the fixed side frame and are exposed to wear. Excessive wear of matching faces, i.e., the friction wedge, bolster slope liners, and bogie side frame column liners, reduces the damping force, adversely affecting bogies' riding parameters.

The tribological performance of the friction wedge material can be simulated on a pin-on-plate tribo-tester utilising reciprocating motion. Hence, the experiments were performed on a pin-on-plate reciprocating tribo-tester, considering the operating conditions of the railway bogies. The tribo-tester comprises a stage that can move in the x- and y-directions. With the help of reciprocatory drive, the stage can reciprocate in the x-direction at a desired frequency. The test plate specimen is fixed on the stage and can reciprocate at the desired frequency and stroke length. The scope of the work included testing and evaluating friction wedge material as per the 2486392/2024/O/o ED/SW/RDSO specifications laid down by RDSO Lucknow.
The as-received test specimens (pin and plate) were first coded and checked for surface conformance. To ensure complete surface area contact, the pinwas run-in on the plate at loads of 25-50N for 20- 30 minutes on a case-to-case basis. Once the full contact of the pin and plate pair was achieved, the specimens were cleaned with the help of solvent and dried in an oven to remove any traces of wear debris or dirt. The dried specimens were weighed with the help of a

laboratory balance to the fourth decimal place of a gram. The pair was reassembled, and the contact conditions were re-checked. After obtaining the total area contact, the pins were loaded, and the experiments were performed per the desired conditions. At the end of the experiment, the pin and the plate were removed, cleaned with solvent and dried in an oven to remove the traces of wear debris. The dried specimens were again weighed with the help of a laboratory balance. The weight measured before and after the tests was used to determine the weight loss and the corresponding wear rate. The friction force was continuously monitored and recorded with the help of data acquisition software. Each experiment was repeated to ascertain the repeatability and reproducibility of the results.

Key Findings of the Study/Project

The experimental findings reveal that the friction wedge material meets the standard requirement as per the specifications laid down by RDSO Lucknow.



Frictional Force at 2Hz and 108N for 5hr test duration

R&D Work carried which has a Significant Impact

Unravelling the Effect of Chain and Branch Content on Viscosity of Polyisobutylene-Mineral Oil Blends

Modern lubricants provide mobility and enhance the efficiency of the system. A wide range of additives is blended into the base oil to impart specific desirable properties to improve its performance. Lubricant science primarily aims to correlate measurable viscoelastic properties, such as viscosity and specific volume, with structural parameters, such as molecular dimensions and intermolecular frictional constants. This correlation helps in understanding the effect of molecular dimension on the physical properties of lubricants and estimating those physical properties theoretically.

Till 1960, several researchers suggested that lubricant viscosity (η) is greatly influenced by (i) structural factor (F): dependent mainly on the number of atoms (Z) in the chain's backbone, and (ii) temperature density: dependent on friction factor per chain atom (ξ). It was later

observed that the polymer dimension plays a significant role in viscosity and influences the structural factor of the lubricants. The focus of the study shifted to the polymer coil dimension, rather than chain length. Researchers introduced new structural parameters that consisted of the radius of gyration (S), molecular mass (M), chain length (Z), and branch content (∅) and concluded that the dimensional factor (X) is a more critical parameter than either molecular mass (M) or chain length (Z).

Interestingly, though the research has been conducted with different sets of chemical compounds, mathematical modelling has never been employed for mineral oil-based lubricants. Hence, an attempt was made using the Berry and modified Fox equations to model the relationship between viscosity and molecular structure of paraffinic mineral oil (N 150) blended with a popular viscosity index improver, i.e., Polyisobutylene (PIB). PIB is an excellent VI (viscosity index) improver because it has a high molecular weight and is highly flexible, allowing it to maintain its viscosity over a wide temperature range

Molecular Structure of Lubricants

Generally, mineral oils are blends of various viscosity grade hydrocarbons; hence, their molecular structure is unknown. Analytical techniques such as NMR, GPC, and CHNS are employed to approximate the molecular structure of mineral oils. The NMR data of N150 mineral base oil revealed that it consists of 29.30% of terminal CH_3 proton, 62.70% of CH_2 proton and 8.00% of the naphthenic proton (Hnaph). The GPC data provided the information on the number average molecular weight, Mn and the weight average molecular weight, Mw, of mineral oil. The data obtained from GPC and NMR analysis are sufficient for the approximation of the molecular structure of the mineral oil

The approximation of terminal CH_3 and CH_2 groups in mineral-based oil are;

Molecular weight of terminal CH_3 groups in N-150 mineral base oil $= \frac{495*0.293}{100} = 145$

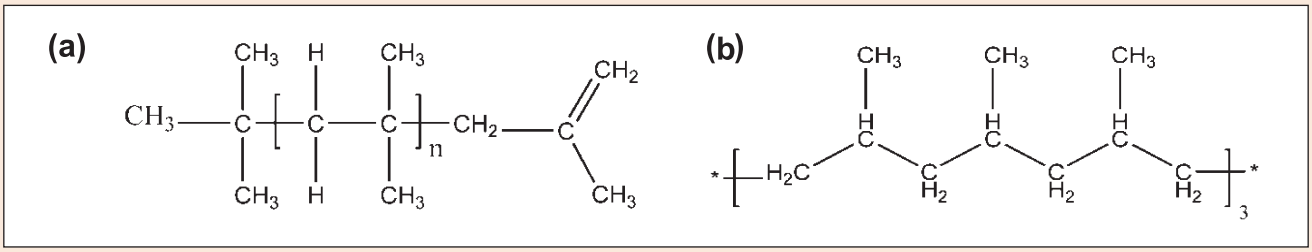
Number of terminal CH_3 groups $= \frac{molecular\ weight\ of\ terminal\ CH_3\ in\ N150}{molecular\ weight\ of\ CH_3} = \frac{145}{15} = 9$

Similarly for CH_2 groups:

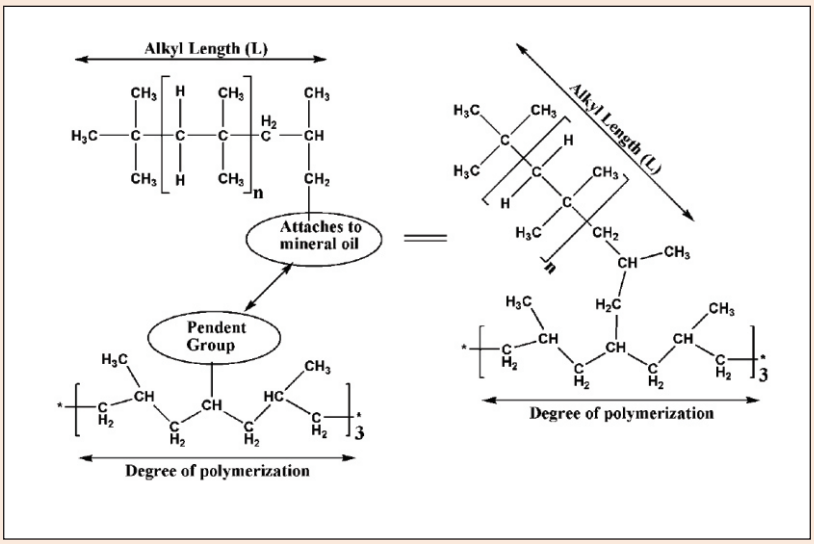
Total molecular weight of terminal CH_2 groups $= \frac{495*0.627}{100} = 310$

Number of CH_2 groups $= \frac{310}{14} = 21$

the order 92 92%, with 9 terminal CH_3 and 21 CH_2 groups with a linear hydrocarbon chain. The approximated molecular structure of N-150 mineral-based oil and PIB is shown in the figure



The molecular structure of (a) PIB and (b) the approximate molecular structure of mineral base oil.



Schematic Diagram of PIB Blended in Mineral Oil

- Several factors contribute to the calculation of the theoretical specific volume and viscosity. The structural volume model uses molecular mass, Van der Waals volume, and molecular packing factor to estimate the theoretical specific volume (V0T). The structural-viscosity model based on Berry and Fox has been used to estimate viscosity (η0T) at atmospheric conditions. Several steps are involved in determining the specific volume from the molecular structure. The molecular mass (M), Van der Waals volume (Vw), Van der Waals specific volume (vw), molecular packing factor (MPF), and specific volume (V0T) are all computed based on the molecular structure. The structural-viscosity model of Berry and Fox is used to calculate viscosity as the product of the structural factor and the monomeric

Viscosity Variation Structure

Blending PIB in mineral oil enhances its thickening, increasing its viscometric property. A significantly higher degree of polymerisation is necessary for low-branch-content mineral oil to achieve higher viscosity than a PIB with high-branch content.

The table below shows the PIB concentration in the base oil and the volume and viscosity obtained from the mathematical equations used. Due to longer chain length and branch content, the friction factor of PIB blend increases with an increase in PIB concentration. The viscosity values are very close to experimental viscosity values obtained by the Stabinger Viscometer (SVM3000, made by Anton Paar). It is evident from these results that the Berry and Fox equation can give a viscosity which is very close to the experimental viscosity values.

Table: Intermediate Values for Viscosity and Experimental Viscosity Values

Sample	∅ %	Volume	F(X)	ξ	$\eta_{Theoretical}$	$\eta_{Experimental}$
Mineral Oil (B.O)	0	1.153679	110847393	3.04E-07	33.71	33.72
B.O+2%PIB	2	1.152553	105028373	4.01E-07	42.13	39.486
B.O+4%PIB	4	1.151427	99217846	4.98E-07	49.48	46.631
B.O+6%PIB	6	1.15030	93555156	5.95E-07	55.75	55.701
B.O+8%PIB	8	1.14911	89107364	7.12E-07	63.44	66.569
B.O+10%PIB	10	1.14805	85926026	8.38E-07	72.01	78.752

The study presented a modelling system that connected lubricant properties and their molecular structures. The study successfully explored the relationship between molecular structure, specific volume, and viscosity of the PIB blended in the group-I mineral oil (N 150) using a combination of several established models. These properties can be predicted by considering molecular features such as branch types, contents, and degrees of polymerisation.

1.8 दहन / Combustion

"Installation of 50 kg/h Agro-waste to Briquettes Unit and Generating Livelihood thereby Empowering the Women of Champawat"
Sponsored by: Uttarakhand State Council of Science & Technology

Objective

Installation of pine needle briquetting unit and skill development of rural masses.

CSIR–Indian Institute of Petroleum (CSIR–IIP) implemented a pilot project focused on the sustainable utilization of pine needles through briquetting for direct firing applications. The primary objectives were to mitigate forest fires, promote sustainable pine needle management, and generate supplementary income for local communities. The project involved collecting pine needles from forested areas and converting them into solid biogenic fuel. A bottom-up implementation strategy was adopted, emphasizing rural entrepreneurship by training local stakeholders and building market linkages between briquette producers and end-user industries. The operation and management of the unit was entrusted to the "Ujjwala Mahila Group," a women-led self-help group registered under the National Rural Livelihoods Mission (NRLM). The group is actively engaged in the collection of pine needles, briquette production, and product marketing. Additionally, the Forest Department supported the initiative by providing financial support, logistical assistance for transporting briquettes to prospective consumers. Several potential industrial users of pine briquettes were identified, including a milk-based food processing unit and a leading brick manufacturing group located in Muzaffarnagar, Uttar Pradesh. Demonstrations conducted at these facilities confirmed the

technical feasibility of using pine briquettes as a renewable fuel, helping to develop a nascent market for bio-fuels in the region. In 2024, approximately 100 tonnes of pine needles were collected, resulting in a significant reduction in forest fire risks. The initiative not only provides a sustainable solution for biomass waste, but also contributes to the development of a decentralized renewable energy source. By involving the local community in the entire value chain from raw material collection to marketing the project has created new income-generating opportunities for rural stakeholders. Overall, this initiative serves as a model for wildfire mitigation, environmental conservation, and rural livelihood enhancement, demonstrating the viability of small-scale, community-driven bio-energy solutions in forested regions like Uttarakhand.





वनों को आग से निगलने वाला बन गया है ग्रामीण महिला समूहों के रोजगार का जरिया

पहली बार वैज्ञानिकों द्वारा पिरूल से तैयार किया जा रहा है ईंधन का विकल्प

शाह टाइम्स संवाददाता

लोहाघाट। वनाग्नि के मुख्य कारक पिरूल को अब ग्रामीण अर्थव्यवस्था का एक और सशक्त माध्यम बनाया जा रहा है, जिसकी शुरुआत लधिया घाटी के भिंगराड़ा गांव से की गई है। यदि सब कुछ ठीक-ठाक रहा तो मंडल जिले चंपावत की नोडल एजेंसी उत्तराखंड विज्ञान एवं प्रौद्योगिकी परिषद यू-कोस्ट की यह पहल वनों को दावाग्नि की भेंट चढ़ने से न केवल बचाएगी बल्कि लोगों के जीवन को सरल बनाने के साथ उनकी आर्थिक स्थिति मजबूत करेगी।

भिंगराड़ा के वन चेतना केंद्र में इस कार्यक्रम की कार्यशाला/प्रशिक्षण व प्रदर्शन की शुरुआत यू - कोस्ट के महानिदेशक प्रोफेसर दुर्गेश पंत,भारत पेट्रोलियम संस्थान आईआईपी के निदेशक इरेन्द्र सिंह बिष्ट ने चर्चुअली इसका शुभारंभ करते हुए कहा कि यहां पिरूल से ईंधन के ब्रिकेट्स बनाने से न केवल वनों को बचाना संभव होगा, बल्कि इससे महिलाओं को रोजगार भी मिलेगा। इस अवसर पर वन संरक्षक कोको, रोशो मुख्य वन संरक्षक तेजस्वनी पाटिल भी महिला समूहों से रूबरू हुई तथा सभी शंकाओं एवं आशंकाओं का मौके में ही समाधान किया। उनका कहना था कि पहाड़ों में जंगलों को प्रतिवर्ष आग से होने वाले नुकसान से बचाने के लिए यह महत्वपूर्ण पहल की गई है, जिससे दोहरा लाभ मिलेगा। डीएफओ आरसी कांडपाल ने कहा कि पिरूल को एकत्र करने वाली महिला समूहों से पांच सौ रुपए प्रति क्विंटल की दर से पिरूल की खरीद की जा रही है। प्राथमिक चरण में महिलाओं द्वारा दो सौ कुंतल पिरूल एकत्रित कर इससे अपने समूह की एक लाख रुपये की आय कर ली है। भारत पेट्रोलियम आईआईपी के अधिकारी डॉ पंकज आर्य के अनुसार अब पिरूल वनों को नुकसान नहीं बल्कि वनों पर ईंधन का दबाव कम करेगा। प्रारंभिक चरण में जब तक यहां पिरूल से ब्रिकट्स बनाने की मशीन नहीं लगती है, तब तक इसकी आपूर्ति मुजफ्फरनगर के ईंट भट्ठों में की जा रही है। यहां शीघ्र मशीन लगते ही उसके उत्पाद को स्थानीय स्तर पर भी मार्केट उपलब्ध कराया जाएगा। उन्होंने यह भी संकेत दिया कि निकट भविष्य में आईआईपी पिरूल से तेल निकालने की परियोजना पर भी गंभीरता से प्रयास कर रहा है।

उप प्रभागीय वनाधिकारी नेहा चौधरी एवं वन क्षेत्राधिकारी हिमालय सिंह टोलिया, पाटी के बीडीओ सुभाष लोहनी की देखरेख में यह यूनिट संचालित की जा रही है, जिसमें नौ महिला समूह से जुड़ी 90 महिलाओं ने यह काम अपने हाथ में लिया है। ग्राम प्रधान गीता भट्ट, सरपंच हीरा देवी, कमला, पुष्पा,पार्वती, मंजू, तारी आदि महिलाओं का कहना था कि जंगल तो उनका मायका रहा है, जहां से उन्हें पारंपरिक रूप से घास,लकड़ी मिलती रही है। इससे न केवल उन्हें रोजगार मिलेगा बल्कि मवेशियों के लिए घास भी मिल सकेगी। इस कार्य में सामाजिक कार्यकर्ता रमेश भट्ट अपना पूरा सहयोग दे रहे हैं। रेंजर टोलिया द्वारा अपने व्यवहार से क्षेत्रीय लोगों में जो सहयोग व समन्वय का वातावरण तैयार किया गया है, उससे इस कार्यक्रम के संचालन में कोई अड़चन नहीं आ रही है। यू कोस्ट द्वारा यहां धुआं रहित चूल्हों का भी वितरण किया जाएगा। इस अवसर पर एसीएफ कार्तिकेय के अलावा स्थानीय लोग भी मौजूद थे।

जिलाधिकारी नवनीत पांडे के अनुसार वनों को बचाने की जो वैज्ञानिक पहल की गई है, इसको सार्थक रूप देने के लिए हर स्तर पर सफल बनाने का जिला प्रशासन पूरा प्रयास करेगा, जिससे बहुमूल्य वन संपदा को बचाया जा सके।



Newspaper Coverage on the Project Activities

Story Covered by Uttarakhand DIPR

Outstanding R&D/Technical Work

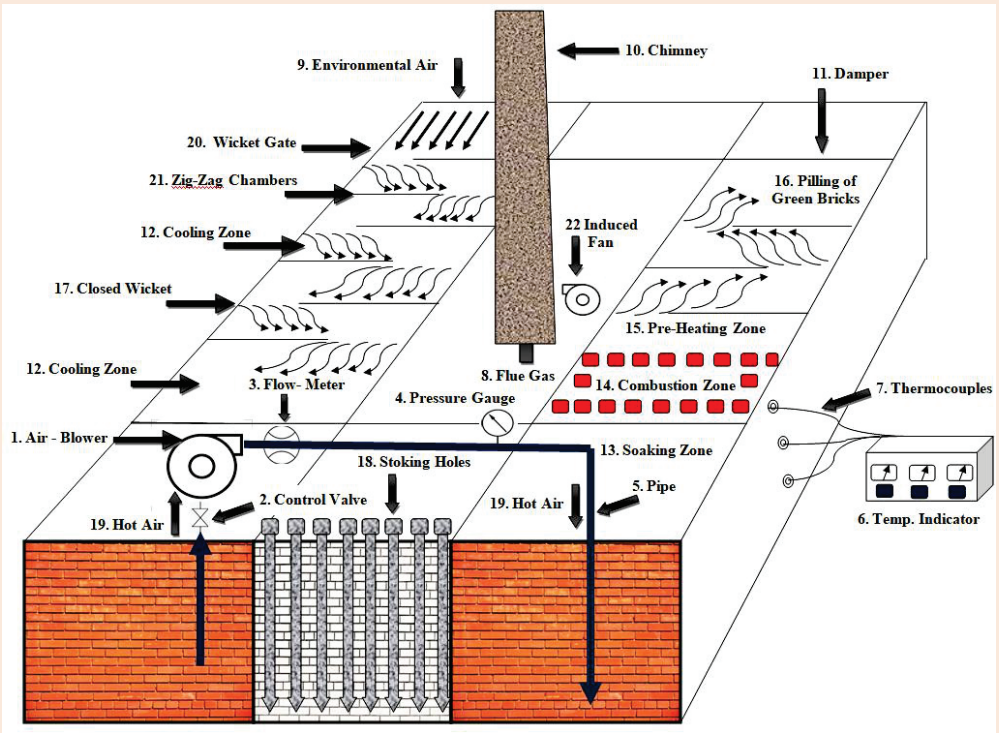
To evaluate the wear resistance properties of hydraulic fluid.

Investigation of Indian Brick Kiln for the Improvement in Thermal and Combustion Performance
Sponsored by: CSIR HQ, RDSF Project

Objective

Improving the thermal and combustion efficiency of the brick kilns by 5%.

An air circulation system has been developed to enhance the thermal efficiency of zig-zag brick kilns by optimizing heat recovery and airflow dynamics. The kiln comprises four primary zones: drying, preheating, firing/combustion, and cooling, as shown in fig. The designed system extracts waste heat from the cooling zone by directing ambient air through the fired bricks, thereby increasing the air temperature by approximately 150–200°C. This preheated air is then supplied to the firing zone, resulting in more uniform heat distribution and increased thermal input. Experimental results confirm that integrating this air circulation system significantly improves heat transfer rates and overall energy efficiency. Enhanced airflow velocity raises the Reynolds and Nusselt numbers, which accelerates convective cooling of the fired bricks and improves thermal performance. The improved combustion conditions contribute to higher kiln productivity and better-quality bricks. Furthermore, the system supports compliance with environmental regulations by reducing fuel consumption and emissions. Preliminary assessments indicate brick quality improvement, a substantial reduction in particulate matter and improved fuel utilization. Ongoing work focuses on refining airflow control mechanisms and exploring the use of alternative fuels to further enhance sustainability and reduce environmental impact.



Designed Air Circulation System for Brick Kilns

Technology Transferred /Commercialization

Technology transfer of improved biomass stove to M/s Ecosence Pvt. Ltd., Auangabad, Maharashtra on 5th Jully 2024.



1.9 आसुत एवं भारी तेल प्रक्रम प्रभाग / Distillate and Heavy Oil Processing Division

1.9.1 Advanced Gas Separation

Thermo-chemical Hydrogen Generation through Partially Open-Loop I-S Process Involving H_2S Incineration: Coupling of Individual Sections for Laboratory Integrated Operation (sponsored by ONGC Energy Centre)

Objective of the Project

Coupling of sub-sections of S-I cycle (H_2S Incineration, Bunsen reaction and HI Decomposition) using existing lab scale glass set-up for hydrogen production @ 1 LPH

Work done in the Project

- Kinetic study of catalytic decomposition of HI to H_2
- Study of NOx formation in H_2S incineration
- Continuous operation of individual cycles of Bunsen reaction and Hix distillation

Key Findings of the Study/Project

Bridge the gap study between individual sections of open loop I-S process

A Multipronged Approach towards CO_2 Separation to Cater the Indian Oil and Gas Sector (MMP 1.2 WP 2.4) (CSIR CCUS Mission Project)

Objective of the Project

Development of catalytic membrane reactor for water gas shift to produce hydrogen and capture of CO_2 from reaction medium by simultaneous reaction and separation to get clean hydrogen

Work Done

- Synthesis of Ceramic hollow fibre-based membranefor separation of H_2 and Co_2
- Development of nano-sized catalysts having high surface area to enhance the performance of the catalysts for WGS process
- Continuous operation of individual cycles of Bunsen reaction and Hix distillation

Production of H_2 from H_2S via Thermochemical Sulfur Looping Process (CSIR FIRST Project)

Objective of the Project

To fundamentally explore the thermo chemical conversion of H_2S into H_2 and elemental sulfur via a two-step reaction system, i.e., cyclic sulfidation and regeneration of sulfur carriers.

Work Done in the Project

- Synthesis of sulfur carriers
- Standardization of experimental and analytical techniques

Key Findings of the Study/Project

Suitable sulfur carriers for H_2S splitting have been developed.

1.9.2 Thermal Conversion

Feasibility Study for Production of High Quality Pet Coke by Co-processing of Coal-Tar and Petroleum Streams" (Inhouse Project)

Objective of the Project

Development of technology for the production of 'Needle Coke' by co-processing of 'Coal-Tar' and Petroleum Streams.

Work Done

Technologies for the production of high grade pet coke by the co-processing of petroleum residue with carbonaceous material such as Coal-Tar with an objective to avoid the formation of amorphous coke. It has been reported in the literature that addition of oxygen containing carbonaceous material into the 'Delayed Coking' feed, promotes the formation of high quality coke. The proposed investigation is based on the scientific approach and fact that the conversion of refinery stream into high grade Coke is invariably preceded by formation of an intermediate 'mesophase'.

2 Nos. Delayed coking experiments have been done very successfully with different feed stocks

Process conditions	Run no 1(coal tar + RFO)	Run no 2(coal tar + RFO
Furnace temp ^{0}C	500	496
Cdrum temp ^{0}C	490	470
C drum pressure	2.5 kg	3 kg
Feed flow rate	2 kg/hr.	2 kg/hr
Water injcn	1%	1%
Coke yield	36	38
Liquid yield	53	58
Gas yield	11	4



Fig. Story Covered by Uttarakhand DIPR

1.9.3 FCC

Evaluation of Improved ZSM-5 Zeolite (for FCC Additive) for Better Propylene Yield (Project No.: SSP-180)
M/s Sud-Chemie India Private (SCIL)

Objective of the Project

Evaluation of improved ZSM-5 zeolite (FCC catalyst additives) for better propylene yield.

Work Done

The detailed evaluation studies were carried out to determine the performance of improved HZSM-5 catalyst samples provided by M/s Sud-Chemie India Private Limited. The work includes steaming and performance evaluation of FCC catalyst/additive samples SCIL-11028, SCIL-11029, SCIL-11030, SCIL-11058, SCIL-11063, and SCIL-11069, as per the standard operating parameters decided by the SCIL and CSIR-IIP.

Key Findings of the Study/Project

The performance of SCIL-11029 FCC catalyst/additive was better for higher propylene yield. Such information gives an idea of the micro activity test conversion of the FCC catalyst additives for the feasibility of producing high value olefins, which further aimed at increased profit margins of a refinery.

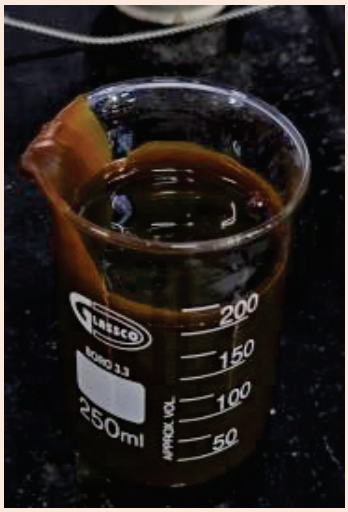
Feasibility Study for Hydro Treating of Pyrolysis Bio Oil and Waste Plastic Oil/Tyre Oil (IHP-240003)

Objectives

- Development of slurry hydrotreating catalysts for pyrolysis oils/waste plastic oil/tyre oil
- Hydrotreating of blended crude oil with py-oils
- Process optimization

Delta Progress since Inception

- Rice straw biomass pyrolysis oil feed stock analysis
- Catalyst synthesis for hydrodeoxygenation reaction
- Hydrodeoxygenation reaction has been done for Rice straw biomass pyrolysis oil
- Elemental analysis of product has been done
- Waste plastic crude analysis
- Catalyst synthesis for hydroprocessing of Waste plastic crude
- Hydroprocessed product analysis (ICP, Carbon Distribution, wax analysis etc.)



Feed material



Product Material

1.10 लाइट स्टॉक प्रसंस्करण प्रभाग / Light Stock Processing Division

1.10.1 उत्प्रेरक सुधार / Catalytic Reforming

Catalytic Valorization of Bio-Ethanol through the Production of Future Fuel (Sponsored by SERB, GAP-0130),

Objectives

Development of a fixed fed catalytic process operating a metal functionalized acidic-basic catalyst for the efficient conversion of ethanol (>30%) with 80% selectivity to fuel grade C_4 alcohol.

Work Done

In the present study, various catalysts have been prepared and evaluated for the production of fuel grade C_4 alcohol from the bio-ethanol in a fixed bed reactor set up under optimized reaction conditions. So far, various metal functionalized acido-basic catalysts (Al_2O_3-MgO) have been prepared and physico-chemical properties were thoroughly characterized with different techniques. The influence of acidity and basicity and their synergism on the product yield was investigated. So far, the process achieved about 30% conversion of ethanol to 60% C_4 alcohol. The process optimization is under progress to increase the yield of C_4 alcohol upto desirable value as given in the objective.

Key Findings of the Study/Project

- The acido-basic property and porosity of the catalyst was mainly influenced on product yield.
- The conversion of bio-ethanol into advanced bio-fuel not only increases the fuel efficiency of bio-ethanol but also improves the overall economy of the bio-ethanol production process as C_4 alcohol fuel features are similar to commercial gasoline.

Production of xylene-rich alkylated aromatics using CO_2 as an alkylation reagent (Sponsored by SERB, GAP -0127)

Objective

The main objective of the project is to develop single-pot catalytic process for the production of alkylated aromatics using CO_2 as an alkylating reagent.

Work Done

A novel and efficient catalytic process has been developed for producing alkylated aromatics, utilizing CO_2-derived species as active alkylating agents. Uniquely, this process employs a liquid organic hydrogen carrier (LOHC) to hydrogenate CO_2, generating an in-situ alkylation reagent—marking the first known use of this approach. Catalysts synthesized in our laboratory have demonstrated promising activity in the target reaction, although there remains significant potential to enhance product yields through further optimization.

In the long term, this work lays a strong foundation for the development of similar catalytic systems aimed at converting CO_2 into value-added chemicals, particularly for the alkylation of various aromatic hydrocarbons. Ultimately, the project contributes to the advancement of indigenous CO_2-to-chemical technologies.

Key Findings of the Study/Project

- Developed a catalytic process for converting CO_2 into valuable alkylated aromatic compounds.
- Achieved approximately 25 wt% yield of alkylated aromatics.
- Demonstrated ~50 wt% selectivity toward mixed-xylene in the aromatic product fraction.

Plastic depolymerization and upcycling (DEPOLUP); WP 3.1d- Value addition to by-products from IIP/commercial plants (Sponsored by CSIR, Mission Mode Project, HCP 0046),

Objective

The main objectives of the project is the development of Indigenous catalyst for hydrocarbon value addition to plastic-derived naphtha

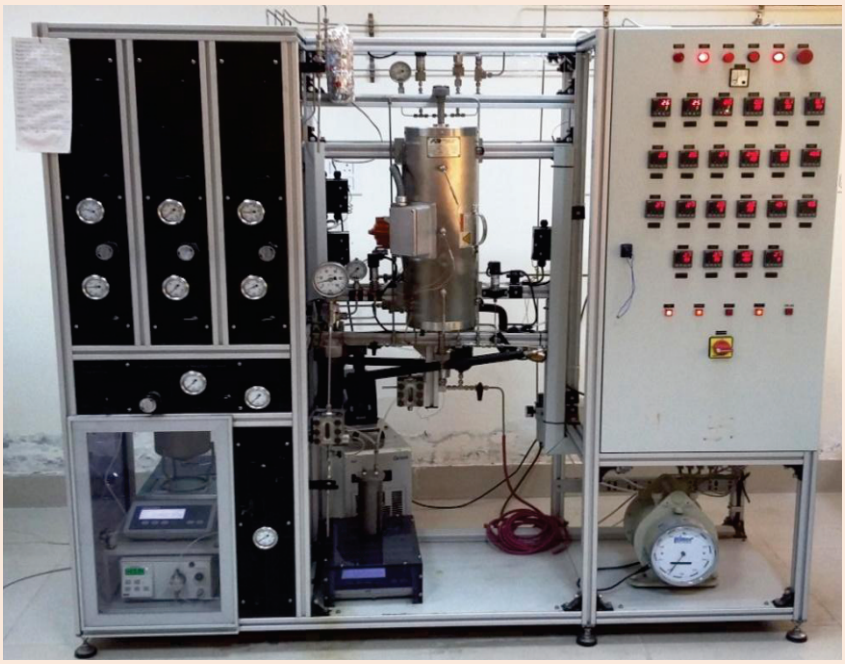
Work Done

This project was successfully completed in March 2025. It focused on developing a catalytic process for converting waste plastic-derived naphtha—particularly rich in olefins—into valuable aromatic compounds. Aromatics are vital chemicals used extensively as precursors for industrial chemicals, as octane enhancers in fuels, and as solvents.

A zeolite-based catalyst was synthesized and optimized in our laboratory specifically for this transformation. The catalyst demonstrated excellent performance, achieving over 60 wt% yield of aromatics from the olefin-rich plastic-derived naphtha. This approach presents a sustainable pathway for upgrading plastic waste into high-value chemical products.

Key Findings of the Study/Project

- Comprehensive analysis of waste plastic-derived naphtha revealed olefins as the predominant components.
- A zeolite-based catalyst developed in-house achieved over 60 wt% aromatic yield, showcasing its efficiency in valorizing plastic waste.



Reaction set-up used for the conversion of waste plastic naphtha to aromatics.

1.10.2 गैस-टू-लिक्विड / Gas-to-Liquid

Development of a catalyst for the production of light olefins by catalytic cracking of naphtha co-processed with CO_2 (In-house Project, OLP-1185)

Objective

To obtain total light olefins yield of ⩾45wt% with P/E>1 under the per pass naphtha conversion of ⩾60wt% at ⩽ 700˚C and 1 bar in a lab-scale fixed bed reactor

Work Done

Catalytic steam cracking is one of the promising approaches than thermal cracking to improve the overall efficiency of the steam cracking process. Metal-doped modified zeolite-based catalysts have been prepared and tested for the production of C_2-C_4 olefins with yields and improved propylene selectivity. Obtained total lower olefins (C_2-C_4) yields ~46 wt.% with P/E~2 at moderate reaction temperature, including valuable by-products LPG and syngas.

Development of an efficient catalyst for the hydrogenation of CO_2 to synthetic natural gas (e-methane) (Sponsored by GAIL, SSP-0138)

Objective

Development of a lab-scale catalytic process for the hydrogenation of CO_2 to synthetic natural gas (e-methane) with CO_2 conversion >90 vol.%.

Work Done

CO_2 hydrogenation to methane is one of the important area of CO_2 utilization and green hydrogen value chain. Here, development of improved catalysts having high activity with enhanced long-term stability is critical due to the structure sensitivity of the CO_2 methanation reaction. A lab-scale catalytic process has been developed for the production of e-methane by CO_2 hydrogenation. The process has been tested at the bench-scale level up to 400 h TOS long-term stability tests of the catalyst for the production of e-methane up to 2000 L/Day. Further, the process has also be applied to various feedstock containing mixtures of CO_2 and (or) CO.

Kinetic evaluation and reactor design aspects for crude bio-glycerol bi-reforming process (In-house Project, OLP-1218)

Objective

Development of a suitable kinetic model and design of reactor for production of bio-hydrogen by bi-reforming of crude bio-glycerol.

Work Done

Value additon of one of the significant by-product from the biodiesel production crude glycerol is very important for the overall sustenance of the biodiesel industry. Initially, thermodynamic analyses have been performed and identified the suitable experimental conditions. Different Ni-based catalysts have been prepared and tested for the bi-reforming of crude bioglycerol. Further, optimization of the process and deduction of reaction kinetics are in progress.

1.10.3 नैनो कैटेलिसिस / Nano Catalysis

Development of an Indigenous Catalyst for Hydrogenation of CO_2 to Methanol and Design of a Pilot Scale Unit for 10kg/day Methanol Production (Sponsored by NTPC-NETRA, SSP-0043)

Objective

Integrated pilot scale demonstration of a 10 kg/day CO_2 to Methanol plant in continuous mode having >10% conversion of CO_2 (99%Purity) to Methanol of 99.0% purity.

Work Done

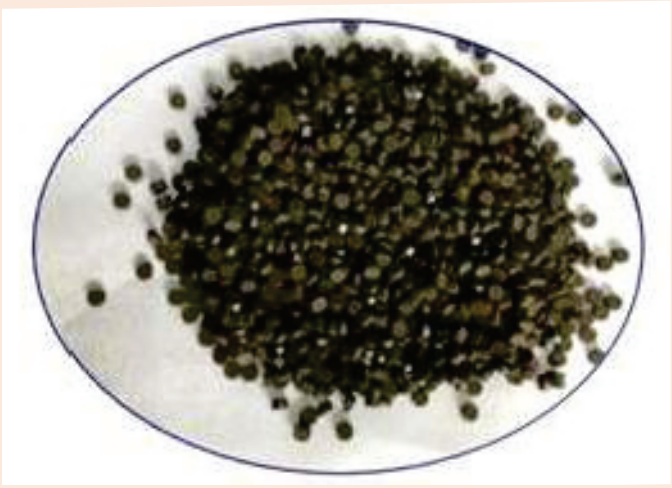
A10 Kg/day methanol pilot plant was commissioned in October 2024, successfully producing high-purity methanol (>99%).

Key Findings

This development positions India to reduce carbon footprints by utilizing waste CO_2 for valuable fuel production.



CO_2 to Methanol pilot plant installed at NETRA-NTPC R&D center at Noida



The catalyst used for the CO_2 to methanol conversion

Scale-up Studies for the Oxidative Coupling of Methane to Ethylene (Sponsored by GAIL, FTT-030509)

Objective

Scale-up Studies for the Oxidative Coupling of Methane to Ethylene

Work Done

Ca supported La-Ce mixed oxide catalyst has been developed where methane conversion is ~36% and C_2 (ethane+ethylene) selectivity is ~78%

Key Findings

Methane Conversion is ~36% and C_2 (ethane+ethylene) selectivity is ~ 78%

1.11 जैवईंधन प्रभाग / Bio Fuels Division

1.11.1 हाइड्रो प्रसंस्कृत अक्षय ईंधन / Hydro Processed Renewable Fuels

Two-Stage Hydroprocessing of Diesel Oil

Objective

Two-stage Hydroprocessing of 2000-liter Diesel Oil

Work Done

BPCL requested CSIR-IIP to utilize its pilot plant facility to hydroprocessing diesel oil. The project cost is ~Rs. 200 Lakhs. This work was carried out in two stages. The pilot plant runs were carried out in the first stage at optimized conditions. The product was collected continuously and was stored in drums for the next run. The catalyst was de-loaded, and the reactor was cleaned with kerosene provided by BPCL and dried to load the second batch of BPCL catalyst. The catalyst was reduced before the reaction as per the conditions provided by BPCL. The product of the first stage reaction was used as a feed for the second stage run, and the plant was run continuously. The product obtained after this stage was collected in drums and was handed over to BPCL for further characterization. Feed and catalyst (first stage and second stage) for this project were supplied by BPCL.

Key Findings

CSIR-IIP has successfully conducted pilot plant runs on two-stage hydroprocessing of 2000 liters of diesel oil.

Hydroprocessing of Palm Stearin and Comparison with Jatropha Oil

Objective

Production of hydroprocessed palm stearin (500 liters) and comparison of Product yield, product property, and comparison with jatropha feed.

Work Done

CSIR-IIP is working on a Feedstock supply chain based on palm stearin and other non-edible tree-borne oils. CSIR-IIP has produced 1000 Liters of SAF from this unit since it was commissioned in 2024-2025 and supplied to IAF. Currently, the Basic Engineering Design Package (BDEP) for the CSIR-IIP SAF process is being finalized by Engineers India Ltd. (EIL). The first commercial demo unit of capacity ~35KLPD of SAF is planned at Mangalore Refinery and Petrochemicals Limited and is expected to be ready by 2027.

CSIR-IIP has created a collaboration area at ASTM named AC-644-CSIR-IIP HEFA- Variant Aviation Biofuel (Code-named Hydroprocessed Esters and Fatty Acids – Synthetic Kerosene with Aromatics, HEFA-SKA). The report and the new Annexure have been under OEM review. After completing this review, the OEMs are expected to recommend balloting.

Key Findings

CSIR-IIP has created a collaboration area at ASTM named AC-644-CSIR-IIP HEFA- Variant Aviation Biofuel (Code-named as Hydroprocessed Esters and Fatty Acids – Synthetic Kerosene with Aromatics, HEFA-SKA).

Detailed Feasibility Report and Basic Engineering Design Package on DILSAAF™ Technology

Objective

Detailed feasibility report and basic engineering design package on DILSAAF™ technology of 20kL SAF production plant

Work Done

CSIR-IIP signed a Memorandum of Agreement (MoA) to develop a commercial package based on CSIR-IIP DILSAAF™ technology. In this project, CSIR-IIP is working on a process design basis, simulation of reaction loop, reactor modeling, and design. Process flow scheme, Simulations of Process sections, preparation of Process Flow Diagrams Heat and material balance, Preparation of P&IDs, catalyst details including type, manufacture, total quantity to be loaded, reactor-wise/bed-wise catalyst distribution, bulk density & other specifications are also studied in the project.

Catalyst activation/sulfiding procedures, Reaction loop start-up procedures and operating parameters, and catalyst regeneration and operating parameters were other points studied during the project. Other points studied for the basic engineering design package are as follows: Chemical requirement during start-up and catalyst regeneration, Chemical requirement during normal operation and shutdown, Catalyst and chemical summary and utility summary, and Characteristics and quantity of effluent during catalyst regeneration.

Key Findings

TIP and BDEP development for MRPL plant.



Two Dornier 228s flying with CSIR-IIP Bio-ATF on Republic Day (2024) Fly-past over Raj-path



CSIR-IIP SAF plant visit



CSIR-IIP SAF plant model

1.11.2 जैव एस्टरीफिकेशन / Bio Esterification

Set up and Demonstration of Mobile Unit 50 lit/batch (1 barrel/day) for Biodiesel Production from Non-edible oil and used Cooking Oil at SANSAD BHAWAN
Sponsor: CSIR

Objective

Process parameter optimisation for the design, setup and demonstration of mobile biodiesel unit.

Work Done

Establishment of supply chain of UCO: Dehradun-model established in Dec. 2019 with launch of RUCO express and collaboration with local NGO (SDC Foundation). So far collected 80KL UCO and 20KL converted to Biodiesel & Bio-jet at CSIR-IIP.

Biodiesel production: Developed a Indigenous decentralized room-temperature biodiesel process with a biodiesel yield of ~85% and ~10% Glycerol as byproduct. Unrefined biodiesel (U-FAME) suitable for blending up to 20% (B-20) complies to BIS 16531:2022 and distilled biodiesel complies to BIS 15607:2022 as drop in biodiesel. One mobile Biodiesel Unit (1

barrel/day) installed at Kashipur, Uttarakhand in Dec'24. CSIR IIP made a filed deployable truck mounted mobile unit for demonstration and conversion of used cooking oil and non edibleoisinot biodiesel. Trail runs completed and is ready frodemosntration. Discussion are on with Director, ITDC Parliament for time slot for demo at SANSAD BHAWAN.

Key Findings

- The UCO analysis showed the FFA content in the UCO ranges from 0.5 to 3 mg KOH/ gm of oil.
- The impurities present in the UCO don't affect the UCO conversion to FAME.
- The average recovery of B100 biodiesel is ~85 wt.% of feedstock. Yield increased on a recycling basis. B100 biodiesel meets the specifications of BIS 15607.
- Successful run of College bus (using B-10 blends) of SCG-IMT college, Kashipur (Uttarakhand).
- Life cycle assessment studies were carried out for conventional and room temperature biodiesel processes and observed less emissions from the RT process over conventional BD processes.



Demonstration of Biodiesel Blends in College Bus, IMT Kashipur



Mobile Biodiesel Unit for the Demonstration at Sansad Bhawan

Scale-up and Field Trail for Spectral Converting Diverging Optics Integrated Solar Sharing Agrivoltaics Technology
Sponsor: CSIR, Collaboration with CSIR-NIIST and CSIR-SERC

Objective

Open field evaluation of 5 kW SS-AV pilot plant for Brassica carinata (short gustation crop) cultivation to produce biofuels.

Work Done

Site identified for the installation of Agrivoltaics and biofuel cropping.

- Field preparation and sowing of carinatta seeds going on in 2 acres of land at Kashipur.
- Fabrication and installation of Agrivoltaics completed.



Field Preparation and Sowing



Open Field Installation of Agrivoltaics at Kashipur, Uttarakhand

1.12 Buisness Development

1.12.1 Initiatives for Better Positioning of the Institute

Different scientist, technical officers, PAs from the institute represented CSIR-IIP in different seminars, conference and workshop organized.

Further, Jigyasa's program was conducted in the institute with the objective to promote science for the common people especially the students.

Besides, regular connect with the industry, understanding their problems and providing them the required solutions in a time bound manner has a high impact of the institute among the industry.

To enhance institute's positioning, several initiatives are being implemented, including strengthening industry connections, leveraging technology, and focusing on student outcomes.

These initiatives helped in better positioning of the institute

Sl. No.	Seminar / Conference/Workshop/ Jigyasa's program
1.	Bengaluru India Nano 2024, during 1-3 August 2024 at Bengaluru
2.	National Conference CEES-2024, during 18-20 September 2024, CSIR-IICT, Hyderabad
3.	IOGCA 2024, during 26-27 September2024 at Delhi
4.	ICTU 2024 during 30 September to 1 October 2024 at , Amethi
5.	International Conference on IC Engine, Propulsion and Combusion-1.0 during 8-11 November 2024, at Graphic Era Hill University, Dehradun
6.	International Conference on Recent innovations and Developments in Mechanical Engineering, during 14-16 November 2024, at NIT Meghalaya
7.	Workshop on Microbial Type Culture Collection and Gene Bank during 18-22 November 2024 at CSIR-IMTech, Chandigarh
8.	26th Energy Technology Meet (ETM 2023) from 9-11 October, 2023 at Delhi
9.	A Five-day Residential Programme under the 'Jigyasa' was held at CSIR-IIP from 9-13 December, 2024
10.	India Energy Week 2025 at New Delhi during 11to 14 February 2025,
11.	National Workshop on Advanced Carbon Materials for next Generation Energy Solutions, at CSIR-IIP, Dehradun from 20- 21 Feb 2025
12.	24th National symposium on Catalysis for Sustainable Chemicals, Materials and Energy (CSCME-2025) during 24 to 26 February 2025, at Thapar University, Patiala, Punjab
13.	International Conference on Green and Sustainable Solutions (ICGSS-2025) at Dev Bhoomi University, Dehradun, during 27 and 28th February 2025
14.	National Conference on Emerging Innovations in Biochemistry and Biotechnology for holistic development of Agriculture from 6-7 March 2025, at SKAUST, Jammu.

Sl. No.	Seminar / Conference/Workshop/ Jigyasa's program
15.	International Conference on Sustainable Energy and Environment (ICSEE-2025) at BITS, Goa Campus, during 8-10 March 2025.
16.	16th International Conference on Advancement in Petrochemical Sector and
17.	Empowering Sustainable Development during 8-10 March 2025 at CPET-IPT, Lucknow
18.	14th International Symposium on Fuels and Lubricants, ISFL. 20- 22 March 2025 at Vivanta by Taj, Faridabad,

1.12.2 Mega Business Proposals

Mega Business Proposals for R&D involve large-scale research initiatives in areas like sustainable energy, advanced materials, or biotechnology CSIR-IIP has submitted business proposals to different sponsors, funding agency addressing their problems, offering solutions, along with a detailed project management plan, including timelines, resource allocation, and monitoring systems to ensure effective project execution.

Some of the major proposals undertaken by the institute during the FY 2024-25 are:

Sl. No.	Title of the Project	Sponsor
1	Installation of 50 Kg/H Agrowaste to Briquettes Unit and Generating Livelihood thereby Empowering the Women of Champawat	UCOST, Dehradun
2	Microplastics from Sewage Treatment Plant along Lower Ganga River Basin: Abundance, Associated Co-Contaminants and Post Effects of Disposing of Sludge in Aqueous and Terrestial Environments (45809)	DST (MOST), New Delhi
3	Evaluation and Compliance of Registered Vehicle Scraping Facility as per GSR 653(E)	Pineview Technology Pvt. Ltd. Sonipat Nirvana Scrappers, Baghpat, Sega Tech Solutions Pvt. Ltd. Roorkee
4	Development of Bio Binders From Agricultural Waste for Utilization in Bituminous Road Construction	MORTH, New Delhi
5	Feasibility Studies on Synthetic Aviation Fuel (SAF) Production from Carbon Dioxide	Oil India Ltd. Duliajan, Assam
6	Studies on the Development of the Additive for Diesel Mehtanol Blend	Oil India Ltd. Duliajan, Assam
7	Feasibility Study from Biodiesel Production by CSIR Study of Different Seeds Derived Fatty Oils from Biodiesel Production by CSIR Room Temperature Biodiesel Process	ICFRE-FRI, Dehradun

Sl. No.	Title of the Project	Sponsor
8	Rating of the Components of Two Nos. Transmission Gear Boxes and One Rear Axle Unit	IDIADA Automotive Technology India Pvt. Ltd. Pune
9	Two-Stage Hydroprocessing of Diesel Oil	BPCL, Noida
10	Study of Impact of Additives on Research Octane Number and Cetane Number	Motul India Pvt. Ltd., Mumbai
11	Impact of Hydrogen-Enriched Natural Gas (HENG) on the Performance of the Domestic Cooking Burner	GAIL (India) Ltd., Noida
12	Solvent Deoiling Unit (Pant 14) Revamp for Capacity Increase And Process Optimization For Product Quality Upgradation & Troubleshooting Study of SDU for Achieving Design Conditions with respect to Throughput, Utility / Chemical Consumptions and Product Quality	EIL, New Delhi
13	Demonstration of BPCL's Crossflow Reactor Technology in CSIR-IIP SAF Production Process	BPCL, Noida
14	Tailored Design and Development of Nanomaterials for the Single Step Conversion of Supercritical Carbondioxide (SC-CO_2) to Fuel and Value-Added Chemicals	Corporate Green R&D HPCL, Bangaluru
15	Study to Examine Feasibility of Converting Heavy Aromatic Hydrocarbons Intomesophase Pitch - A Precursor for Advanced Carbon Materials	HPCL-Mittal Energy Ltd, Noida
16	Pre-Feasibility Study for Revamping of Wax Deoiling Unit at CPCL,Manali	EIL, New Delhi

1.12.3 Indigenous Technology Commercialization

S.No	Title of Technology	Date of License Grant	Name of the Company
1	Technology for Upgrading Raw Biogas to Pipeline Quality Bio-methane	24.06.2024	M/s Organic Recycling Systems Limited, Navi Mumbai
2	lmproved Biomass Stove (Chullha)	05.07.2024	M/s Ecosense Appliances Pvt Ltd, Aurangabad
3	Improved Jaggery Making Plant (Gur Bhatti)	10.10.2024	Mr Rakshpal Singh & Company, Amroha , UP

S.No	Title of Technology	Date of License Grant	Name of the Company
4	Improved Jaggery Making Plant (Gur Bhatti)	10.10.2024	Mr. Chaudhary Dhyan Singh, Amroha, UP
5	Improved Jaggery Making Plant (Gur Bhatti)	30.10.2024	M/s Shakti Udhyog, Nazibabad, District Binjour, U.P
6	Dual-Fuel Engine System	02.01.2025	M/s Upcharge Energy Solutions LLP, Delhi

1.12.4 Clients Added to the Organizations

- 2 Degrees Cli-Con Pvt. Ltd., Hyderabad
- AVI-Oil India Pvt Ltd.; Faridabad
- Blue Planet Biofuels Pvt Ltd, Pune
- Bhagalpur Bio-refinery Pvt. Ltd., Bhagalpur
- Blue Planet Environmental Solutions India Pvt Ltd Pune
- Bajaj Green Energy Limited (BGEL), Noida
- Bharat Oil & Waste Management, Delhi
- Continental India Private Limited, Meerut
- Donga Bio Fuels Pvt. Ltd, Gondal, Gujarat
- Eurochem Industries, Navi Mumbai
- Essar Oil (UK) Limited., Mumbai
- Ecosense Appliances Pvt Ltd, Aurangabad
- Faith Industries Ltd, Ghazipur
- Gadar Kharda Pvt. Ltd., RoorkeeGlobal Ultratech (RVSF), Rampur
- GPS Renewables Pvt Ltd.;Bengaluru
- H.P. Agro Industries Corporation Limited, Shimla
- Indian Institute of Technology, Jodhpur
- Indian Institute of Science, Bengaluru
- Indian Institute of Petroleum & Energy, Visakhapatnam
- Indian Motors, Sonipat
- Kadamba Industries, Bengaluru
- Kattankulathur Campus, Chengalpattu, Tamilnadu
- Lubgraf Synoils Private Limited, Ahemdabad
- Lubrichem, Delhi
- Lovely Professional University, Phagwara
- Madan Mohan Malaviya Engineering College, Gorakhpur
- Motul India Pvt. Ltd., Mumbai
- National Institute of Technology, Hamirpur
- National Institute of Technology Uttarakhand , Srinagar
- Nirvana Scrappers, Baghpat
- Naion Pvt Ltd., Hosur

- Newtrace Private Limited, Bengaluru
- Praj Matrix R&D Center, Pune
- SLB, Navi Mumbai
- Sahasra Enviro Privite Ltd., Hyderabad
- SAIL, Ramgarh
- Saral Auto scrapping India Pvt Ltd., Ghaziabad
- SG Enterprises, Lucknow
- SRM Institute of Science and Technology, Chennai
- Tavasya Ventures, Hyderabad
- Texol Engineering Pvt. Ltd. Pune
- TAFE Motors and Tractors Limited
- Tubex India, Greater Noida
- Total Energies Marketing India Private Limited, Mumbai
- VK Petrochemicals Pvt. Ltd., Bengaluru

1.12.5 Institute's Positioning in the Strategic Sector

In the strategic sector, an institute's positioning refers to how it differentiates itself and creates unique value more effectively. At CSIR-IIP we are catering towards the needs of Strategic sector and presently working for both Indian Air Force and Indian Navy towards Indigenization and strengthening of our Defence Technology.

1.13 वैश्लेषिक विज्ञान प्रभाग / Analytical Sciences Division

Operation of the Fuel Testing Laboratory (Sponsor: MoPNG/PPAC) TSP 0116

Objective

To monitor the Auto Liquid Fuel quality of NCT/NCR Region.

Work Done

We are engaged in the testing of fuel samples, primarily gasoline (IS 2796), kerosene (IS 1459), and diesel (IS 1460), in accordance with BIS specifications. The laboratory was initially established at Noida in 2000 by the Ministry of Petroleum & Natural Gas, Government of India, in compliance with the directives of the Hon'ble Supreme Court of India for setting up an independent testing facility. It was subsequently relocated to the CSIR-IIP campus, Dehradun, in 2023, with operations commencing in 2025. Currently, we are providing continuous support for the analysis of all the samples provided by PPAC/MoPNG.

Key Findings

The laboratory provides the testing reports for fuel samples for their quality.

Design and Development of Biocarbon Supported Mn and Co based Nanocatalysts for the Transfer Hydrogenation/Deuteration Reactions using CH_3OH/CD_3OD as Hydrogen/ Deuterium Source and Synthesis of Pharmaceutical Intermediates (GAP 0172)

Objective

The main objective of the proposal is the Design and Development of Biocarbon Supported Mn and Co based Nanocatalysts for the Transfer Hydrogenation/Deuteration Reactions using CH_3OH/CD_3OD as Hydrogen/Deuterium Source and Synthesis of Pharmaceutical Intermediates.

Work Done

We developed an efficient catalytic transfer hydrogenation method for the selective reduction of diverse nitroarenes, utilizing inexpensive, eco-friendly, and readily available methanol and methanol as hydrogen donors. The process employs a cobalt-based nanocatalyst ($Co–N/Al_2O_3$), synthesized via a straightforward impregnation technique using cobalt, carbon source, and alumina. The $Co–N/Al_2O_3$ catalyst exhibited remarkable activity, affording a broad spectrum of aryl amines (35 examples), pharmaceutical intermediates (4 examples), and facilitating a late-stage functional group transformation (1 example) with yields ranging from 70% to 98% across different scales. Comprehensive characterization of the catalyst using HR-TEM, powder XRD, XPS, H_2-TPR, N_2 adsorption-desorption, Raman spectroscopy, and ICP-OES confirmed the formation of Co_3O_4 nanoparticles. Mechanistic investigations revealed an indirect pathway. Recyclability tests confirmed the catalyst's stability and reusability over at least three cycles. The molecules reported in this work are presented below. Part of this work has been published in Industrial & Engineering Chemistry Research (Ind. Eng. Chem. Res. 2025, 64, 13, 6771–6787).

Key Findings

So far, we have successfully carried out the reductive transformation of nitroaromatics to aryl amines, as well as the conversion of aldehydes and ketones to their corresponding alcohols, using methanol and isopropyl alcohol as hydrogen donors. Both alcohols proved to be highly effective; however, each comes with its own advantages and limitations. Methanol, due to its higher reactivity, occasionally leads to side product formation during the reduction of nitroarenes. In contrast, isopropyl alcohol may result in lower conversions for certain substrates because of its relatively lower reactivity. These effects are substrate-dependent.

Feasibility Studies of Preparing Napkins from Cellulosic Materials of IIP Forest Residues /Inhouse (OLP-1216)

Objective of the Project

- Preparation of absorbent materials (AHM)from Forest/Agro residues
- Develop a process to make sanitary napkins from prepared absorbent materials
- Utilisation of Black liquor produced during AHM process

Title of the Project along with Name of the Sponsor/In-house/Collaborative etc.

- Analytical Method Development for regulated petroleum products (Aviation Turbine Fuel / Diesel / Biodiesel / Lubricants)
- SSP-0188: Collaborative Support for Commercialization of Greenchem Energies Private Limited Technology for Production of Biofuels (Biodiesel and Green Diesel).
- SSP-0169: Analysis of Biodiesel Samples from Office of SP, Khargon.
- SSP-0165: Analysis of Biodiesel Samples from M/s Donga Bio Fuels Private Limited, Rajkot.
- SSP-0162: Analysis of Ethanol Blended Gasoline Samples from M/s Rhomu Technologies Private Limited, Chennai.
- SSP-0166: Analysis of Ethylene in Gas Samples from M/s India Glycols Private Limited, Kasipur
- SSP-0189: Analysis of Waste Plastic Pyrolysis Samples as per IS 1460 Specifications.
- SSP-0197: Analysis of Biodiesel (B100) Samples as per IS 15607: 2022 Specifications.
- SSP-0213: Analysis of Automotive Diesel Samples as per IS 1460 specifications Sponsored by M/s H.P. Agro Industries Corporation Ltd, Shimla.

Objective of the Projects

Analytical method development activity was aimed at developing new methods for the determination of

- FAME in ATF (to support IS 1571)
- Used Cooking Oil in Diesel-Biodiesel blends (to support IS 1460)
- Biodiesel adulteration (to support IS 15607)
- Finished and Used Lubricating oils (to support hydrocarbon types in finished new and used lubricants)

1. SSP-0188: Detailed characterization (qualitative and quantitative component/ group-wise) of distilled intermediate / base oil and finished products through analytical techniques to achieve the desired target products.
2. SSP-0169 & SSP 0165 and SSP-0197:Analysis of biodiesel samples from Office of SP, Khargon and M/s Donga Bio Fuels Private Limited, Rajkot using standard test methods as per IS 15607.

3. SSP-0162: Determination of Ethanol Blended Gasoline Samples from M/s Rhomu Technologies Private Limited, Chennai using standard test methods.
4. SSP-0166: Determination of ethylene in gas samples from M/s India Glycols Private Limited, Kashipur using standard test methods.
5. SSP-0189: Analysis of waste plastic pyrolysis samples as per IS 1460 specifications using standard test methods.
6. SSP-0213: Determination of automotive diesel parameters as per IS 1460 specifications (sponsored by M/s H.P. Agro Industries Corporation Ltd, Shimla).

Work Done

The analytical method development work is based on CSIR-IIP's competency in the determination of QC parameters of petroleum fuels. Activities under this project largely focused on providing QC solutions that are either not part of the product specifications or have some limitations associated with the instrumental method.

- A significant achievement was developing the HPLC method to determine biodiesel or FAME in diesel in the range of 0.1% to 50%. This method provides an alternative to the lone FTIR-based ASTM D7371 method, which has a limitation of up to 20 %. The method parameters were optimized, validated through ILC, and provided to BIS for adoption as Indian Standard. This method is presently under publication and has been assigned the number IS 1448 Part 202.
- FAME in ATF is presently limited to 50 ppm as per IS 1571 and DEFSTAN. We are developing a sensitive method to detect it at a concentration of less than 5 ppm.
- Determination of Used Cooking Oil or Vegetable Oils in Diesel-Biodiesel blends is aimed at supporting IS 1460 for monitoring product adulteration.
- The biodiesel adulteration determination study is complete and will support IS 15607.
- The finished new engine lubricants do not have a test method to determine the quantity of its saturates, aromatics, and additives. A method development is underway to address this cause. This method was effective in determining the same groups in Used Lubricating oils.
- All Sponsored Projects (SSP-0188, SSP-0169, SSP-0165, SSP-0162, SSP-0166, SSP-0189, SSP-0197, and SSP-0213) were completed by carrying out the required characterization, and providing interpretations of the results to the client. The analysis covered all petroleum products as per their respective product specifications.

Key Findings

The projects are the analysis studies of the different petroleum products and biodiesel samples from the different regions of Indian origin using different chromatographic techniques and physicochemical methods. The final technical report of analysis was submitted to the sponsoring body.

- **Total Number of Samples Analyzed (GC/HPLC/GCMS):** 2164 (all projects of the institute)

R & D work which has Great Impact

- **An Indigenous Standard Test Method was developed and submitted to the Bureau of Indian Standards (BIS), New Delhi, for standardization (Accepted & Under Publishing at BIS)**

Standard Test Method Number: IS 1448 (Part 202)

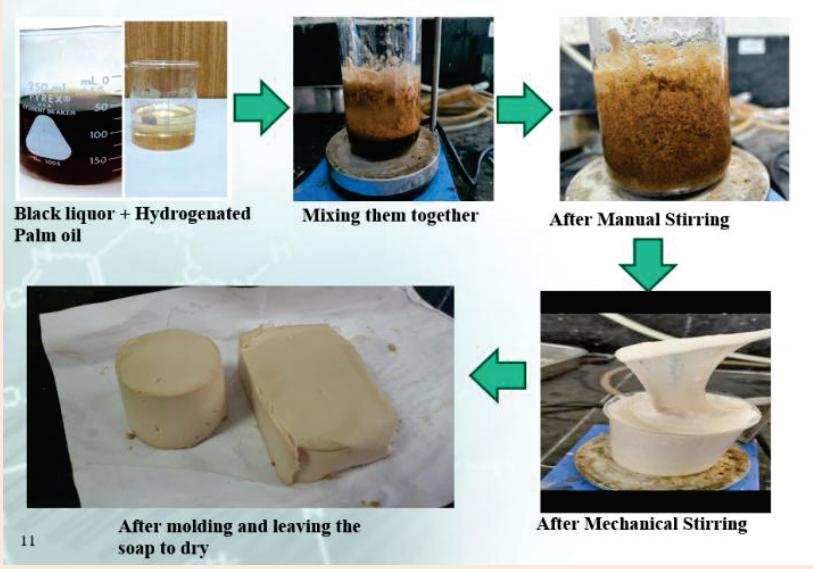
Title : Standard Test Method for Determination of Fatty Acid Methyl Estersin Biodiesel Blended Automotive Diesel/Paraffinic Diesel Fuels by High-Performance Liquid Chromatography - Refractive Index Detection.

Inventors:Bhanu Prasad Vempatapu, Jagdish Kumar, Pankaj K. Kanaujia

Other methods mentioned above are being developed.

- **Utilisation of Black liquor produced during AHM process**

This study investigates the sustainable production of soap from BL, a waste byproduct of cellulose extraction, during the alkaline hydrolysis process. This approach addresses environmental concerns associated with waste disposal, repurposing BL into soap, and creating a value-added product. The soap formulation is optimized to meet quality standards for cleansing efficacy and Grade 1 laundry soap, BL-derived soap offers a sustainable alternative to conventional soap production methods, contributing to environmental conservation and resource efficiency. Using BL produced from sanitary pad production to soap manufacturing presents a sustainable solution to waste management and resource utilization challenges. Moreover, BL-derived soap offers a promising alternative to conventional soap production methods, with potential applications across various industries. Further, the idea leads to utility product-making from waste liquor, contributing to a more resource-efficient future.



2

उपलब्धियां

ACHIEVEMENTS

2.1 प्रकाशित शोध / Published Research

2.1.1 जर्नलों में प्रकाशित शोध-पत्र / Papers Published in Journals

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2.1.2 पुस्तकों / विवरणिकाओं मे प्रकाशित अध्याय / लेख / Chapters / Articles Published in Books / Proceedings

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4. Negi, Pratibha, Pankaj Kumar Dubey, Avinash V. Palodkar, Asheesh Kumar, Prashant Bhardwaj, and Ajay Kumar. "Plastic Waste as a Resource, its Availability, and the Conversion Technologies for its Transformation to Wealth in the form of Thermal Insulating Materials." In Development of Sustainable Thermal Insulators from Waste Materials: A Circular Economy Approach, pp. 83-99. Singapore: Springer Nature Singapore, 2024.
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2.2 शोध पत्रों की प्रस्तुतियां / Presented Research papers

2.2.1 सम्मेलनों / संगोष्ठियों आदि में प्रस्तुतीकरण शोध पत्र / Papers Presented in Conference / Seminars

14th European Conference on Industrial Furnaces and Boilers, 2-5 April 2024 – Algarve, Portugal

- Study of flame and heat transfer characteristics of a premixed hydrogen blended methane dual flame impinging on flat plate, Harish Algani, Pankaj Kumar Arya, Manoj Kumar, Satish Kumar, G D Thakre.

International Conference on Clean Energy Technologies and Sustainable Development. 5-6 April 2024, Punjab University, Chandigarh

- Depolymerisation of expanded polystyrene using alkali-metal- supported Fe/Al_2O_3 catalyst, Bhanu Joshi, Arvind and Bipul Sarkar.

RAFAS-2024, 19-20 April 2024, LPU, Ludhiana

- Optimization of catalyst for diesel soot oxidation, M.K. Shukla, Anupam Chauhan, Bhavya B Krishna, T. Bhaskar and Atul Dhar.

ICMSDT-2024, 1st to 3rd May 2024, Central University of Jammu

- Waste plastic derived Nanostructured carbon-based Ni-carbon materials for electrocatalytic hydrogen evolution. Laxmi Sah and Bipul Sarkar.

National Conference on Micro-innovations and Challenges: Opportunities for Sustainability (MICROS) 3-4 May 2024, Graphic Era University, Dehradun

- Defatted yeast biomass valorization for a closed-loop lipid biorefinery concept. Ayan Banerjee, Thallada Bhaskar and Debashish Ghosh.

3rd Indian Analytical Congress (An International Conference & Exhibition) IAC, 5-7 June 2024, CSIR-IIP, Dehradun

- Improving oxidation stability of UCO-biodiesel using metal deactivators, Shoiab Akhtar, Neeraj Atray and Rajkumar Singh.
- Development of triazole-based multifunctional additive for lubricant applications. Piyush Gupta, Ripa Roy, Susheel Kumar Porwal, Rajkumar Singh.
- Development of emulsifiers for Indian heavy crude oil using a novel surfactant for pipeline transportation. Aruna Kukrety, Mansi Awasthi and Rajkumar Singh.
- High performance liquid chromatography based newly developed test methods for petroleum applications. Bhanu Prasad Vempatapu, Bhagwat Upreti, Jagdish Kumar, Rajesh Kumar and Pankaj Kumar Kananujia.

- Determination of used cooking oil and waste hydrocarbon solvents in biodiesel fuel through high performance liquid chromatography, Bhagwat Upreti, Bhanu Prasad Vempatapu, Bhumika Rawat and Pankaj Kumar Kananujia.
- The application of gas chromatography in determining helium in natural gas samples. Jagdish Kumar, Bhanu Prasad Vempatapu, Bhagwat Upreti, Rajesh Kumar and Pankaj Kumar Kananujia.
- Study for conversion of tung oil into biodiesel: optimization using response surface methodology. Harshil Bhanushali, Neha Rawat, Rajkumar Singh and Neeraj Atray.
- Fabrication of low-cost portable visible spectrohphotometer using a micro-controller and triad spectral sensor. Naina Rawat, Hemant Sanhoo, Rajesh Kumar and Babita Behera.
- Development of Diethylenetriamine-based mannich polymer as corrosion inhibitor for application in oil and gas industries. Varsh Choudhary, BG Prakashaiah, T Senthil Kumar and Sudip K Ganguly.
- A bio-based dual additive for simultaneous inhibition of gas hydrates and corrosion in oil and gas pipelines. Sadhbhawana Dubey, Varsh Choudhary, BG Prakashaiah,Sanat Kumar and Asheesh Kumar.
- Enhanced Natural gas storage in the form of gas hydrates using a new additive: Applications in Energy Storage. Abhishek Sutradhar, Sadhbhawana Dubey, Sanat Kumar and Asheesh Kumar.
- Investigating drilling fluids for gas hydrate exploration. Aniket Singh, Anirudh Bardhan, Amit Saxena, Shivanjali Sharma and Asheesh Kumar.
- Carbon dioxide sequestration in sub-sea sediments as solid gas hydrate deposits. Shweta Negi, Sanat Kumar, Avinash V Palodkar, Suhas Suresh Shetye and Asheesh Kumar.
- Pyrolysis of geranium and Marigold flower waste. Tarun Kumar Valiveti, Kritika Pandey, Bhavya B Krishna and Thallada Bhaskar.
- Fluid catalytic cracking of glycerol to acetaldehyde and acrolein over E-cat. Nimisha Jain, Bharat Singh Rana, DV Naik and Samir Maity.
- Investigating the impact of tight contact phenomenon on the role of zirconium in CeO2-ZrO2 catalyst for soot oxidation. MK Shukla, Vibhuti Bangwa, Anupam Chauhan and Thallada Bhaskar.
- Investigation on lubricity of dimethylfuran blended gasoline. MK Shukla, Omprakash Sharma, Anupam Chauhan and Rajkumar Singh.
- Enhancing mild steel corrosion resistance in the acidic medium through Schiff's base surfactants. Sachin Dua, BG Prakashaiah and T. Senthil Kumar.
- Performance and analysis of biowaste infused PLA composite for FDM 3D priniting. Nishtha Arora and T. Senthil Kumar.
- Analytical perspective on black liquor utilization. Vaibhav Joshi, Kritika Kohli, Babita Behera and Rajesh Kumar.
- CSF biomass derived composite material for waste water treatment application. Vishwas Saini, Sundaram Sharma, Naresh Kumar, Kamar Kumar and Rajkumar Singh.

- AGHIS-HRMS characterization of cokerkero for producing alpha olefin and alkylated benzene. Deependra Tripathi, Rajkumar Singh,Kamar Kumar, Raghuvir Singh, Ekta Tripathi, Rajesh Kumar and Anjan Ray.
- Importance of rheology as an advanced analytical tool in the performance analysis of bituminous binders. Kamal Kumar, Mudavath Ravi, Nisha, Pradeep Kumar, Vishwas Saini, Raghuvir Singh, Deependra Singh, Rajkumar Singh and Manoj Srivastava.

18th International Congress on Catalysis (ICC) 14-19 July 2024, France

- Deciphering the dynamic structured evolution of oxygen vacancy enriched SrFe12O12 for efficient reverse water gas shift reaction. Gaje Singh and Ankur Bordoloi.
- CO_2 Conversion to formic acid over Cu-Zn metal-organic framework derived catalysts. JyotishamKaishyop and Ankur Bordoloi.
- Properties and characterization of red-mud based heterogeneous catalyst for the catalytic oxidation of benzene. Shivani Singh and Rajaram Bal.
- Methane aromatization using molybdenum supported zeolite catalyst. Anil Chandra Kothari and Rajaram Bal.

राष्ट्रीय हिंदी विज्ञान सम्मेलन -2024 30-31 जुलाई 2024, सीएसआईआर – केंद्रीय सड़क अनुसंधान संस्थान

- CSIR-IIP Technology for Bioaviation. Rohit Kumar, SA Farooqui, Rakesh Kumar, Rakesh Joshi and Anil K. Sinha.

ACS Virtual Global Symposium Accessing Clean water, Occurrence, transport and toxicity of Traditional and Emerging Dissolved contaminants. 18th to 22nd August 2024

- Investigating water footprint and quality flux in yeast lipid biorefinery. Challenges and Opportunities. Ayan Banerjee, Rahul Gautam, Shalini Singh, S. Venkata Mohan, Sandeep Mudliar, T Bhaskar and Debashish Ghosh.

Refining India Conference, 9-10 September 2024, New Delhi

- Distillation, solvent extraction and hydrotreating based integrated process for gas oil desulfurization, Sunil Kumar
- Transitioning to Sustainable Aviation Fuel: Indian scenario and Global Frameworks.Tuhin Surve Khan and Sunil Pathak

National Conference on "Catalysis for Energy, Environment & Sustainability (CEES-2024) during 18-20 September, 2024, CSIR-IICT, Hyderabad

- Development of high performance bio-based membranes for CO_2 separation application. Amit Jha, Soumen Dasgupta R. Surya Murali.
- Modified $LaNiNO_3$ nanocube for low temperature CO/CO_2 methanation. Satyajit Panda, Varun Raturi and Ankur Bordoloi.
- Ion Exchange catalysis in polyol esterification: Advancing sustainable pathways to specialty lubricants. P. Nagendramma, Ankit Pandey and Atul Pratap Singh.
- Carbon containing zeolites for methane upgradation from coal bed methane. Anjali Sharma and Aarti.
- Highly efficient CO_2 hydrogenation to methyl formate using supported Cu catalyst. JyotishamKaishyop, Arpan Mukerjee and Ankur Bordoloi.
- Cu-BTC@SBA-15 composite as adsorbent with enhanced CO_2/CH_4 and CO_2/N_2 selectivity for biogas and flue gas separation. Suman Dalakoti, Narendra Singh, Anjali Sharma, Anjali Singh, Madhur Sachdeva, Swapnil Divekar, Aarti Arya, R. Surya Murali and Soumen Dasgupta.
- Structural dynamic evaluation of Rh-Ni alloy catalyst for autothermal reforming of methane. Md Jahiruddin Gazi and Ankur Bordoloi.
- Activity enhancement of a Gerhardite phase derived Cu-Zn-Al/γ-Al_2O_3 hybrid catalyst for direct DME synthesis from syngas. D.P.L. Lumar Kasina, Mohd. Belal Haider, Neelam Naidu Botcha and Chandra Sekhar Pendem.
- Preparation of zeolite from coal waste material. Anil Chandra Kothari and Rajaram Bal.
- Investigating the impact of tight contact phenomenon on the role of zirconium in CeO_2-Al_2O_3 catalyst for soot oxidation. M.K. Shukla, Vibhuti Bangwal, Anupam Chauhan and Thallada Bhaskar.
- Catalytic depolymerization of mixed plastics (PP and PS) to aromatic hydrocarbons using MgO supported catalysts. Bhanu Joshi and Bipul Sarkar.
- Coproduction of propylene and methanol via oxidative dehydrogenation of propane using CO_2 as soft oxidant over oxide-based catalyst. Arvind and Bipul Sarkar.
- Chemical fixation of CO_2 for the synthesis of polyether carbonate polyol catalysed by double metal cyanide catalyst. Neeraj Kala and Umesh Kumar.
- Analysis of cobalt effect in Co/CeO_2-Al_2O_3 catalyst for diesel soot oxidation. Rakesh Upadhyay, M.K. Shukla, Bhavya B Krishna and Thalldat Bhaskar.
- A bio-based dual fuel additive for simultaneous inhibition of gas hydrates and corrosion in oil and gas pipelines. Sadhbhawana Dubey, Varsha Chowdhary, Prakashiah BG , Sanat Kumar and Asheesh Kumar.
- CO_2 sequestration in subsea sediments as solid gas hydrate deposits. Shweta Negi, Sanat Kumar, Avinash V. Palodkar and Asheesh Kumar.
- A robust calcium-based microporous metal organic framework for efficient CO_2/CH_4 and CO_2/N_2 separation. Anjali Singh, Suman Dalakoti, Narendra Singh, Aarti, Soumen Dasgupta

and Swapnil Divekar.

- Heterogeneous cobalt nanocatalyst for reductive transformation of nitrarenes to arylamines using isopropanol as green H_2 source. Manvender, Raju Kumar, Achala Rana, Baint Singh, Yashveer Singh Meena, Deependra Tripathi, Rajesh Kumar, Sunil Kumar Pathak and Naesh Naik.
- Benzene-rich aromatics from used cooking oil over supported zeolites. Poorna Tyagi, Sudhakar Reddy and Bipul Sarkar.
- Glycerol: A co-processing feedstock for LPG Production. Nimisha Jain, Moit Verma, Bharat Singh Rana, DV Naik and S.K. Maity.
- Effect of temperature and cat-to-oil ratio on the conversion of light crude oil to C_2-C_4 olefinds by FCC process. Mohit Verma, Nimisha Jain, Bharat Singh Rana, DV Naik and SK Maity.

3rd International Conference on Electrochemical Science and Technology 2024. 18- 20 September 2024. CSIR-NPL, New Delhi.

- 1D lithium based high entropy alloy as an efficient electrocatalyst for water splitting reactions. Pooja Rani, Rajesh Kumar and Dr Nanoji Islavath.
- Graphene-NiO-PANI nanocomposite based epoxy-coatings to protect mild steel in aggressive corrosive environment. Ravi Saini, Ranesh N. Goswami and Om.P. Khatri.

7th International Oil and Gas Chemistry,, Chemicals and Additives Conference and Exhibition (IOGCA-2024) 26-27 September 2024

- An integrated approach for captivating the edge of biofunctional MoO_3-x species for efficient biogas reforming. Satyajit Panda, Varun Raturi and Ankur Bordoloi.
- Mitigation and Management of gas hydrate deposition and corrosion problems of oil and gas pipelines with a single chemical injection. Asheesh Kumar, Sadhbhawana Dubey, Varsha Choudhary, BG Prakashaiah and Sanat Kumar,
- Corrosion analysis of gasoline methanol blends on metals: Implications for material longevity and reliability. Anupam Chauhan, MK Shukla, Devendra Singh and Prakashaiah BG

International Conference on Transforming Upstream: Breakthrough Technologies and Sustainability (ICTU-2024), 30th September to 1st October 2024, RGIPT, JAIS, Amethi

- Water-based drilling fluids for gas hydrate exploitation. Aniket Singh, Anirudh Bardhan, Anit Saxena, Shivanjali Sharma and Asheesh Kumar.
- Gas hydrate based CO_2 sequestration in subsea sediments collected from Arabian sea. Shweta Negi, Sanat Kumar, Avinash P. Palodkar, Suhas Suresh Shetya and Asheesh Kumar
- Gas hydrate mitigation/management for deepwater gas fields. Sadhbhawana Dubey, Sanat Kumar and Asheesh Kumar.

Canadian Engineering Conference - The meeting of Canadian Society of Chemical Engineering. 6-9 October, 2024, Toronto, Canada

- Dual purpose additive for the prevention of corrosion and gas hydrate deposition: Application in oil and gas pipeline flow assurance. Asheesh Kumar, Sadhbhawana Dubey, Varsha Choudhary, BG Prakashaiah and Sanat Kumar.

International Conference on Photophysics and Photochemistry (ICOPP-2024), 14- 16 October 2024, IIT Bombay

- Photocatalytic oxidative deamination of benzylamines using CO2 catalysed by synergistic combination of $ZnCl_2$/Cu-BTC MOF under visible light irradiance. Amod Kumar and Suman Lata Jain.

International Symposium on Feedstock Recycling of Polymeric Materials, ISFR-2024. 21-23 October 2024, Grand Josun Jeju, South Korea

- Catalytic hydropyrolysis of cashew de-oiled shell using Py-GC/MS. Ramandeep Kaur, Bhavya B Krishna, Thallada Bhaskar and Kalpit Shah.

Conference on Sustainable Energy, Environment, Molecules, Materials and Technologies. (NCSEEMMT-2024), 22-23 October 2024, Doon University, Dehradun

- Valorization of fire-prone forestry waste biomass of Himalayan region into high surface activate carbon for wastewater treatment. Anubhi Semwal, Sweta Mehta, Om.P. Sharma and Om P. Khatri. National Interfacial heterogeneity in 1T/2H-MoS_2 for enhancement of lubrication performance via tribo-induced transformation. Anchal Pandey, Sangita Kumari, Ramesh Goswami, Om.P. Sharma, Nanaji Islavath and Om P. Khatri.
- Interfacial heterogeneity in 1T/2H-MoS_2 for enhancement of lubrication performance via tribo-induced transformation. Anchal Pandey, Sangita Kumari, Ramesh Goswami, Om.P. Sharma, Nanaji Islavath and Om P. Khatri.

International Conference on IC Engine, Propulsion and Combustion. 8-11 November 2024, Graphic Era University, Dehradun

- Study of injection strategies on combustion and emission behaviour of CIDI and HCCI:ID engine. Pranab Dass Srinivas Padala, Wittison Kamei, PMV Subbarao, JP Subhramanyam.

27th Energy Technology Meet (ETM-2024), 12-14 November 2024, Bengaluru

- Improved crude oil processing configurations for enhancing energy efficieny and reducing GHG emissions from crude distillation unit. Sunil Kumar, Avinash Mhetre, Ojasvi and Manoj Srivastava.
- Performance of new polymeric additive as flow improvers and wax dispersants for Indian waxy crude oil. Manisha Sahai, Umesh Kumar, Bijan Mahanta, Rajshri Panigrahi, Sanant Kumar, Sudip K. Ganguly and Ibha Kalitha.
- Benzene rich aromatics from used cooking oil over supported zeolites. Bhanu Joshi and Bipul Sarkar.

International Conference on Recent innovations and developments in Mechanical Engineering (ICRIDME-25024), 14-16 November 2024, NIT Meghalaya

- Studies on diesel oxidation catalyst and partial flow filter for reduction of particulate matter from diesel generation set. Navjot, Devendra Singh, Pranab Das, Nitin Labhsetwar, Wittison Kamei and Srinivas Padala.
- A comparative study of cycle variation in combustion process for conventional DI, HCCI-DI and HCCI-DI with DGE engines. Pranab Dasm Srinivas Padala, Wittison Kamei, PMV Subbarao, JP Subhramanyam.

30th International Conference & Expo On Corrosion (CORCON)-2024, 20-23 November 2024, Chennai

- Comprehensive characterization and performance evaluation of Alsol-based corrosion inhibitors derived for mild steel in acid environment: Insights for EIS, weight loss and DFT studies. Varsha Choudhary, Sachin Dua, Nishtha Arora, BG Prakashaiah, T. Senthil Kumar and Sudip K Ganguly.
- Formulation of Schiff base with alkyl halide as corrosion inhibitor for oil & gas industries. Nishtha Arora, Varsha Choudhary, Sachin Dua, BG Prakashaiah, T. Senthil Kumar and Sudip K Ganguly.
- Enhancing mild steel corrosion resistance in the acidic medium through Schiff base combined with inorganic compounds. Sachin Dua, Nishtha Arora, Varsha Choudhary, BG Prakashaiah, T. Senthil Kumar and Sudip K Ganguly.
- Corrosion protection of mild steel in acidic environment using fatty acid-PEG hybrid inhibitors. Mansi. Aruna Kukrety, Varsha Choudhary, BG Prakashaiah and T. Senthil Kumar.

International Conference on emerging trends in functional materials in Sciences. 21-22 November 2024. Maharshi Dayanand University, Rohtak, Haryana.

- Feasibility study of different unexplored seeds derived fatty oils for biodiesel production by CSIR-IIP room temperature biodiesel process. Neha Rawat, Tushar Agarwal, Aman Kumar Bhonsle, Ekta Naik, Sudhakara Reddy Yenumala, Rajkumar Singh and Neeraj Atray.

7th International Conference on Frontiers in Chemical Sciences (FICS-2024), 2-4 December 2024, IIT Guwahati

- CO_2 photo reduction integrated with oxidative coupling of amines over WOz/Cu(BTC) nanocomposite. Anil Malik and Suman Lata Jain.
- Photocatalytic CO, Reduction to Methanol Integrated with the Oxidative Coupling of Thiols to S-X (X=S, C)) bond formation over $Fe_3O_4/BiVO_4$ Composite. Nitish Saini and Suman Lata Jain.
- Application of response surface methodology for development of eco-friendly biolubricant from Brassica carinata oil and its characterization. Ekta Naik, Anil Kumar Sinha and Neeraj Atray.
- Magnetic β-glucosidase inorganic nanohydrbid nanoflowers: Highly active and recyclable nano-biocatalyst for cellobiose hydrolysis. Shaifali Bhardwaj and Anil Kumar Sinha.

IX International Conference on Sustainable Energy and Environmental Challenges (IX SEEC), 13th to 15th December 2024, IIT Mandi

- Role of bio-oil from pyrolysis of pinewood and furnace oil blends for sustainable energy practice. Omvesh, Thallada Bhaskar and V.C.S. Palla.
- Role of organosolv treatment on wheat straw:Composition and Structural analysis. Deep Kumar and Thallada Bhaskar.

Conference on Advances in Chemistry for Energy and Environment (CACEE)-2024, 16- 20 December 2024, TIFR, Mumbai

- Removal of sulphur compounds from fuels via ternary deep eutectic solvents. Nisha, Prachi and Rajkumar Singh.
- Chemically functionalized MoS_2/WS_3 heterostructure:a novel lubricious material to decrease energy consumption by minimizing frictional losses for engineering surfaces. Anchal Pandey, Abhishek Negu , Gaje Singh, Arnab Pan, Sahil Bhandari and Ompkrakash Khatri.
- Feasibility of making polyester and their applications in bitumen modification. Kamal Kumar, Vedant Joshi, Mudhavat Ravi, Vishwas Saini, Nisha, Pradeep Kumar, Aruna Kukrety and Manoj Srivasatava.
- Nanomaterials and biomass composite membrane for water treatment application. Viswas Saini,m Nisha, Kamal Kumar and Rajkumar Singh.
- Development and assessment of novel lubricity enhancer additives for ultra-low sulphur diesel fuel. Shoaib Akhtar and Rajkumar Singh.

38th DAE Solid State Physics Symposium , BARC, Mumbai, 18-22 December 2024

- Improved thermoelectric performance of Yb-filled $CoSb_3$ with the addition of Type-I clathrates. Keshav Prasad Dabral, Shailesh Singh and Sunil Kumar Pathak.

IIChE-CHEMCON 2024. 27th to 30th December 2024. NIT Jalandhar

- Pilot-scale optimization of enhanced biodiesel production from high FFA Podocarpus falcatus oil via simultaneous esterification and transesterification assisted by Zirconia supported ZSM-5. BSBL Ngomade, Cryille Ghislain Fotsop, Ndifor Angwa forNche, SG Anagho and Neeraj Atray.

India Energy Week 2025, 11-14 February 2025, New Delhi

- Hydro co-processing of waste cooking oil to sustainable aviation fuel. Saleem A Farooqui, Rakesh Kumar, Rohit Kumar, Rakesh Joshi, Pervez Alam, Tasleem Khan and Anil Kumar Sinha.
- Two-dimensional nanostructured materials based energy-efficient lubricant systems to minimize the frictional losses. Anchal Pandey, Sweta Mehta, O.P. Sharma and O.P. Khatri.

National Workshop on Advanced Carbon Materials for next Generation Energy Solutions, 20-21 February, 2025. Venue CSIR-IIP, Dehradun

- Carbonaceous water-based drilling fluids: Applicable to oil and gas industries. Aniket Singh, Manisha Shaai, Sanat Kumar and Asheesh Kumar.
- Energy production with carbon sequestration: CH_4-CO_2 hydrate replacement process. Priyanka Verma, Kalpana Tyagi, Sumant Ram Tripathi and Asheesh Kumar.
- Carbon dioxide sequestration in Arabian sea sediments as solid gas hydrates. Shweta Negi, Avinash V Palodkar, Suhas Suresh Shetya, Sanat Kumar and Asheesh Kumar.
- Dual nature additives enhancing energy efficiency: Applicable to gas hydrate and corrosion mitigation in oil and gas pipelines. Sadhbhawana Dubey, Varsha Chaudhary, Praskashaiah BG, Sanat Kumar and Asheesh Kumar.
- Application of oil-soluble hybrid polymeric additive as drag reducing agent for crude oil flow in pipelines. Anjali Mahara, Bhupender Singh, Umesh Kumar, Manisha Sahai and Sanat Kumar.
- Improving the methane adsorption capacity of zeolite through ion metal exchange. Rekha Chauhan, Anjali Sharma and Aarti.
- Synthesis of Methyl Oleate Sulfonate Surfactant and its Evaluation as Asphaltene Dispersant. Nisha, Vishwas Saini, Sundaram Sharma, Shoaib Akhtar, Neeraj Atray and Rajkumar Singh.
- Nitrogen rich activated carbon prepared from SiO_2 template polyaniline as high performance anode material for sodium ion batteries. Kirti Chabbra, Gazal Gupta, Deepak Kumar and Om Prakash Khatri.
- Biomass derived nanostructured carbon for lubrication performance enhancement. Sweta Mehta, Pratiksha Joshi, Anchal Pandey, Ramesh N. Goswami, O.P. Sharma and Om P. Khatri.

International Conference on Physics and Chemistry of Materials (ICPCM-2025), Department of Physics, Graphic Era Deemed University, Dehradun 20-22 February 2025

- Temperature-dependent charge carrier and thermophysical properties of pristine $CoSb_3$-based thermoelectric materials, Keshav Prasad Dabral Shailesh Kumar Singh and Sunil Kumar Pathak.

24th National Symposium on Catalysis for Sustainable Chemicals, Materials and Energy (CSCME-2025). 24 to 26th February 2025, Thapar University, Patiala, Punjab

- Valorization of waste crude bio-glycerol through sustainable hydrocarbon fuel production. Kamal Singh Koranga, Mahesh Kumar, Anup Prakash Tathod, N. Vishwanadham and Selvamani Aurumugam.
- Green Innovations alert: Bioglycerol as a green template for ZSM-5 catalyst synthesis towards aromatics production. Mahesh Kumar, Megha Rawat, Kamal Singh Koranga, Anup Prakash Tathod, N. Vishwanadham and Selvamani Aurumugam.

- Catalytic depolymerization of mixed plastics (PP and PS) to aromatic hydrocarbons over Zn/SiO_2-MgO catalyst. Bhanu Joshi, Anjali Dimri and Bipul Sarkar.
- Rice husk derived Ni-doped carbon as electrocatalyst for hydrogen evolution reaction. Arvind and Bipul Sarkar.
- Benzene Rich Aromatics from Used cooking oil over supported zeolite. Poorna Tyagi and Bipul Sarkar.
- Renewable p-Xylene Production by Catalytic Conversion of Crude Bioglycerol. Vijendra Singh, Selvamani Arumugam, Mahesh Kumar, Anup Thathod and N.. Vishwanadham.

International Conference on Green and Sustainable Solutions (ICGSS-2025), Dev Bhoomi University, Dehradun, 27-28 February 2025

- Alternate production of alpha olefins from thermocatalytic pryolysis of waste plastic. Anjali Dimri, Anshuman Kunwar and Bipul Sarkar.
- High octane fuel and aromatics production from waste refinery light coker gas oil. Poorna Tyagi and Bipul Sarkar.
- National Conference on Emerging Innovations in Biochemistry and Biotechnology for Holisitic Development of Agriculture. 6-7 March 2025, SKAUST, Jammu
- Exploring the diversity and bioactivities of endophytic fungi associated with Coleus species. Nancy Sharma, Vijay Lakshmi Jamwal and Sumit G Gandhi.

International Conference on Sustainable Energy and Environment (ICSEE-2025), BITS, Goa Campus, 8-10 March 2025

- Microbial Bioremediation and Biotransformation: Phenol Degradation and Catechol Conversion to Muconic Acid. Pooja Chauhan,Pankaj Kumar Kanaujia Sunil Kumar Suman.
- Bioconversion of fish processing side streams into sustainable biodiesel production using oleaginous yeast, Shifa Naseem and Sunil Kumar Suman.

16th International Conference on Advancement in Petrochemical Sectior and Emopowering Sustianable Development leading to "VIKSIT BHARAT" 8-10 March 2025. CPET-IPT Lucknow

- Synthesis characterization and evaluation of novel surfactant as an emulsifier for pipeline transportation of Indian heavy crude oil. Mansi Awasthi, Aruna Kukrety, Umesh Kumar, T.Senthilkumar
- EDTA as a complexing agent for double metal cyanide catalyzed synthesis of polyether carbonate polyol, Oluwatunininu Abosede Mutiu, Neeraj Kala and Umesh Kumar

14th International Symposium on Fuels and Lubricants, ISFL. 20-22 March 2025. Vivanta by Taj, Faridabad, Haryana.

- Advanced sustainable ester-based oil formulations for the lubrication of aircraft precision components. P. Nagendramma, Atul Pratap Singh and Prashant Kumar.

- Lubricating base oils and greases from industrial polyolefinic by-product. Manisha Sahai, Ajay Kumar GD Thakre and Sanat Kumar.
- Application of deep eutectic solvents as fuel additive for diesel fuel. Nisha, Prachi, Kamal Kumar and Rajkumar Singh.
- Mixed waste vegetable oils: A sustainable approach for bio-based lubricants. Jyoti Porwal, GD Thakre and Debashish Ghosh.
- Synthesis of Ethyl Levulinate Coupled N-Phenyl-p-Phenylenediamine: A Multifunctional Additive for Enhancing Biodiesel Oxidation Stability and Lubricity. Aman Kumar Bhonsle, Neha Rawat, Tushar Agarwal, Neeraj Atray and Sudhakar Reddy Yenumala.
- Investigating Ni-Al.O/ZrO, Catalysts For methane Oxidation to reduce methane GHG Emissions from CNG Vehicles. M.K. Shukla, Punit, Bipul Sarkar and Wittison Kamaei.
- Mitigation of acidity in High TAN crudes using Hydrotalcite additives. Rashmi and Jagdish Kumar.
- Synthesis of L-histidine derivatives and their evaluation as ecofriendly lubricant additives. Piyush Gupta, Shoaib Akhtar, Shailesh K. Singh and Rajkumar Singh.

2.3 मुद्रांकित एकस्व / PATENT SEALED

2.3.1 विदेशों में मुद्रांकित एकस्व / Patents Sealed Abroad

1. Light assisted, catalyst-free oxidation of aldehydes to carboxylic acids using carbon dioxide. Suman Lata Jain, Shafuir Rehman Khan, Vineet Aniya, Alka Kumari, Sandhya Saini, Praveen Kumar Khatri and Anjan Ray. US Patent No: 12043595 B_2 granted on 23 July 2024.

2.3.2 भारत में मुद्रांकित एकस्व / Patents Sealed in India

1. A method for purification of raw biogas to pipeline quality biomethane. Soumen Dasgupta, Swapnil Divekar, Anshu Nanoti, Aarti Arya, Pushpa Gupta, Rekha Chauhan. Indian Patent No: 533315 granted on 15 April 2024
2. Catalytic process to convert renewable feedstocks directly into aromatics rich feedstock pool. Sinha Anil Kumar, Anand Mohit, Farooqui Saleem Akhtar, Kumar Rakesh, Joshi Rakesh Kumar, Kumar Rohit, Rana Bharat Singh, Verma Deepak, Sibi Malayil. Indian Patent No: 535808 Granted on 29 April 2024
3. An article with superior tribological properties and methods thereof. Gosvami Nityanand, Krishnan NM Anoop, Khatri Om P and Sahoo Sourav. Indian Patent No: 536612 Granted on 2 May 2024

2.4 आवेदित एकस्व / PATENTS FILED

2.4.1 विदेशों में आवेदित एकस्व / Patents Filed Abroad

- Synthesis of polyether polyols based low dosage gas hydrate inhibitors using double metal cyanide catalyst. Umesh Kumar, Asheesh Kumar, Akash Verma, Sadhbhawana Dubey, Sanat Kumar, Sudip Kumar Ganguly. PCT Filing PCT/IN2024/050405 dt.18 April 2024.
- Polymeric wax deposition inhibitor, Umesh Kumar, Manisha Sahai, Aruna Kukrety, Thangaraj Senthilkumar, Bijan Mahanta, Rajarshi Panigrahi, Sanat Kumar, Sudip Kumar Ganguly, Anjan Ray, Neeraj Mathur. US Patent Application 18/756827. dt. 27 June 2024.
- Ni impregnated metal modified ZSM-5 catalyst for dehydration of aqueous ethanol to ethylene and process thereof. Umesh Kumar, Swati, Akash Verma, Bhawna Sharma, Anjan Ray. US Patent Application 18/726327 dt. 2 July 2024.
- Ni impregnated metal modified ZSM-5 catalyst for dehydration of aqueous ethanol to ethylene and process thereof. Umesh Kumar, Swati, Akash Verma, Bhawna Sharma, Anjan Ray. Brazilian Patent Application BR 11 2024 0138453 dt. 5 July 2024.
- Method of producing renewable hydrocarbon fuel from crude byproduct of animal wastes from fat oil biodiesel process. Anup P Tathod, Sivasamy Arumugam and Sreeram Katarical Janardhan.US Patent Application no 18/981153. dt. 13 December 2024.
- Improved crude petroleum oil processing methods for crude distillation unit. Sunil Kumar. US Patent Application No. 19/040,498 dt. 29 January 2025.

2.4.2 भारत में आवेदित एकस्व / Patents Filed in India

- Novel traizole-based hindered phenolic additive for polyol based organoclay grease. Ripudaman Negi, Rajkumar Singh, Shailesh Singh and Harender Singh Bisht. Indian Patent Application No. 202411035572 dt. 3 May 2024.
- Gelling agents based formulations and methods for managing hydrates deposition in oil and gas pipelines. Asheesh Kumar, Sadhbhawana Dubey and Sanat Kumar. Indian Patent Application No. 202411049377 dt. 24 June 2024.
- Process and preparation of nanostructured material for methane generation from both CO and CO_2 hydrogenation. Ankur Bordoloi, Satyajit Panda, Gaje Singh, Vivek K. Shrivastaw, Md. Jahiruddin Gazi, Jyotishman Kaishyop, Rajaram Bal and Prem Lama. Indian Patent Application No 202411064502. Dt. 23 August 2024.
- Process for CO_2 hydrogenation to short chain olefins via methanol mediated pathway at relatively low temperature. Ankur Bordoloi, Gaje Singh, Satyajit Panda, Vivek K. Shrivastaw, Md. Jahiruddin Gazi, Jyotishman Kaishyop, Rajaram Bal and Prem Lama. Indian Patent Application No. 202411099857 dt.17 December 2024.
- Development of high performance novel Cr-Cu-Mn-Ni high entropy alloy system. Shailesh Singh, Bashita Kumar, Sanjeev Kumar, Pankaj Rawat, Harender Singh Bisht, Sunil Kumar Pathak. Indian Patent Application No 20241102374 dt 23 December 2024.

- Combustion mode control system and method for Dual-fuel engine (Jointly Filed with Upcharge Energy Solutions, New Delhi), Wittison Kamei, Devendra Singh and Rajendra Badola Indian Patent Application No 202511014947 dt. 21 February 2025.
- Cryogenic process for helium recovery from low helium-containing gas streams. Sunil Kumar and Manoj Srivastava. Indian Patent Application no 202511026605, dt. 21 March 2025.

2.5 उपाधियाँ/अध्येतावृत्तियाँ / Degrees / Fellowships

2.5.1 प्रदत डी.लिट्ट / डी.फिल. उपाधियाँ / D.Litt. / D.Phil. Degrees Awarded

- Ms. Megha Sailwal was awarded PhD degree for her thesis entitled "Deciphering Metabolic Network of Oleaginous Yeast Rhodotorula Mucilaginosa IIPL32 (MTCC 25056) through Multi-Omics Study" under the supervision of Dr. Debashish Ghosh and Dr Diptarka Dasgupta by the Academy of Scientific & Innovative Research (AcSIR), 01 April, 2024.
- Ms. Naina Sarki was awarded PhD degree for her thesis entitled "Transition Metal-catalysts for N-alkylation and Hydrogenation Reactions under the supervision of Dr. Suman L. Jain and Dr. Kishore Natte by the Academy of Scientific & Innovative Research (AcSIR), 01 April, 2024.
- Ms. Bhavna Saini was awarded PhD degree for her thesis entitled "Development of Zeolite Based Catalysts for the Conversion of Biomass Derived Feedstocks into Value Added Chemicals under the supervision of Dr. N. Viswanadham by the Academy of Scientific & Innovative Research (AcSIR), 16 April, 2024.
- Mr. Ramesh Nath Goswami was awarded PhD degree for his thesis entitled "Polyaniline Composites with 2D Nanostructured Materials for Corrosion Inhibition" under the supervision of Dr. Anjan Ray and Dr. O. P. Khatri by the Academy of Scientific & Innovative Research (AcSIR), 16 April, 2024.
- Ms. Bhawna Sharma was awarded PhD degree for her thesis entitled "Homo(Co)Polymerization of Higher Alpha Olefins and Acrylates for their Applications" under the supervision of Dr. Umesh Kumar by the Academy of Scientific & Innovative Research (AcSIR), 07 May 2024.
- Mr. Baint Singh was awarded PhD degree for his thesis entitled "Value Addition of Lignin-Derived Feedstocks to High-Value Fine Chemicals" under the supervision of Dr. Anand Narani and Dr. Ganesh Naik by the Academy of Scientific & Innovative Research (AcSIR), 24 April, 2024.
- Mr. Rohan Singh Pal was awarded PhD degree for his thesis entitled "Development of Nanostructured Catalysts for Oxidative Coupling of Methane to Olefins" under the supervision of Dr. Rajaram Bal and Dr. V. V. D. N Prasad by the Academy of Scientific & Innovative Research (AcSIR), 15 July, 2024.
- Ms. Swati was awarded PhD degree for her thesis entitled "Development of Value-added Products through Catalytic Conversion of Bioethanol" under the supervision of Dr. N. Viswanadham and Dr. Umesh Kumar by the Academy of Scientific & Innovative Research (AcSIR), 25 July, 2024.

- Ms. Neha Dhiman was awarded PhD degree for her thesis entitled "Nano-metallic Oxide Based Dehydration Catalyst(s) for Synthesis of Sustainable Chemicals using Bio-derived Feedstocks" under the supervision of Dr. Bipul Sarkar and Dr.Y.S Reddy by the Academy of Scientific & Innovative Research (AcSIR), 17 September, 2024.
- Mr. Ripudaman Singh Negi was awarded PhD degree for his thesis entitled "Development of Novel Eco-friendly Greases and their Performance Enhancement" under the supervision of Dr. Shailesh Singh and Dr. Raj Kumar Singh by the Academy of Scientific & Innovative Research (AcSIR), 23 October, 2024.
- Mr. Himanshu Raghav was awarded PhD degree for his thesis entitled "Development of Multifunctional Metal Oxide Catalyst(s) for Alternative Production of Light Olefins" under the supervision of Dr. Bipul Sarkar and Dr. Shailendra Tripathi by the Academy of Scientific & Innovative Research (AcSIR), 10 November, 2024.
- Gaje Singh was awarded PhD degree for his thesis entitled "Design and Development of Heterogeneous catalysts for CO_2 Hydrogenation to Short-chain Olefins under the supervision of Dr. Ankur Bordoloi and Dr. Indrajeet Ghosh by the Academy of Scientific & Innovative Research (AcSIR), 16 November, 2024.
- Meenu Jindal was awarded PhD degree for her thesis entitled "Reductive Catalytic Valorization of Cotton Stalks to Value-added Chemicals" under the supervision of Dr. T. Bhaskar and Dr. P. V. Chandrasekhar by the Academy of Scientific & Innovative Research (AcSIR), 06 December, 2024.
- Ramandeep Kaur was awarded PhD degree for her thesis entitled "Investigations into Pyrolysis of Spent Biomass" under the supervision of Dr. T. Bhaskar and Dr. Bhavya B Krishna by the Academy of Scientific & Innovative Research (AcSIR), 12 March, 2025.

2.6 सम्मान, पुरस्कार एवं अभिनंदन / Honours, Awards & Recognitions

2.6.1 सांस्थानिक/सामूहिक पुरस्कार / Institutional/Group Awards

CSIR-IIP received 1st and 2nd runner up award jointly with IIT-Madras in Coal India Hackathon 2024; organized by CMPDI (Coal Mining Planning & Designing Institute)



2.6.2 व्यक्तिगत पुरस्कार / Individual Awards

Recognition of Energy and Fuels 2024 excellence in Review Award by Americans Chemical Society(ACS) to Dr Asheesh Kumar



energy&fuels

Energy & Fuels 2024 Excellence in Review Awards



विधान केसरी

आर.जी.आई.पी.टी. में अपस्ट्रीम क्षेत्र के रूपांतरण विषय पर दो दिवसीय अंतरराष्ट्रीय सम्मेलन का समापन

Dr Asheesh Kumar delivered a keynote lecture in an international upstream conference at RGIPT, Amethi, which was featured in the VidhanKeshri newspaper

2.7 दर्ज समझौता–ज्ञापन / सहयोग-ज्ञापन/करार / MoU's/MoC's/Agreement Inked

2.7.1 भारतीय संस्थाओं के साथ / With Indian Concerns

- MoU with Petroleum Planning & Analysis Cell, New Delhi for Technical Support Services to PPAC towards Testing of Liquid Fuel Sample (MS, HSD, Kero) April 03 2024.
- MoU with Shri Guru Ram Rai University, Dehradun on Academic Collaboration and Joint Research Programs, April 05 2024.
- MoU with Laxminaryan Innovation Technological University, Nagpur on Academic Collaboration and Joint Research Programs, April 05 2024.
- NDA with Droft-Ketal Chemicals India Pvt. Ltd. Mumbai on the Development of Process for the Synthesis of 6-tert-butyl-2,4, Dimethylphenol by Alkylation of 2,4 Dimethlly Phenol with C-4 Hydrocarbons, 15 April 2024.
- NDA with TR Mega Foods and Beverage LLP, Ludhiana on the Biogas Plant at Haibowal Dairy Complex Run by TRMF will be used as a Commercial Reference for CSIR-IIP's Biogas Upgradation Process, April 15, 2024.
- NDA with Kadamba Intrac Pvt Ltd. Uttar Kannada on Evaluation of Nano Materials developed by Kadamba, April 18, 2024.
- MoU with ICAR-Indian Institute of Maize Research, Ludhiana on Research and Development in the Areas of Sustainable Biofuels and Value Addition for Residual Biomass during Millets Production, Biobased Products/Chemicals, Functional Carbons etc., May 16, 2024.
- MoU with Institute of Pesticide Formulation Technology, Gurugram on Research and Development in the Areas of Sustainable Biomass, May 28, 2024.
- MoU with Organic Recycling System Limited, Navi Mumbai on Developing a Vacuum Swing Adsorption (VSA) Technology for the Up-gradation of Raw Biogas to Pipeline Quality Bio-methane, Meeting BIS 16087: 2016 Specifications, June 24, 2024.
- MoU with Ecosense Appliance Pvt. Ltd. Aurangabad on Improved Biomass Stove, July 05, 2024.

- MoU with Exx Carbon Pvt Ltd. Bangalore on Upgradation of Pyrolysis Bio-oil, July 06, 2024.
- MoU with Forest Research Instiute, Dehradun To undertake Feasibility of different Seeds Derived Fatty Oils for Biodiesel Production by CSIR- Room Temperature Biodiesel Process, July 10, 2024.
- MoU with D B S (PG) College, Dehradun on Academic Collaboration and Joint Research Programs, July 11, 2024.
- NDA with Bharat Petroleum Corporation Limited, Mumbai on Cross Flow Reactor Technology and SAF Producton alongwith Pre-treatment of Vegetable Oil, July 12, 2024
- MoU with Social Development for Communities Foundation, Dehradun on Collaboration related to Supply of Waste Plastic and Used Cooking Oil, July 12, 2024
- NDA with BHEL Ceramic Technological Institute (CTI), Bangaluru on Methane Reforming Catalyst Development and Scale Up, July 22, 2024
- MoU with Harcourt Butler Technical University, Kanpur on Academic Collaboration and Joint Research Programs, July 29, 2024
- MoU with Indian Oil Corporation Limited, New Delhi on Training Course for Refining Technology Program, August 01, 2024.
- MoU with Sridev Suman Uttarakhand Vishwavidyalaya, Badshahithaul on Academic Collaboration and Joint Research Programs, August 08, 2024.
- MoU with Lovely Professional University, Kapurthala on Academic Collaboration and Joint Research Programs , September 03, 2024.
- MoU with National Institute of Technology Hamirpur on Academic Collaboration and Joint Research Programs, October 3, 2024
- NDA with Bharat Petroleum Corporation Limited, Mumbai on Pilot Plant Facility for Hydroprocessing of Diesel Oil, October 8, 2024
- Licensing Agreement with Mr Rakshpal Singh & Company, Chanchal Chikra Amroha on Improved Jaggery Making Plant, October 10, 2024
- Licensing Agreement with M/s Chaudhary Dhyan Singh, Amroha on Improved Jaggery Making Plant, October 10, 2024
- MoU with Madan Mohan Malaviya Engineering College, Gorakhpur on Academic Collaboration and Joint Research Programs, October 25, 2024
- Licensing Agreement with Shakti Udhyog, Najibabad on Improved Jaggery Making Plant, October 30, 2024
- NDA with Newtrace Private Limited. Bangaluru on CSIR-IIP SAF Technology, Deployment of Cost Effective Hydrogen Production Technology by Newtrace, and Its Utilization in the HEFA process, November 06, 2024
- NDA with Droft-Ketal Chemicals India Pvt. Ltd. Mumbai for Manufacturiing of SAF Catalyst, November 07, 2024

- NDA with 2 Degrees Cli-Con Pvt. Ltd., Hyderabad on the Development of Innovative Technology for Recycling of Identified Waste, December 07, 2024
- NDA with Reliance Industries Limited, Mumbai to Conduct a Feasibility Study for Setting up and Installation of an Advanced Gas Upgradation System in the CBG Plant on Pilot Basis at Reliance's Facilities at Gujarat, December 13, 2024
- MoU with Graphic Era University, Dehradun on Academic Collaboration and Joint Research Programs, December 19, 2024
- MoA with Hindustan Petroleum Corporation Limited, Bengaluru For Joint Collaborative Tailored Design and Development of Nanomaterials for the Single Step Conversion of Supercritical Carbon Dioxide (SC-CO_2) to Fuels and Value-added Chemicals, December 30, 2024
- Licensing of Technology with Upcharge Energy Solution LLP, New Delhi on Dual-Fuel Engine System, January 02, 2025
- MoU with Bhagalpur Biorefinery Private Linrited, Bhagalpur that CSIR-IIP will make the Bioiet (Jet A-1) Aviation Fuel from Corn Oil for Demonstration Flights in India and Develop a Techno-Commercial Feasibility Report, January 04, 2025
- NDA with Adobde Biotec India Private Lted. Hyderabad on Industrial Validaion for Production and Down Streaming at 2KL Fermentor by using RMIIPL 32 MTCC25056 Strain, January 09, 2025
- MoA with Jaypee Institute of Information Technology, Noida on Enzyme cocktail derived from fungus developed by CSIR-IIP, January 10, 2025
- NDA with Naion Pvt Limited. Hosur on Modified Alumina and Structural Alumina for Reforming and other Catalytic Applications, February 06, 2025
- MoU with IIT Jodhpur on Academic Collaboration and Joint Research Programs, February 10, 2025
- NDA with TCG Life Sciences Private Limited, Kolkata on Collaboration on Estimation on Green House Gas Emission in Active Pharmaceutical Ingredient, March 04, 2025
- MoU with Delhi Technological University, New Dehi on Academic Collaboration and Joint Research Programs March 11, 2025

3

प्रशिक्षण

TRAINING

3.1 तेल एवं संबद्ध क्षेत्र से उद्योगों के कार्मिकों का प्रशिक्षण / Training of Personnel from the Oil and Allied Sector Industries

As a part of its mandate, CSIR-IIP imparts training to personnel from the oil industry and related fields like the Automobile and Transport sector.

3.1.1 पेट्रोलियम शोधन प्रौद्योगिकी' पर आयोजित कार्यक्रम / Programmes on 'Petroleum Refining Technology'

- Training Programme on "Petroleum Refining Technology" for 29 Chemical Engineers of IOCL New Delhi from April 29, 2024 to June 07, 2024.
- Training Programme on "Petroleum Refining Technology" for 30 Chemical Engineers of IOCL, New Delhi from June 11, 2024 to July 19, 2024.
- Training Programme on "Petroleum Refining Technology" for 33 Chemical Engineers of IOCL New Delhi from July 5, 2024 to August 13, 2024
- Training Programme on "Petroleum Refining Technology" for the Chemical Engineers of IOCL New Delhi from November 11, 2024 to December 20, 2024
- Training Programme on "Petroleum Refining Technology" for 26 Chemical Engineers of IOCL New Delhi from February 10, 2025 to March 21, 2025.
- One Week Training Programme on "Refining Technology and Configuration" for the Chemical Engineers of NRL, Numaligarh from 24th March to 28th March, 2025
- Training Programme on "Petroleum Refining and Petrochemicals Technology" for Trainees from ITEC Tanzania from 31st March 2025 to April 11, 2025.





3.1.2 अन्य कार्यक्रम / Other Programmes

- Project Trainee – 25 Students from different Universities from June 2023 to 30th June 2026.
- Two days Training Programme on "Emerging Trends of CBG and Flex Fuel Engines / Vehicles" for 16 Officers of Maruti India Limited, New Delhi during 5-6 December, 2024.

- One week Training Programme on "Electric Mobility and Advanced Automotive Technology" for Officers of Ministry of Road Transport and Highway (MoRTH), New Delhi from 18-22 November, 2024.
- Seven days Training Programme on "Alternative Fuels for Automotive Application" for the Officers of Ministry of Road Transport and Highway (MoRTH), New Delhi, from 20-24 January, 2025.
- One Week Training Programme on "Vehicular Emissions and Control" for Officers of Ministry of Road Transport and Highway (MoRTH), New Delhi, from 24-28 February, 2025.

3.2 संभाषण- गोष्ठियाँ / Colloquia

- Prof. Vishav Sharma, Senior Solutions Consultant, Clarivate Analytics delivered a Colloquium on Web of Science and JCR on 24th September, 2024.
- Dr. Parasuraman Selvam, FICS, FRSC Head, National Centre for Catalysis Research Professor, Department of Chemistry, Coordinator (M.Tech - Catalysis Technology), Department of Chemical Engineering, Indian Institute of Technology-Madras, Chennai delivered a colloquia on Catalysis - A Key to a Sustainable Future on 2nd July 2024.

3.3 विदेश में प्रतिनियुक्ति / Deputations Abroad

- Dr. Thallada Bhaskar, Chief Scientist visited France to strengthen the R & D France and CSIR-IIP, India during 16th September 2024 to 29th September, 2024.
- Dr. Anil Sinha, Chief Scientist participated in Technical Meetings being organized by American Society for Testing and Materials (ASTM) in Anahelm, CA USA during 8-12 December, 2024.

4

अनुसंधान-संबंधी गतिविधियाँ प्रारंभ की गई चालू, एवं संपन्न हो चुकीं

RESEARCH ACTIVITIES INITIATED, ON-GOING & COMPLETED

4.1 नई परियोजनाएँ / Projects Initiated

4.1.1 प्रायोजित परियोजनाएं / Sponsored Projects

1. Installation of 50 Kg/H Agro-Waste to Briquettes Unit and Generating Livelihood thereby Empowering the Women of Champawat
2. Basic Study to Resolve Paraffin Wax Type II a Quality Issue
3. Direct Synthesis of 6-Tertbutyl-2,4-Dimethylphenol (Topanol A) From 2,4-Dimethyl Phenol
4. Testing of Performance of FCC Catalyst Sample
5. Microplastics from Sewage Treatment Plant along Lower Ganga River Basin: Abundance, Associated Co-Contaminants and Post Effects of Disposing of Sludge in Aqueous and Terrestrial Environments (45809)
6. Evaluation and Compliance of Registered Vehicle Scraping Facility as per GSR 653(E) for M/s Pineview
7. Evaluation and Compliance of Registered Vehicle Scraping Facility as per GSR 653(E) for M/s Nirvana
8. Evaluation and Compliance of Registered Vehicle Scraping Facility as per GSR 653(E) for M/s Sega Tech
9. From CO2 to Carboxylic Acids: C(Sp2)–H Bond Functionalization using Earth-Abundant-Transition Metals and Cooperative Photoredox Catalysis
10. Development of Bio Binders from Agricultural Waste for Utilization in Bituminous Road Construction
11. Friction and Wear Behaviour of Friction Wedge Material for Railway
12. Collaborative Support for Commercialization of Greenchem Energies Private Limited Technology for Production of Biofuels (Biodiesel And Green Diesel)
13. Analysis of Waste Plastic Pyrolysis Samples as per IS 1460 Specifications
14. Evaluation and Compliance of Registered Vehicle Scraping Facility as per GSR 653(E) for M/s Gadar Kharda
15. Impact of Hydrogen-Enriched Natural Gas (Heng) on the Performance of the Domestic Cooking Burner
16. Feasibility Studies on Synthetic Aviation Fuel (SAF) Production from Carbon Dioxide
17. Studies on the Development of the Additive for Diesel Mehtanol Blend (Phase-I)
18. Study the Deposits & Distressed Characteristics of Two Diesel Engines at IDIADA Chakan Facility
19. Impact Studies of LPG Quality Parameters on Pipeline Corrosion : Experimental and CFD Simulation Activities
20. Feasibility Study for Biodiesel Production by CSIR Study of different Seeds derived Fatty Oils from Biodiesel Production by CSIR-Room Temperature Biodiesel Process
21. Analysis of Biodiesel (B100) Samples as per IS 15607:202 Specifications

22. Study of Deposits and Distress Characteristics of Two Diesel Engines
23. Study of Impact of Additives on Research Octane Number and Cetane Number
24. Basic Lab Study to Generate Design Data on Feed Stock (DAO from PDA Unit) for Implementation of CSIR IIP-EIL-NAL Wax Deoiling Technology at CPCL Refinery to Produce Micro Crystaline Waxes (MCW)
25. Troubleshooting Study of SDU for Achieving Design Conditions with Respect to throughput, Utility/Chemical Consumptions and Product Quality
26. Rating of the Components of Two Nos. Transmission Gear Boxes and One Rear Axle Unit
27. Two-Stage Hydroprocessing of Diesel Oil
28. Study the Deposits & Distressed Characteristics of Two Diesel Engines at Idiada Chakan Facility
29. Demonstration of BPCL's Crossflow Reactor Technology in CSIR-IIP SAF Production Process
30. Investigation of Defect-Rich Zeolite-based in the Catalytic Cracking of Tree-Borne Oils to Produce Sustainable Aromatics
31. Tailored Design and Development of Nanomaterials for the Single Step Conversion of Supercritical Carbondioxide (SC-CO2) to Fuel and Value-Added Chemicals
32. Study to Examine Feasibility of Converting Heavy Aromatic Hydrocarbons into Mesophase Pitch - A Precursor for Advanced Carbon Materials
33. Design Development and Demonstration of a Pilot Scale Unit for Dimethyle Ether Production from Syngas
34. Honda Shine Engine Parts Rating
35. Fire Resistant Type Hydraulic Fluid
36. To Study the Deposit & Distresses Characteristics of Two Diesel Engines
37. Analysis of Automotive Diesel Samples as per IS 1460 Specifications
38. Pre-feasibility Study for Revamping of Wax Deoiling Unit at CPCL, Manali
39. Testing of Fire Resistant Hydraulic Fluid
40. To Study the Deposit & Distresses Characteristics of Two-wheeler Engines

4.1.2 संस्थागत / In-house

1. Propylene Carbonate from Carbon Dioxide
2. Fermentation Scale-up and Technology Development of Lead Industrial Enzymes for Biofuel, Food, Feed, Agriculture and Vaccine Applications
3. Scale-Up and Field Trail for Spectral Converting Diverging Optics Integrated Solar Sharing Agrivoltaics Technology
4. Development of Catalyst for the Oxidative Coupling of Methane to C2 (Ethane + Ethylene) Hydrocarbons

5. Lignin to Chemicals
6. Process Development for Oxygen- Argon Separation
7. Feasibility Study on the Development of Catalyst for the Production of Isoprene
8. Feasibility Study for Hydro Treating of Pyrolysis Bio Oil and Waste Plastic Oil/Tyre Oil
9. Design and Evaluation of the Synergistic Effect of Hybrid Cnc-Surfactant-Polymer Additive as Drag Reducing Agents for Pipeline Transportation of various Crude Oil
10. Developing Electro- & Photoelectro-Catalytic Processes using Pesctides for Co2rr
11. Solvent-Assisted and Extractive Pyrolysis of Lignocellulosic Biomass
12. Establishing the Proof of Concept of Hydrogen Free Desulfurization Scheme for Industrial Applications in a Cost Effective Manner
13. Synthesis of Linezolid and Carbamazepine Drug Intermediates to a 25g Scale through Reductive Hydrogenation of Nitro Derivatives
14. Study and Prototyping of a Super Capacitor Management System (SMS) for EV Application
15. Investigation of Indian Brick Kilns for the Improvement in Thermal and Combustion Performance
16. Environmental Impact Assessment of Room-Temperature Bio-Diesel and DILSAAFTM Sustainable Aviation Fuel Production Processes
17. Generation of Free Energy using Flywheel, Alternator and Solar Powered Pulses
18. Up-gradation of Engine and Vehicle Mass Emission Test Facility
19. Novel In-situ Microbial Thermal Stimulation Approach of Methane Recovery from Natural Gas Hydrate-Bearing Sediments and Simultaneous Carbon Dioxide Sequestrationa: Experimental Investigations and Modeling
20. Advancing Fuel Flexibility of Solid Oxide Fuel Cell through Development of Compatible Multi component & High Entropy Alloy Cermets/Oxides
21. Production of H_2 From H_2S Via Thermo Chemical Sulfur Looping Process

4.2 चालू परियोजनाएँ / On-going Projects

4.2.1 प्रायोजित / Sponsored

1. Clathrate Hydrates: Opportunities for Innovative Technologies
2. Audit and Certification of Biodiesel Plants based on used Cooking Oil (UCO) as Feedstock
3. Development of New Variants of the Re-Formulated Thoxcat ES Catalyst with Effective Foam Control Feature for Supply Security in the Middle East Market
4. Production of Xylene-Rich Alkylated Aromatics using CO_2 as an Alkylation Reagent
5. Indigenously Design and Development of Hybrid Network Composite Solid Electrolyte for Batteries
6. Catalytic Valorization of Bio-Ethanol through Production of Future Fuel
7. Evaluation of Turbine and Compressor Oils
8. Analysis of HR-TEM with EDS

9. Supply of Bio Diesel to Garhmukteshwar-Meerut Road Project
10. Development of Efficient Catalysis for Hydrogenation of CO_2 to Synthetic Natural Gas (E-Methane)
11. Production of Propylene and Hydrogen via Propane Dehydrogenation : Catalyst and Process Development at Bench Scale
12. Creation of Nodal Centers for Development and Production of Key Starting Materials, Intermediates and other Raw Materials that are required by the Health Care Sector
13. Thermo-Chemical Hydrogen Generation through partially Open-Loop I-S Process Involving H_2S Incineration : Coupling of Individual Sections for Laboratory Intergraded Operation
14. Detailed Feasibility Report and Basic Engineering Design Package on Dilsaaf Technology
15. Set-up of an One TPD Solid Organic Waste Processing Anaerobic Digester (AD) at the Labour Camp of Jewar Airport Construction Site. Providing Consultancy Service to Tata Projects Limited for the Evaluation, Selection, and Procurement of the AD
16. Conversion of a Diesel Genset to A Dual-Fuel Mode and Performance and Emissions Study of the Converted Genset
17. Mapping, Monitoring and Management of Lantana Camara through Utilization for Improving Livelihood of People in Forest Fringe Villages of India
18. HR-TEM Analysis with EDS for Sprint Testing Solutions
19. One Step Conversion of Carbon Dioxide into Diphenyl Carbonate
20. Machine Learning Enable Design and Synthesis of Nanoscale Layered Pervoskite Materials for High-Performance Fuel Cell and Battery
21. Performance Evaluation of New Engine Lubricants formulated for Motorcycles
22. Innovation Stratefies for CO_2 Valorization Integrated with Organic Synthesis using Earth Abundant Metals and Cooperative Photoredox Catalysis
23. National Greenhouse Gases Inventory for Road Transport Sector- BTR1, BUR4 and Fourth National Communication
24. Analysis of Ehtylene Gas Samples
25. Setting up of a Demonstration Plant for the Production of D-Methanol 1 Kg/Day
26. Design and Development of Biocarbon supported Mn and Co based Nano Catalysts for the Transfer Hydrogenation/Deterioration Reactions using Ch_3OH/Cd_3OD as Hydrogen/Deuterium Source and Synthesis of Pharmaceutical Intermediates
27. Oil Soluble Metal Catalyst for Upgradation of Crude/Heavy Crude to Value Added Petro-Products and Precursors
28. Characteristic Property Evaluation of Houghtosafe 620 EP
29. Integrated Fermentation and Chemical Catalysis for Jet Range Bio-Renewable Fuels and Blends
30. Installation of 50 Kg/H Agro-Waste to Briquettes Unit and Generating Livelihood thereby Empowering the Women of Champawat

31. Testing of Performance of FCC Catalyst Sample
32. Microplastics from Sewage Treatment Plant along Lower Ganga River Basin: Abundance, Associated Co-Contaminants and Post Effects of Disposing of Sludge in Aqueous and Terrestrial Environments (45809)
33. From CO_2 to Carboxylic Acids: C(SP_2)–H Bond Functionalization using Earth-Abundant-Transition Metals and Cooperative Photoredox Catalysis
34. Development of Bio Binders from Agricultural Waste for Utilization in Bituminous Road Construction
35. Friction and Wear Behaviour of Friction Wedge Material for Railway
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50. Demonstration of BPCL's Cross-Flow Reactor Technology in CSIR-IIP SAF Production Process
51. Investigation of Defect-Rich Zeolite-Based in the Catalytic Cracking of Tree-Borne Oils to Produce Sustainable Aromatics
52. Tailored Design and Development of Nanomaterials for the Single Step Conversion of Supercritical Carbon-dioxide (SC-CO_2) to Fuel and Value-Added Chemicals
53. Study to Examine Feasibility of Converting Heavy Aromatic Hydrocarbons into Mesophase Pitch - A Precursor for Advanced Carbon Materials

54. Design Development and Demonstration of a Pilot Scale Unit for Dimethyle Ether Production from Syngas
55. Honda Shine Engine Parts Rating
56. Fire Resistant Type Hydraulic Fluid
57. To Study the Deposits & Distressed Characteristics of Two Diesel Engines
58. Analysis of Automotive Diesel Samples as per IS 1460 Specifications
59. Pre-Feasibility Study for Revamping of Wax Deoiling Unit at CPCL, Manali
60. Testing of Fire Resistant Hydraulic Fluid
61. To Study the Deposit & Distresses Characteristics of Two-Wheeler Engines
62. Development and Testing of Bio-Jet Fuel for IAF
63. Thermo-Chemical Hydrogen Generation through partially Open-Loop S-I Process Involving H_2S Incineration : Part I. Experimental Study of Bunsen Reaction and Hi Decomposition
64. Setting up of 1 TDP Demo Pilot Plant for Conversion of Waste Plastic to Value Added Hydrocarbons (Phase-II)
65. Thermo-Chemical Hydrogen Generation Through Partially Open-Loop S-I Process Involving H_2S
66. Development of Lubricating Oil (HALCR-35m) for Helicopter Transmission Gearboxes
67. Operation of Fuel Testing Laboratory at Noida

4.2.2 संस्थागत / In-house

1. Eco-Campus Initiative of CSIR-IIP to Develop a Sustainable Model Campus
2. Feasibility Study of Production of High Quality Pet Coke/Needle Coke by Co-Processing of Coal-Tar and Petroleum Streams
3. Hydro-processing of Palm Stearin and Comparisons with Jatropha Oil
4. Crude Oil to Chemicals : Olefins Maximization
5. Development of a Catalyst for the Production of Lower Olefins by Catalytic Cracking of Naphtha Co-Processes with Co_2
6. Development of Novel Lubricant Additive through Chemical Modification / Derivatization of Biomaterial
7. Techno-Economic Evaluation of Chemical Looping based Separation Process for Closed Boiling Mixture Separation of Mixed Xylene Isomers over UOP's Parex Process
8. Development of Emulsifiers for Indian Heavy Crude Oil (API 10-30) using a Novel Surfactant for Pipeline Transportation
9. Development of Low-Cost Metal-Organic Frameworks and their High Capacity Formulation Routes (LCM-HCF) for Gas Separation Applications
10. Development of Corrosion Inhibitor Formulation for up and Mid Stream Applications

11. Utilization of Coal Gauge TP Synthesize Zeolites and their Application in Adsorption and Catalysis
12. Development of High Performance Mixed Matrix Membranes (MMMS) For CO_2 Capture from Industrial Flue Gases
13. Electric Re-trofitment of a Polluting Diesel Auto-Rickshaw into an Electric Auto-Rickshaw in Imphal using an EV Kit (of Indian Parts) and Kit Road worthiness Trials
14. Kinetic Evaluation and Reactor Design Aspects using Multi-Physics Methodology for Catalytic Stream Naphtha Cracking and Crude Bio-Glycerol Bi-Reforming Processes
15. Development of Porous Adsorbents for their Use in Gas Separation Application
16. Development of Catalyst for the Synthesis of Polyether Carbonate Polyois via Chemical Fixation of Co_2
17. SAF Plant Facility Operation to Produce Sustainable Aviation Fuel (SAF) and Green Diesel
18. Development of Cost Effective Scale-Up Process for the Production of High Value Amines
19. Maintaining ISO-9001-2015 Certification for the Institute and to Obtain Future Certification
20. Process Development for Oxygen- Argon Separation
21. Feasibility Study on the Development of Catalyst for the Production of Isoprene
22. Feasibility Study for Hydro Treating of Pyrolysis Bio Oil and Waste Plastic Oil/Tyre Oil
23. Design and Evaluation of the Synergistic Effect of Hybrid CNC-Surfactant-Polymer Additive as Drag Reducing Agents for Pipeline Transportation of various Crude Oil
24. Developing Electro- & Photo-electro-Catalytic Processes using Pnictides For HER and CO_2RR
25. Solvent-Assisted and Extractive Pyrolysis of Ligno-cellulosic Biomass
26. Establishing the Proof of Concept of Hydrogen Free Desulfurization Scheme for Industrial Applications in a Cost Effective Manner
27. Synthesis of Linezolid and Carbamazepine Drug Intermediates to a 25g Scale through Reductive Hydrogenation of Nitro Derivatives
28. Study and Prototyping of a Super Capacitor Management System (SMS) for EV Application
29. Investigation of Indian Brick Kilns for the Improvement in Thermal and Combustion Performance
30. Environmental Impact Assessment of Room-Temperature Bio-Diesel and DILSAAFTM Sustainable Aviation Fuel Production Processes
31. Generation of Free Energy using Flywheel, Alternator and Solar Powered Pulses
32. Design of Modular Biogas Dry Reforming Pilot Plant With Optional Downstream Syngas Conversion Processes
33. Catalyzing Rural Empowerment and Enterpreneurship Development through Cultivation, Processing, Value Addition and Marketing of Aromatic Plants
34. Development and Certification of New Generation Lubricant Formulations for Aerospace Surfaces and Components / WP-5

35. Design and Development of High-Entropy Alloys using Artificial Intelligence for Gas Turbine Applications (WP- 4.2)
36. Hydrogen Technology (H_2T) Mission Program
37. Plastic Depolymerization and Upcycling (DEPOLUP)
38. Phenome India-CSIR Health Cohort Knowledgebase (HTC)
39. Carbon, Capture, Utilization & Storage (CCUS)
40. Waste to Wealth: Comprehensive Solutions towards Circular Economy and Sustainability
41. Jigyasa 2.0 Programme with the Concept of Virtual Lab Integrated (CJVL)
42. Lignin to Chemicals
43. Production Of H_2 From H_2S Via Thermo-chemical Sulfur Looping Process
44. Novel in-situ Microbial Thermal Stimulation Approach of Methane Recovery from Natural Gas Hydrate-Bearing Sediments and Simultaneous Carbon Dioxide Sequestrationa: Experimental Investigations and Modeling
45. Upgradation of Engine and Vehicle Mass Emission Test Facility
46. Propylene Carbonate from Carbon Dioxide
47. Development of Catalyst for the Oxidative Coupling of Methane to C_2 (Ethane + Ethylene) Hydrocarbons
48. Scale-up and Field Trail for Spectral Converting Diverging Optics Integrated Solar Sharing Agrivoltaics Technology
49. Fermentation Scale-up and Technology Development of Lead Industrial Enzymes for Biofuel, Food, Feed, Agriculture and Vaccine Applications
50. Advancing Fuel Flexibility of Solid Oxide Fuel Cell through Development of Compatible Multi-component & High Entropy Alloy Cements/Oxides
51. CSIR-Integrated Skill Initiative (Phase-II) 2020 To 2025

4.3 पूर्ण हो चुकी परियोजनाएं / Projects Completed

4.3.1 प्रायोजित / Sponsored

1. Feasibility Study for Implementation of Pinch Analysis in Crude Distillation Unit-II at CPCL Manali
2. To Study the Deposits & Distresses Characteristics of the Components of One Diesel and Two Gasoline Passenger Car Engines
3. Performance Evaluation of New Engine Lubricant Formulation Synthesized for Two-Wheelers through Field Trials
4. Corrosion Inhibitor Performance Evaluation Studies
5. Energy and Process Optimization of Pulping and Chemical Recovery Sections
6. Basic Study to Resolve Paraffin was Type II a Quality Issue
7. Demonstration of Mobile Pyrolyser for Conversion of Agriculture Residues for Production of Bio-Oil and Biochar
8. Evaluation and Compliance of Registered Vehicle Scraping Facility as per GSR 653(E) for M/s Pineview
9. Evaluation and Compliance of Registered Vehicle Scraping Facility as per GSR 653(E) for M/S Nirvana
10. Evaluation and Compliance of Registered Vehicle Scraping Facility as per GSR 653(E) for M/S Sega Tech
11. Analysis of Ethanol Blended Gasoline Samples
12. Evaluation and Compliance of Registered Vehicle Scraping Facility as per GSR 653(E) for M/s Gadar Kharda
13. Feasibility Assessment of Sweet Sorghum (SS) Stalk and Syrup for 2g Ethanol Production
14. To Utilise Organic Fraction of Waste available at Dumsite of Kondungiyur, Chennai and Strategic Planning / Approval of Technology for New Processing Units
15. Analysis of Biodiesel Samples
16. Engine Components Rating As Per ASTM Manual For Component Distress
17. Analysis of Bio Diesel
18. Assessment and Preliminary Studies for Upgrading Type Pyrolysis Oil to LDO Grade
19. Exhaust Gas Analysis for NOx Reduction in Industrial Furnace Through a Novel Exhaust Gas Recirculation Technology
20. Study the Deposits & Distressed Characteristics of Two Diesel Engines at IDIADA Chakan Facility
21. Direct Synthesis of 6-Tertbutyl-2,4-Dimethylphenol (Topanol A) from 2,4-Dimethyl Phenol
22. Testing of HC HFDU 68 Synthetic Ester based Fire Resistant Hydraulic Oil as per IS 7895 & IS 10532

23. Compatibility Studies of Lubricating Greases
24. Technology Information Document (TID) for Demonstration Unit of 1mt/Day Feedstock Processing on CSIR-IIP DILSAAF Technology
25. Development of an Indigenous Catalyst for Hydrogenation of CO_2 to Methanol and Design of a Pilot Scale Unit for 10kg/Day Methanol Production
26. Metal Sharp Sterilization and Infraction Apparatus Messia
27. Friction and Wear Behaviour of Friction Wedge Material
28. Study of Deposits and Distress Characteristics of Two Diesel Engines
29. Demonstration of 1000 Lit/Day Syngas Generation Via Dry Reforming
30. A Bench Scale High Pressure Visual Autoclave: Assessment of Green Hydrate Inhibitors for Deepwater Energy Production
31. Fabrication, Supply and Installation of Medical Grade Oxygen Concentrator System to Government Establishments under PM Care Fund

4.3.2 संस्थागत / In-house

1. Separation and Recovery of Bicyclic Aromatic Chemicals (BAC) from Carbon Black Feedstock (CBFS), Coke Liquid and Light Cycle Oil (LCO)
2. Development of IGH Photo-Conversion Efficiency Electron Donors for Organic Photovoltaic Applications
3. Eco-Campus Initiative to Convert Biomass to Pellets using In-House Facility
4. Rational Design of Industrially Viable Ammonia Oxidation Catalysts using High throughput Computational and Experimental Techniques
5. Energy and Process Optimization of Pulp and Paper Mill's Processes using Simulation and Pinch Analysis Tools
6. Feasibility Study for the Recovery of Fats, Oils, And Grease (FOG) From Indian Drains / Nallahs and its Conversion into Bio-Fuel
7. A Method for Immobilizing B-Glucosidases on a Magnetically Separable Recycleable Support based on Graphene for Multiple Cycle Conversion of Cellobiose into Glucose
8. Desulfurization of Tire Pyrolysis Oil (TPO) from Waste Tires(WT) of Airplane and Vehicle Tires
9. Development of Conducting Polymer based Coatings for Metal Corrosion Protection
10. Feasibility Studies of Preparing Napkin from Cellulosic Material of IIP Forest Residues
11. Development Of Biobinder For Construction Of Flexible Pavements
12. Synthesis of Lube Base Oil from Used Cooking Oil (UCO)
13. New Multipurpose Green Lubricating Grease Formulations base on Indigenous Non-Edible Oils
14. Set-Up and Demonstration of Mobile Unit 50 Lit/Batch (1 Barrel/Day) for Biodiesel Production from Non-Edible Oil and Used Cooking Oil at Sansad Bhawan

5

अनुसंधान एवं विकास अवसंरचना का विस्तार

ENHANCING R&D INFRASTRUCTURE

5.1 सृजित की गयी नई सुविधाएँ / New Facilities Created

- **Bidirectional Power Supply - SM210CP150 (battery emulator)**



The SM210CP-150 is a high-performance DC contactor designed for switching high current loads in electric vehicles, battery storage systems, and industrial automation. It supports continuous current ratings up to 150A, making it ideal for applications requiring safe and efficient power control. The contactor features arc suppression and coil economizer technology, ensuring long operational life and reduced power consumption. It is commonly used in DC charging stations, forklifts, and renewable energy systems. Its compact design and robust construction allow for reliable operation in harsh environments.

It will be used for testing of ev and renewable energy applications.

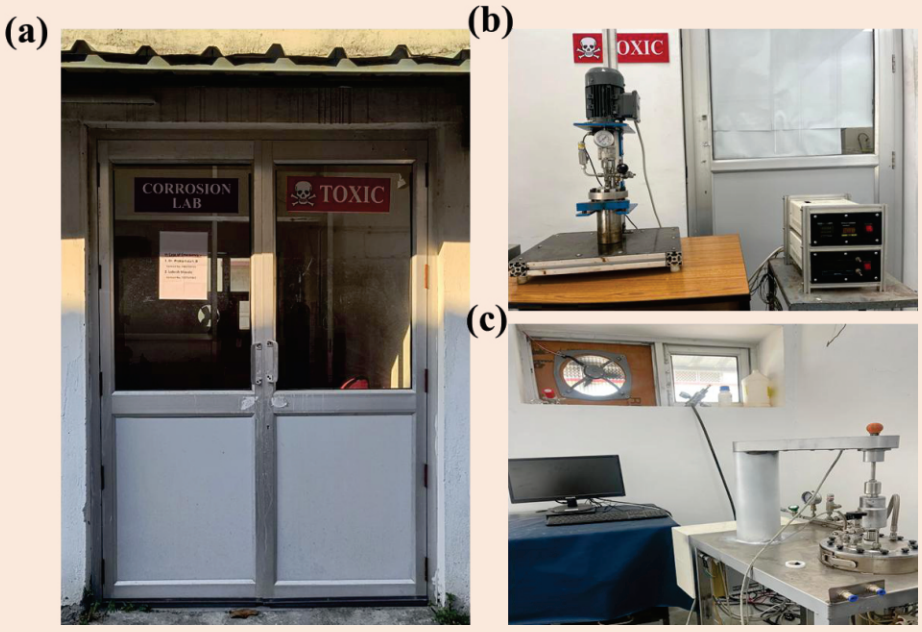
- **Vacuum Arc Melting Furnace**

The Vacuum Arc Melting (VAM) furnace is a specialized equipment used for melting and refining metals and alloys under a controlled vacuum environment. It operates by striking an electric arc between a consumable electrode and a water-cooled copper crucible, ensuring high-purity processing by minimizing contamination from gases and impurities. VAM is widely employed in the production of advanced materials, such as high-entropy alloys, superalloys, and specialized steels, due to its ability to achieve homogeneous composition and superior mechanical properties. This technique is crucial for aerospace, and energy applications requiring high-performance metallic materials.



- **LPG Corrosion Analysis Facility**

To ensure safety, a separate dedicated laboratory has been utilized for LPG corrosion analysis. Additionally, LEL detectors have been used to monitor the leakage of combustible gases, the fire and safety equipment installed in the working area. Lab photos are shown in Fig.1 and the high-pressure reactor has been utilized for the LPG corrosion studies and its photos are presented in Fig 2b & 2c.



(a) LPG corrosion lab, (b) 0.3 L reactor and (c) 3 L reactor

- **LPG Corrosion Analysis Facility**

To understand the stability of CO_2 hydrate in subsea sediments, we designed a lab-scale hydrate storage facility that mimics the subsea conditions.



- **High Pressure and High Temperature Rotating Cage**

It will help in the evaluation of corrosion inhibitors for use in refinery and oilfield applications typically require apparatus that can simulate the interaction between the corrosive fluid and the carbon/low alloy steel used in the construction of the refinery, pipeline, or drilling equipment.

6

महत्वपूर्ण आयोजन

IMPORTANT EVENTS

6.1 स्थापना दिवस / Foundation Day

6.1.1 सीएसआईआर-भापेसं स्थापना दिवस, 27 अप्रैल, 2024 / CSIR-IIP Foundation Day, April 27, 2024

CSIR-IIP, celebrated its 65th Foundation Day on 27th April, 2024 the celebration marked the institute's rich history of pioneering research, innovative technologies, and industry collaborations. Padma Bhushan Dr V K Saraswat, Hon'ble Member NITI Aayog and Mentor CSIR-IIP, graced the occasion as Chief Guest and delivered the Foundation Day lecture on the "Energy Transition in India". In his talk, Dr Saraswat emphasized need for the cleaner and carbon-free technologies that will drive the world in the near future. He encouraged scientists to undertake challenging research in e-Methanol and Green Hydrogen. He added that for Indian technologies to remain competent across the globe, India needs to start working on carbon neutrality rigorously.



Dr V.K. Saraswat also interacted with the scientific fraternity of CSIR-IIP. During the interaction, the Director CSIR-IIP presented the roadmap of the institute from 2024 to 2030 to accomplish the Vikasit Bharat Vision of the Prime Minister of India. Dr Saraswat appreciated the roadmap and proposed various suggestions for making it more beneficial to the nation.

The students and teachers from the Oak Grove School, Mussoorie, also attended the program as a part of the Jigyasa 2.0 program. The students visited various laboratories at the institute and interacted with the scientists and research scholars working in them. The motive of the Jigyasa 2.0 program is to inculcate scientific temperament among school-going kids so that they grow up as budding scientists in the country.

6.1.2 वैऔअप स्थापना दिवस समारोह, 7 अक्तूबर 2024 / CSIR Foundation Day Celebrations 7th October 2024

The CSIR-Indian Institute of Petroleum (IIP) proudly commemorated the 83rd Foundation Day of the Council of Scientific and Industrial Research (CSIR) with a ceremony on October 7, 2024 that showcased its achievements in research and commitment to sustainability.
Sh. Chandrasekhar N, ED and Head (R&D), BPCL graced the Event as Chief Guest while Sh. Rama Rao Marri, VP & MD of Lummus Technology was the Guest of Honor.





Dr. Chandrasekhar discussed the critical need to collaboratively utilizing resources to meet India's net-zero targets. He stressed the vital role of partnerships between research institutions and industry in fostering innovation and driving meaningful change in sustainability practices.

Guest of Honor Sh. Rama Rao Marri elaborated on the "IIP and Lummus's potential collaboration for Bharat's Growth Initiatives," emphasizing the importance of comprehensive technologies that align with India's Swachh Bharat and Global Biofuels Alliance (GBA) initiatives. He highlighted key areas of focus, including addressing plastic waste pollution, implementing decarbonization strategies, and advancing green technologies such as biofuel production and bio-petrochemical products.

The ceremony also honored employees with 25 years of dedicated service to CSIR, as well as those who retired between September 30, 2023, and August 31, 2024. Their contributions have significantly shaped the institute's legacy.

In line with the tradition of recognizing excellence, awards were presented for the "Swatchata Mission" initiative. The IIP's cleanliness drive serves as an inspiration to the community, encouraging active participation in maintaining cleanliness and promoting environmental awareness. Laboratory Representatives of CSIR-IIP were awarded for their commitment to maintaining clean and organized workspaces.

The evening festivities included a vibrant cultural program showcasing the talents of children of IIP staff, students, project personnel, and regular staff, who performed with enthusiasm through song and dance.

6.1.3 Open Day at CSIR-IIP on the Occasion of CSIR Foundation Day Celebration 26th September 2024

CSIR-IIP, observed an Open Day on 26th September 2024 as a part of CSIR's Foundation Day celebrations. A group of 50 Students from The Sapience School, Herbertpur, Dehradun along with faculty members

The students visited the Bio-technology & Biochemistry Lab, Adsorption & Membrane Separation Lab, CFR Engines, Emission Testing Lab, Thermo Catalytic Process Lab, Advanced Crude Oil Research Centre, IR, and GC-MS lab.

The whole programme was coordinated by Jigyasa Coordinator Dr Aarti, Principal Scientist CSIR-IIP.



6.2 राष्ट्रिय एवं अंतर्राष्ट्रीय दिवसों का आयोजन / National and International Days Celebrated

6.2.1 डॉ. अंबेडकर जयंती 14 अप्रैल 2024 / Dr. Ambedkar Jayanti, April 14, 2024

The programme was initiated with a tribute to Bharat Ratna Dr B. R. Ambedkar, followed by an enlightening speech on Dr BR Ambedkar's life and his achievements by Shri Jagdish Kumar, President SC/ST employee's welfare society.

6.2.2 राष्ट्रीय प्रौद्योगिकी दिवस, 10 मई, 2024 / National Technology Day Celebration 10 May, 2024

On the 11th day of May each year, India celebrates its National Technology Day. The day celebrates the first successful nuclear test carried out at Pokhran. The day is celebrated to signify the technical acclaim and growth of India. It also inspires young minds across Schools and Colleges and creates awareness of the technological supremacy of the country.

CSIR-IIP celebrated the 'National Technology Day' on 10th May 2024. Dr. D.K. Aswal, Director, Health, Safety and Environment Group, BARC, Mumbai graced the occasion as Chief Guest of the function. Dr H.S. Bisht Director CSIR-IIP informed the august gathering about the importance of this day and introduced the Chief Guest to the distinguished audience.

Dr. Aswal delivered a lecture on “Nuclear Energy for a Clean Environment and a Sustainable Future”. In his lecture, Dr Aswal clarified various myths associated with the safety hazards and use of nuclear radiation. Dr Aswal emphasized that Nuclear energy is far more safe and more economical than coal-based energy.

On the occasion, Dr Aarti, Senior Principal Scientist and Co-ordinator Jigyasa activities at CSIR-IIP, presented a brief overview of the Jigyasa Activities undertaken by CSIR-IIP and how it is beneficial for school-going children. On the occasion of National Technology Day “Lab Visits" were also organized for the students of St. Kabeer Academy Dehradun under the Jigyasa program.





6.2.3 विश्व पर्यावरण दिवस, 5 जून 2024 / World Environment Day, June 5, 2024

Three-day International Conference cum Exhibition IAC-2024 (3rd Indian Analytical Congress) was inaugurated at CSIR-Indian Institute of Petroleum (CSIR-IIP) Dehradun on 5th June 2024 on the occasion of World Environment Day.



6.2.4 International Yoga Day-2024, 21 June, 2024

"स्वयं और समाज के लिए योग" के रूप में अंतर्राष्ट्रीय योग दिवस - 2024 महोत्सव

अंतर्राष्ट्रीय योग दिवस, दिनांक 21 जून 2024 को सीएसआईआर-आईआईपी प्रांगण मे दसवा अंतराष्ट्रीय योग दिवस बडे ही धूम धाम से मनाया गया जिसमे मुख्य अतिथि के रूप मे योगाचार्य डॉ. पी एस सलवनिया जी रहे। श्री सलवनिया जी ने योग के बारे मे बहुत अच्छे से वर्णन किया तथा योग से होने वाले फाईदो से अवगत कराया।

योगाचार्य श्री पी एस सलवनिया जी ने महतवपूर्ण योग के बारे मे जानकारी दी जिसमे व्रक्षआसन, ताडआसन, बज्रासन, सर्ववांगआसन, तथा प्राणायाम मे ध्यानमुद्रा, ब्राहमरी और ओम के उच्चारण का पूर्ण महत्व बताया, सभी को योग से होने वाले फाईदो से लाभान्वित कराया। उन्होने संस्थान कर्मियों को सीटिंग जॉब मे होने वाली बीमारी जैसे स्पोण्डलेटिस से निजात पाने के लिए आफिस योगा के कुछ आसन बताएं जिस से संस्थान के सभी कर्मचारी लाभान्वित हुए।

यह कार्यक्रम हमारे संस्थान के निदेशक डॉ एच एस बिष्ट जी की अगुवाई मे कार्य सम्पन्न हुआ तथा इस कार्यक्रम में डॉ. हेमंत कुलकर्णी, डॉ. एन विश्वनाधाम, डॉ. जी डी ठाकरे, डॉ. सनत कुमार, डॉ. बबीता बेहरा, श्री सोमेश्वर पांडे तथा संस्थान के लगभग 250-300 लोगो ने बडी ही ऊर्जा के साथ भाग लिया।





6.2.5 स्वतंत्रता दिवस 15 अगस्त 2024 / Independence Day, August 15, 2024



भारतीय स्वतंत्रता की 78वां वर्षगांठ के अवसर पर भारतीय पेट्रोलियम संस्थान, देहरादून में 15 अगस्त 2024 को स्वतंत्रता दिवस समारोह का आयोजन किया गया। डॉ हरेन्द्र सिंह बिष्ट, निदेशक, सीएसआइआर-भापेसं, देहरादून ने ध्वजारोहण किया।

6.2.6 गणतन्त्र दिवस समारोह 26 जनवरी 2025 / Republic Day Celebrations, January 26, 2025

सीएसआईआर-भारतीय पेट्रोलियम संस्थान, देहरादून में 26 जनवरी, 2025 को 76 वां गणतंत्र दिवस मनाया गया। इस अवसर पर डॉ हरेन्द्र सिंह बिष्ट, निदेशक सीएसआईआर-भापेसं ने ध्वजारोहण किया तथा सुरक्षाकर्मियों द्वारा की गयी परेड की सलामी ली। गणतंत्र दिवस के अवसर पर डॉ हरेन्द्र सिंह बिष्ट ने सभी लोगो को संबोधित किया।



6.2.7 राष्ट्रीय विज्ञान दिवस, 28 फरवरी 2025 / National Science Day, February 28, 2025

National Science Day is celebrated in India every year on 28thFebruary to celebrate discovery of the Raman effect by Sir C.V. Raman. The day also commemorates contributions of scientists towards the development of the nation. This year, the theme of National Science Day is "Empowering Indian Youth for Global Leadership in Science & Innovation for Viksit Bharat."

On this occasion, the AcSIR Science Club of CSIR-IIP organized an event “AAGAZ 3.0”. The event was graced by Shri Gopal Joshi, ED & Head, KDMIPE, ONGC as Chief Guest and Dr. Bharat Newalkar, Chief General Manager (R&D), BPCL as Guest of Honour. Dr. Sanat Kumar, Chairman, Organizing Committee of AAGAZ 3.0 welcomed all on this occasion and informed about the importance and significance of National Science Day.

Dr.Harender Singh Bisht, Director CSIR-IIP, informed the august gathering that this year's theme focuses on encouraging young minds, recognizing ground-breaking contributions, and celebrating India's scientific achievements towards the Viksit Bharat. He mentioned that this required a different thinking way beyond laboratory-bound scientific research if we have to go and serve society and deliver a sustainable solution for the planet.

Dr. Bharat Newalkar, Chief General Manager (R&D), BPCL, the Guest of Honour of the event, mentioned societal challenges like health issues, climatic change, clean and efficient energy, security, etc., and the role of every citizen to take the societal challenges as we all are eligible, capable, responsible. He also mentioned that Women should be given more opportunities to participate in research and innovations.

Shri Gopal Joshi, Chief Guest of the event addressed audience and emphasized need of three qualities in our scientific endeavours: persistence, deep observation and revalidation. He gave the example of WD-40, anti-dust spray, which was successfully launched after 40 attempts. He also discussed the oil and gas exploration and well drilling in the Himalayas, West Bengal, and across India which requires a lot of persistence and adaptability. While discussing current energy scenario, he remarked that Petroleum is going to stay for a long and stressed the importance of budding young scientists in solving nation`s problem and leading towards Viksit Bharat.

On this day the doctorate students showed immense enthusiasm in the celebration. More than 200 students participated in different events like Rangoli on Visksit Bharat theme, photography based on natural beauty of Uttarakhand, graphical abstract competition based on lab safety theme, etc .





6.3 राज्य व्यापी मिशन / State-wide Missions

6.3.1 सक्षम (सरंक्षण क्षमता महोत्व)-2023) / Saksham (Sanrakshan Kshamata Mahotsav)

सक्षम (संरक्षण क्षमता महोत्सव) 2025" it's people centric fuel conservation campaign of PCRA/ Mo PNG it has been continually organized by the Oil Industries namely IOCL, HPCL, BPCL, jointly with the Petroleum Conservation Research Association (PCRA). CSIR-IIP hosted inaugural event of "Oil & Gas Conservation Month 2025 Celebration" on 28th feb 2025.

On this occasion, Hemant Rathore, ED, IOCL, stressed upon the need for circular economy, Dr H S Bisht, Director , CSIR-IIP remarked that the requirement of fossil fuel is bound to increase in coming years and there is a critical need to improve energy efficiency while simultaneously focusing on renewable energy. The chief guest of Valedictory session Mr Amit Kumar Sinha, IPS and ADG (UK police) stressed upon the importance of the general masses in driving energy conservation efforts. The Chief Guest also administered an energy conservation pledge on this occasion. This was followed by a Nukkad Natak depicting the need to save energy and prize distribution to the Winners of the Energy Conservation Quiz conducted at CSIR-IIP by SAKSHAM team.

6.3.2 Himalayan Diwas, 4th September, 2024

As a part of Himalaya Conservation Week (2-9 September, 2024), CSIR-IIP hosted a panel discussion on 4th September 2024 on " Technological Advancements and Development Perspectives in Management of Himalayan Ecosystem". The panelists included Padma Bhushan Dr Anil Prakash Joshi (HESCO), Dr. R P Singh (Director, IIRS), Prof. Durgesh Pant (Director General, UCOST), Dr. G S Rawat, (Former Director, WII and Founder, HAST), Dr Reema Pant (Director, Graphic Era Hill University), Dr Abhishek Rajvansh, (Head CIPET Dehradun), Professor Govind Singh Rajwar and Dr. Sanat Kumar.

Dr Harender Singh Bisht, Director CSIR-IIP urged need to identify appropriate solutions, customized for a region, to ensure its easy and faster adoption. He cited an example of pine needle briquetting work done by IIP for Champawat region. Padma Bhushan Dr Anil Prakash Joshi highlighted need to balance both the science and means to achieve equitable and sustainable growth of Himalayan region. He also stressed need to create awareness especially amongst youth and with highest echelons. Dr G S Rawat gave an overview of rich cultural legacy and biodiversity of Higher Himalayan region and its current challenges. He advocated a need to develop plan addressing both, conservation and livelihood / development of region. Prof R P Singh highlighted developments in remote sensing applications especially for assessment of phenology of Himalayan forests and measurement of CO2 flux. Prof Reema Pant emphasized role of education especially amongst youth to promote use of eco-friendly and appropriate practices. Dr Sanat Kumar stressed importance of scale and economics for every solution for sustainable and all inclusive development. He highlighted work done by IIP in providing solution to waste plastics by converting it into fuel.





6.4 Dissemination of Knowledge and Skills

6.4.1 Skill Development Programme

Skilled workforce is key to economic growth, higher productivity, poverty reduction and building resilient economy. CSIR-Integrated Skill Initiative for varied segment of the society is very aptly placed program to address the issue. At CSIR-IIP, Training programs were run to cater Students, Research Scholars and corporate executives. Good exposure to various analytical tools with theoretical clarification was key ingredient of our skill development training programs catering modern day work place challenges. Short duration program were introduced for maximum participation of outstation and girl participants. Maximum practical exposure and show- off in many of our training programs will

promote efficiency, productivity and competiveness. There has been good amount of re-skilling and up-skilling of employed corporate professionals through our sponsored training programs during the period .We also contributed towards international training partnership commitments through ITEC programs which will boost future global skilling alliances.





Sl No.	Name of the Skill Development Training	Duration /Dates	Qualification criteria	Overall Feedback Rating %
1.	Spectroscopic Analytical Techniques NMR & IR'	01/07/2024-12/07/2024	MSc Chem/M Pharm/MTech	95%
2.	'Analysis using Chromatography and Mass-spectrometry Techniques'	17/07/2024-27/07/2024	MSc Chem/M Pharm/MTech	86%
3.	'Analysis using Chromatography and Mass-spectrometry Techniques'	17/9/2024-25/9/2024	MSc Chem/M Pharm/MTech	90%
4.	'Testing of Key Parameters of Gasoline'	30/9/2024-09/10/2024	MSc Chem/M Pharm/MTech	90%
5.	'Analysis with Elemental, Microscopic and Thermo-gravimetric Tools'	06/01/2025-17/01/2025	MSc Chem/M Pharm/MTech	70%
6.	'Analysis using Chromatography and Mass-spectrometry Techniques'	03/02/2025-14/02/2025	MSc Chem/M Pharm/MTech	95%
7.	Spectroscopic Analytical Techniques NMR & IR'	03/03/2025-07/03/2025	MSc Chem/M Pharm/MTech	90%
8.	"Biobased Sanitary Napkins"	10/03/2025	Women NGO/SHG	95%
9.	'Analysis of petroleum Products'	18/03/2025-28/03/2025	B.sc	90%

Key Achievements

Short duration program introduced has shown good participation from remote areas, specifically girl candidates. Programs generated lot of scientific temperament and mobilised participants towards Q/C, R&D, academia. Participants got benefitted from earlier programs and are serving in different institutions including CSIR-IIP. Enhanced laboratory exposure has also raised interest in production /manufacturing industry also.

New initiatives taken

a. Skill Development proposed for remote area (Garhwal region of Uttarakhand) under 'Technology Development and Utilization Program for Women (TDUPW) / proposed creation of Satellite Skill center under DSIR Scheme.

b. Framing QP of NSQF level 6 or above for 'Glass blower' job role with NSDC / NCVET registration



6.4.2 Major Jigyasa Activities

A One-day Awareness Program on "The Environmental Hazards of Polymers" under the "Jigyasa 2.0 Program, 06 August 2024

A One-day awareness program on "The environmental hazards of polymers" under the "Jigyasa 2.0 program" in association with the Social Development for Communities (SDC) Foundation was successfully organized on 06 August 2024 at CSIR-Indian Institute of Petroleum, Dehradun. Over 150 students from grades IXth -XIIth from different government schools, of Dehradun region participated in this awareness program. The program's main objective was to make the students aware of Plastic waste and its reuse or recycling to minimize its environmental impact while keeping our city clean.

In his interaction with the students, Dr Harender Singh Bisht, Director, CSIR-IIP, briefed them about the different types of plastics and emphasized checking the plastic type before use. As some plastics are recyclable, reusing waste plastic will lead to a waste-free environment. He also informed students about the CSIR-IIP technology for converting waste plastic into gasoline, diesel, and petrol. Dr Aarti briefed about the Jigyasa program and highlighted the advanced research work and technologies developed at CSIR-IIP. She also urged students to

use plastics wisely for a clean and green environment. Dr Anoop Nautiyal, Founder of the Social Development for Communities (SDC) Foundation, briefed on the plastic waste generated in Dehradun City and emphasized how its collection and recycling can help convert Dehradun into a clean city. Dr. Umesh Kumar, Principal Scientist, CSIR-IIP, delivered a talk on different types of polymers and how these polymers make various types of plastics. Besides this, the students visited the pilot plant for waste plastic conversion to fuel, the process for converting used cooking oil to biodiesel at room temperature, and the Advanced Crude Oil Research Centre.



Road Show under Jigyasa 2.0 program was organized as a Sequel to Curtain Raiser event for IISF 2024, at CSIR-IIP Dehradun, India, 8th December, 2024

As a sequel to curtain raiser event, IIP on Nov 8, 2024 organised road show under Jigyasa 2.0 program in which students (Class XI-XII) from St. Kabeer Academy along with their faculty participated. The students visited Waste Plastic pilot plant. Dr Ajay Kumar explained different processes involved and co-ordinated their walk-through. The students participated in a road show highlighting various thematic areas of IISF 2024. In the main session held at Dr. Lovraj Kumar Auditorium, Dr S K Ganguly, Chief Scientist welcomed the honourable guests Prof K. D. Purohit, President of VIBHA Uttarakhand and Dr O P Nautiyal, Scientist USERC to CSIR-IIP and gave in his opening remarks welcomed participants to the event and gave an overview of IISF2024 and its societal relevance. In subsequent sessions, Prof K D Purohit, gave an overview of history, various activities of VIBHA (UK) and encouraged students to actively associate with its activities. Dr O P Nautiyal, urged need for “curiosity driven learning”. Several IIP scientists made presentations on Challenges in various contemporary scientific topics and work being pursued at IIP.





Five-day Residential Programme under 'Jigyasa' Programme was Organized for the students of Class XIth of Scindia Kanya Vidyalaya, Gwalior from 9th-13th December, 2024 at CSIR-Indian Institute of Petroleum, Dehradun

A Five-day Residential Programme under the 'Jigyasa' program was successfully organized for the students of the XIth class of Scindia Kanya Vidyalaya, Gwalior, from 9th-13th December, 2024 at CSIR-Indian Institute of Petroleum, Dehradun. The main objective of this Residential program is to provide an opportunity to observe and participate in the actual scientific work going on in the different research laboratories. The students were assigned to different research laboratories where they would get the chance to perform experiments. These research laboratories were the Biochemistry & Biotechnology Laboratory under Dr. Debashish Ghosh; the Nanocatalysis Laboratory under Dr. Rajaram Bal, the Surface Science & Technology Laboratory under Dr. O.P Khatri; the Polymeric Material Laboratory of Dr. Umesh Kumar; and Wax Rheology Laboratory under Dr. Manisha Sahai; wherein the students participated in routine chores of the laboratory while learning about science.



6.5 Exposure Events

6.5.1 Students' Visits

A large number of students from various Schools/ Colleges / Universities / Institutes visited the Institute :

- Around 170 students and teachers from the Oak Grove School, Mussoorie, visited the Institute on 27th April, 2024 under the Jigyasa 2.0 program.
- 18th DEGO Batch of CRPF visited CSIR-IIP, on 12th June, 2024 as a part of their study tour to get familiarized with prominent institutions of national importance situated in Dehradun.
- A team of 100 plus Students of B.Tech CSE, and IT, along with Faculty Members from Dev Bhoomi Uttarakhand University, Dehradun visited CSIR-IIP Campus on 13th August, 2024. This visit aims to provide practical exposure and enhance their understanding of industry operations, processes, and work culture.

- Under the Jigyasa program, "Lab Visits" were organized for the students of St. Kabeer Academy Dehradun on 22nd August, 2024
- On the occasion of CSIR Foundation Day Celebrations Lab Visits was organized under the Jigyasa program, for the students of The Sapience School, Herbertpur, Dehradun, on 26th September, 2024.
- 60 Students of Computer Science First year from Dev Bhoomi Uttarakhand University visited CSIR-IIP on 9th October, 2024, This visit aims to provide practical exposure and enhance their understanding of industry operations, processes, and work culture.
- A team of 82 Students of B. Tech. first-year along with Faculty Members of UPES, Dehradun visited our Institute on 16th October 2024.
- A team of 90- Undergraduate & Graduate students of The Department of Biotechnology and Faculty from Ramnarain Ruia Autonomous College, Mumbai visited CSIR-IIP Campus on 15thJanuary, 2025.
- A team of 17 plus Students of M.Tech Chemical Engineering and M.Tech Petroleum Engineering along with faculty visited the Institute on 24th March, 2025.
- A team of 26 Student from B.Sc. (H) Chemistry & M.Sc. Chemistry (Polymer Science & Chemical technology) and Faculty Members Ch. Charan Singh University, Meerut visited the Institute on 28th March, 2025.






6.5.2 Showcasing Our Capabilities (Outreach Activities)

Teams comprising of Scientists, Technical Officers/Assistants, and Technicians participated in the following events to showcase the technologies, capabilities and expertise of CSIR-IIP

- **CSIR-IIP participates in India Bio Energy & Tech Expo from 02-04 September, 2024**

CSIR participate in India Bio Energy & Tech Expo from 02-04 September, 2024 held at, Yashobhoomi- India International Convention & Expo Centre, Dwarka, Delhi. CSIR-IIP showcased it's technologies offerings in green naptha, sustainable aviation fuel and renewable biodiesel.

- CSIR Foundation Day Celebrations at NASC Convention Centre, Pusa, New Delhi on 26 September 2024 and CSIR Thematic Exhibition on 26, 27–29 September 2024
- "Vibrant Uttarakhand 2024 Expo" organized at SGNPM Inter College Ground, Race Course, Dehradun, Uttarakhand during 04-06 October, 2024.
- 5th Dehradun International Science and Technology Festival (DISTF-2024) organized by UCOST, ONGC and DBT, SRADSTA along with Department of Medical Education, Govt. of Uttarakhand from 20th to 23rd of November, 2024 at VMSB Uttarakhand Technical University, Suddhowala, Chakrata Road, Dehradun
- "Eat Right Mela", at Tapovan, Dehradun on 23rd December, 2024.
- 78th Foundation Day Celebrations of BIS, Dehradun on 6th January, 2025.
- "Bharat Development & Scheme Expo" from 21 Feb – 23 Feb 2025 at Prem Nagar Aashram, Haridwar, Uttarakhand.
- "Science Festival Exhibition" on 27-28 February 2025 organized by UCOST at RSC Vigyan Dham Jhajra Dehradun



6.6 अनुसंधान प्रबंधन गतिविधियाँ / Research Management Events

6.6.1 सीएसआईआर-आईआईपी अनुसंधान परिषद (आरसी) की बैठक / CSIR-IIP Research Council (RC) Meeting

54th Research Council Meeting scheduled to be held on 13th December,. 2024.

The Head of Divisions and the Institute's Technical and Administrative personnel attended the RC Meeting.

6.7 सम्मेलन / सेमिनार / संगोष्ठियाँ / Conferences / Seminars / Symposia

6.7. 3rd Indian Analytical Congress – IAC-2024, 5-7 June, 2024

The three-day International Conference cum Exhibition IAC-2024 (3rd Indian Analytical Congress) was inaugurated at CSIR-Indian Institute of Petroleum (CSIR-IIP) Dehradun on 5th June 2024. The conference was jointly organized by the Indian Society of Analytical Scientists (ISAS-Delhi Chapter) and CSIR-IIP. The conference theme highlights the "Role of Science and Technology in Green Transitions".



6.7.2 Valedictory Function of One Week One Theme (OWOT) Energy & Energy Devices (EED) Theme of CSIR at CSIR-IIP, 28th June, 2024

CSIR- IIP hosted valedictory funtion of the "One Week, One Theme" campaign, which focused on the pivotal Theme of Energy and Energy Devices (EED). Shri. Rajiv Agrawal, Director Technical, Engineers India Ltd., graced the occasion as the Chief Guest. Dr. M.O. Garg, President Petchem R&D, Reliance Industries Ltd., was the Guest of Honour on this special occasion.





6.7.3 CSIR-IIP Hosts R&D-Industry Meet Focused on "Prospects and Challenges in Petrochemicals and Biochemicals" 18th July, 2024

The Council of Scientific and Industrial Research - Indian Institute of Petroleum (CSIR-IIP) proudly hosted R&D-Industry meet as part of CSIR's "One Week, One Theme" (OWOT) campaign of the Chemical (including Leather) and Petrochemical (CLP) theme. Held at the IIP campus in Dehradun, this prestigious event centered around the "Prospects and Challenges in Petrochemicals and Biochemicals". It aimed to bridge the gap between cutting-edge research advancements and real-world industrial applications.





6.7.4 Visit of Hon'ble Vice-President of India to CSIR-IIP, 31st August, 2024

On 31st August 2024, CSIR Indian Institute of Petroleum (IIP), Dehradun, welcomed the Hon'ble Vice-President of India, Shri Jagdeep Dhankhar. The Hon'ble Vice President visited the Institute to address and interact with the Scientists, Faculty and Students of CSIR-IIP. He was accompanied by his Spouse, Dr. (Smt) Sudesh Dhankhar and Hon'ble Governor Uttarakhand, Lt. General Gurmit Singh.



6.7.5 Plantation of Sapling at CSIR-IIP by Hon'ble Vice President his Spouse, Dr. (Smt) Sudesh Dhankhar and Hon'ble Governor Uttarakhand, Lt. General Gurmit Singh on 31st August, 2024





6.7.6 India International Science Festival, 30th November to 3rd December, 2024

Curtain Raiser event for IISF 2024 at CSIR-IIP Dehradun, India on 30th October and Road Show on 8th November, 2024

As a sequel to curtain raiser event, IIP on Nov 8, 2024 organised road show under Jigyasa 2.0 program in which students (Class XI-XII) from St. Kabeer Academy along with their faculty participated. The students visited Waste Plastic pilot plant. Dr Ajay Kumar explained different processes involved and co-ordinated their walk-through. The students participated in a road show highlighting various thematic areas of IISF 2024. In the main session held at Dr. Lovraj Kumar Auditorium, Dr S K Ganguly, Chief Scientist welcomed the honourable guests.







6.7.7 CSIR-IIP hosted National Workshop on Advanced Carbon Materials for Next Generation Energy Solutions (NWCM2025), Dehradun on 20-21st February 2025

A 2-Day National Workshop on “Advanced Carbon Materials for Next Generation Energy Solutions (NWCM2025)” was organized by ICS in collaboration with CSIR-Indian Institute of Petroleum (CSIR-IIP) and CSIR-National Physical Laboratory at CSIR-IIP Dehradun on 20-21st February 2025. The workshop had focus on carbon material & thin applications in advancing technologies for energy storage and conversion devices.

6.8 कर्मचारी जागरूकता अभियान / Employee Awareness Drives

6.8.1 स्वच्छता पखवाड़ा 2024

Swachata Pakhwada was celebrated during 01.05.2024 to 15.05.2024. A variety of events were organized during the fortnight. A special session on Climate Change was organized on 13th May 2024. **Prof. Chetan Singh Solanki referred to as the "Solar Man of India"** The keynote speaker of this program, is a distinguished academician and renewable energy expert from IIT Mumbai gave a lecture on the topic **"Understanding 6 Points of Climate Change"** . In which he explained (AMG) threw light on the topic of energy efficiency and utilization with the help of Avoid, Minimize and Generate formula, which will be very beneficial in developing habits for green environment. The main objective of the program was to bring awareness about the environment and climate among everyone.







6.8.2 सतर्कता जागरूकता सप्ताह, 28 अक्टूबर - 3 नवंबर, 2023 / Vigilance Awareness Week, 28 Ocotber – 3 November, 2023

The Vigilance Awareness Week 2024 began with a Pledge taking ceremony at 11:00 am on 28.11.2024. The pledge was administrated by the Director CSIR-IIP, Employees were also encouraged to take e-pledge through the CVC website. Considering the importance of the "Vigilance Awareness Week" banners were displayed on prime frontal locations of the Institute.



Banners Displayed



Posters on integrity and eradication of corruption etc. displayed on different locations of the Institute



Integrity Pledge administered by Director, CSIR-IIP

Special lectures were also organized during the Vigilance Awareness Week to build capacity and to train the officials for smooth and effective functioning of the organization. One lecture was delivered on the topic "Governance Risk and Compliance" by Shri Umesh Kumar Nandwani, Ex-Director General STQC MeitY, on 28.10.2024 at CSIR-IIP Dehradun.

6.8.3 Swachh Bharat Abhiyaan at CSIR-IIP, 2024

155th Birth Anniversary of Mahatma Gandhi is being celebrated on 2nd October, 2024. The Swachh Bharat Abhiyaan is a significant step towards achieving this goal, and we are committed to contributing to this national mission. During the event, employees, students, and volunteers actively participated in cleaning the roads, parks, and nearby areas, with a special focus on proper disposal of plastic waste. The campaign also highlighted the importance of waste segregation and recycling.



6.8.4 CSIR-Cohort Sampling and Scanning, 6th May to 12 May, 2024

The Phenome- India CSIR Health Cohort knowledgebase (PI- CHeCK) is major initiative of CSIR to build comprehensive longitudinal database of health, multi- omics and lifestyle date for indian population. As a part of above, CSIR- IIP organized sampling & screening camp at it's premises from May 6-12, 2024.



6.8.4 सद्भावना दिवस 20 अगस्त, 2024 / Sadbhawna Diwas, 2024

सद्भावना दिवस पर संस्थान में एक शपथ-ग्रहण समारोह का आयोजन 20 अगस्त, 2024 को किया गया, जिसमें कर्मचारियों व अधिकारियों ने आपसी सद्भावना के प्रति अपनी प्रतिबद्धता को दोहराया।

6.8.5 RASHTRIYA EKTA DIWAS CELEBRATED, OCTOBER 31, 2024

As per GOI instructions, Rashtriya Ekta pledge was taken by the employees of the Institute on October 31, 2024, on the occasion of the birthday of Sardar Vallabhbhai Patel.

6.8.6 THE CONSTITUTION DAY, NOVEMBER 26, 2024

The Constitution of India was adopted by Constituent Assembly on November 26, 1949 and came into effect later on January 26, 1950. As per the instruction of the Govt. of India, Constitution Day was celebrated in the Institute on November 26, 2024.

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अनुसंधान एवं प्रबंधन निकाय

RESEARCH & MANAGEMENT BODIES

सीएसआईआर-भापेसं की अनुसंधान परिषद के सदस्य
Research Council Members of CSIR-IIP

अध्यक्ष / Chairman

Mr Arun Kumar Singh
Chairman and CEO,
Oil and Natural Gas Corporation Ltd.
Plot No. 5A- 5B Nelson Mandela Road,
Vasant Kunj, New Delhi - 110070

बाह्य सदस्य / External Members

Dr. G.S. Kapur
Advisor (R&D), GAIL India Ltd
former Executive Director-I/c
(Chemical Technology), and
Head-IndianOil Technology Development
& Deployment
Centre, R&D Division,
Indian Oil Corporation Ltd
Consultant, Energy Transition
& Petrochemicals
Sector 17, Faridabad – 121002

Dr Neeraj Mathur
Former Executive Director(R&D),
Oil India Limited
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Ms Sukla Mistry
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Indian Oil Corporation Ltd. Scope Complex,
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एजंसी प्रतिनिधि / Agency Representative

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6th-8th Floor, Block 2 and 4th-5th Floor,
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सहोदरी प्रयोगशाला / Sister Laboratory

Dr.Ashish Lele
Director
CSIR-National Chemical Laboratory
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Pune - 411 008

डीजी-नॉमिनी / DG's Nominee

Shri Anoj Kumar Chadar
Senior Principal Scientist
Technology Management Directorate (TMD)
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निदेशक / Director

Dr. Harender Singh Bisht
Director
CSIR-Indian Institute of Petroleum
P.O. IIP, Mohkampur
Dehradun – 248005

सचिव / Secretary

Dr. Sanat Kumar
Head, RPBD
CSIR-Indian Institute of Petroleum
P.O. IIP, Mohkampur
Dehradun – 248 005 (Uttaranchal)

सीएसआईआर-भापेसं प्रबंधन परिषद (01 जनवरी, 2024 – 31 दिसम्बर, 2025)

The CSIR-IIP Management Council (January 1, 2024 – December 31, 2025)

अध्यक्ष / Chairman

डॉ. हरेंद्र सिंह बिष्ट / Dr. Harender Singh Bisht
निदेशक / Director

आंतरिक सदस्य / Internal Members

डॉ. एस के गांगुली / Dr. S K Ganguly
मुख्य वैज्ञानिक / Chief Scientist

डॉ सनत कुमार / Dr. Sanat Kumar
मुख्य वैज्ञानिक / Chief Scientist

डॉ सुमन लता जैन / Dr Suman Lata Jain
वरिष्ठ प्रधान वैज्ञानिक / Senior Principal Scientist

डॉ ए हरीश / Dr. A. Harish
वैज्ञानिक / Scientist

डॉ सत्यम कुमार प्रजापति / Dr Satyam Kumar Prajapati
वैज्ञानिक / Scientist

श्री राकेश कुमार / Sh Rakesh Kumar
वरिष्ठ तकनीकी अधिकारी (3) / Senior Technical Officer (3)

श्री जे के चौरसिया / Sh J K Chaurasia
वित्त एवं लेखा नियंत्रक / Controller of Finance & Accounts

श्री अंजुम शर्मा / Sh Anjum Sharma
वरिष्ठ प्रशासन नियंत्रक / Senior Controller of Administration

बाहरी सदस्य / External Member

प्रो प्रदीप कुमार रमन चारला / Prof. Ramancharla Pradeep Kumar
निदेशक / Director
सीएसआईआर- केंद्रीय भवन अनुसंधान संस्थान, रुड़की /
CSIR- Central Building Research Institute, Roorkee

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राजभाषा

OFFICIAL LANGUAGE

राजभाषा गतिविधियां 2024-25

हिन्दी माह - 2024 का आयोजन

हर वर्ष की भांति इस वर्ष भी सीएसआईआर- भारतीय पेट्रोलियम संस्थान में दिनांक 01 सितंबर से 30 सितंबर 2024 तक हिन्दी माह मनाया गया। इसके अंतर्गत संस्थान के समस्त अधिकारियों/कर्मचारियों तथा अनुबंध अंतर्गत अस्थाई कर्मचारियों व शोध छात्रों के लिए विभिन्न प्रतियोगिताओं तथा कार्यक्रमों का आयोजन किया गया। इस वर्ष इन प्रतियोगिताओं / कार्यक्रमों में से कुछऑनलाइन एवं ऑफलाइन दोनों माध्यमों में एवं कुछ का आयोजन केवल ऑफलाइन माध्यम में किया गया। हिन्दी माह 2024 का शुभारंभ निदेशक महोदय के शुभकामना संदेश तथा ऑनलाइन दैनिक प्रश्नोत्तरी प्रतियोगिता के साथ हुआ। इस ऑनलाइन दैनिक प्रश्नोत्तरी प्रतियोगिता के अंतर्गत प्रतिदिन एक लिंक के माध्यम से ईमेल तथा व्हाट्सएप द्वारा एक प्रश्न पूछा जाता था, जिसका उत्तर उन्हें ऑनलाइन गूगल प्रपत्र पर देना होता था। मुख्यत: इसमें पूछे जाने वाले प्रश्न हिन्दी भाषा, हिन्दी साहित्य, राजभाषा नियम और राजभाषा कार्यान्वयन आदि से संबंधित थे तथा प्रतिभागी को राजभाषा विभाग की वेबसाइट अथवा गूगल पर इनके उत्तर खोजने की छूट होती है। इस प्रतियोगिता में प्रतिभागियों को इन प्रश्नों के उत्तर देने तथा अपना निजी-विवरण भरने हेतु अनिवार्यतः हिन्दी भाषा का ही प्रयोग करना होता है। इस प्रतियोगिता में संस्थान के अधिकतर कर्मचारियों ने भाग लिया। इसमें कुल 20 प्रश्न पूछे गए थे। यह प्रतियोगिता संस्थान की हिन्दी की सर्वाधिक लोकप्रिय प्रतियोगिता है। संस्थान हिन्दी की उत्तरोत्तर प्रगति और प्रयोग तथा प्रभावी राजभाषा में कार्यान्वयन के लिए प्रतिबद्ध है और इसी दिशा में संस्थान में 14 सितंबर 2024 को हिन्दी दिवस के उपलक्ष में निदेशक, आईआईपी द्वारा सभी वैज्ञानिकों, अधिकारियों तथा कर्मचारियों को हिन्दी में अधिक से अधिक कार्य करने की अपील की गई और उन्होंने इसका एक उदाहरण भी स्थापित किया तथा अपना हिन्दी दिवस शुभकामना संदेश हिन्दी में दिया, जिसे संस्थान के व्हाट्सप्प ग्रुप तथा ईमेल द्वारा सभी को प्रेषित किया गया। इस संदेश के द्वारा उन्होंने सभी से हिन्दी की अधिकाधिक प्रयोग एवं प्रचार प्रसार करने की अपील की। दिनांक 05 सितंबर 2024 को संस्थान के सभी कर्मचारियों के लिए





एक श्रुत टंकण एवं लिप्यंतरण प्रतियोगिता का आयोजन किया गया। इस प्रतियोगिता के अंतर्गत कर्मचारियों को दी गई टंकण सामग्री की लिपि को अंग्रेजी में रखा गया ताकि जब वे श्रुत टंकण करें तो साथ ही उनकी लिप्यंतरण एवं वर्तनी शुद्धता के कौशल की भी परीक्षा हो सके। सभी कर्मचारियों को दी गई सामग्री का लिप्यंतरण एवं श्रुत टंकण कर व्हाट्सप्प ग्रुप पर भेजना था। इसके उपरांत दिनांक 10 सितंबर 2024 को संस्थान में कार्यरत एमटीएस एवं समकक्ष कर्मचारियों के भाषा कौशल एवं सर्जनात्मक अभिरुचि में वृद्धि के उद्देश्य से एक चित्र वर्णन प्रतियोगिता का भी आयोजन किया गया। इस प्रतियोगिता को इस वर्ष ग्रुप सी-एमटीएस / तकनीशियन I और II के लिए आयोजित किया गया।इसके अतिरिक्त दिनांक 17 सितंबर, 2024 को एक निबंध प्रतियोगिता का भी आयोजन किया गया। इस प्रतियोगिता में इस वर्ष 'भारतीय भाषाएं और हिन्दी', 'देवभूमि उत्तराखंड: संस्कृति और साहित्य', जैसे विषयों के साथ-साथ तकनीकी एवं वैज्ञानिक विषयों जैसे 'अपशिष्ट प्रबंधन में समस्याएं एवं समाधान', 'अक्षय ऊर्जा: एक बेहतर विकल्प' आदि विषय भी रखे गए थे। ये निबंध ऑनलाइन माध्यम से आमंत्रित किए गए थे। हिन्दी माह के इस अवसर पर दिनांक 26/09/2024 को संस्थान के वैज्ञानिक/ तकनीकी कर्मचारियों के लिए 'वैज्ञानिक/तकनीकी पावरपॉइंट प्रस्तुतीकरण प्रतियोगिता का भी आयोजन किया गया। इस प्रतियोगिता में संस्थान के तकनीकी कर्मचारी, वैज्ञानिक आदि के साथ-साथ अनुसंधान अध्येताओं ने भी भाग लिया। इस प्रतियोगिता में 'पेट्रोलियम उत्पादों के लिए आसवन विधि की उपयोगिता', 'शॉर्ट सर्किट', 'स्पेक्ट्रम विज्ञान की एक झलक', 'कवक: प्रकृति का एक इंजिनियर', 'रिफ़ॉर्मेट फ़ीडस्टॉक से ऐरोमैटिक अवयवों का निष्कर्षण', 'माइक्रो इलेक्ट्रो यांत्रिकी प्रणाली एवं उनके अनुप्रयोग', आदि विषयों पर प्रतिभागियों द्वारा प्रस्तुतीकरण किया गया। इस प्रतियोगिता का आयोजन एम जी कृष्णा सभागार में किया गया। इसी क्रम में दिनांक 27 सितंबर 2024 को संस्थान के ग्रुप सी एवं समकक्ष संवर्ग के लिए सी वी रमन व्याख्यान कक्ष में सुलेख प्रतियोगिता का आयोजन किया गया।

नगर राजभाषा कार्यान्वयन समिति (का.2) के तत्वावधान में संस्थान में आयोजित प्रतियोगिताएं

इस वर्ष नगर राजभाषा कार्यान्वयन समिति (का.२), देहरादून के तत्वावधान में संस्थान द्वारा दिनांक २० सितंबर २०२४ को एक कविता लेखन प्रतियोगिता का भी आयोजन किया गया। इस प्रतियोगिता हेतु प्रतिभागियों को कुछ शब्द दिए गए थे, जिन्हें यथारूप प्रयोग करते हुए प्रतिभागियों द्वारा काव्य रचना की जानी अपेक्षित थी। इस प्रतियोगिता में नराकास के सदस्य कार्यालयों के ४० से भी अधिक कर्मचारियों ने प्रतिभागिता की। इस प्रतियोगिता हेतु प्रविष्टियाँ ऑनलाइन माध्यम से आमंत्रित की गई थीं।

इसके अतिरिक्त हडको, देहरादून द्वारा नराकास के तत्वावधान में संस्थान के परिसर में एक चित्र वर्णन प्रतियोगिता का भी आयोजन किया गया था। इस प्रतियोगिता के आयोजन में भी संस्थान की सक्रिय प्रतिभागिता रही। इस अवसर पर दोनों संस्थानों के प्रमुख भी उपस्थित रहे तथा उन्होंने प्रतिभागियों को अपने दैनिक कार्यालयीन कार्यों में हिन्दी भाषा का अधिकाधिक प्रयोग करने हेतु प्रेरित किया एवं उनका उत्साह बढ़ाया।।







हिन्दी में वैज्ञानिक/तकनीकी प्रस्तुतीकरण के कुछ चित्र





नगर राजभाषा कार्यान्वयन समिति (का. 2), देहरादून द्वारा वर्ष 2023-24 के लिए संस्थान की पत्रिका विकल्प- को देहरादून स्थित केंद्र सरकार के कार्यालयों की श्रेष्ठ पत्रिकाओं में प्रथम पुरस्कार स्वरूप राजभाषा शील्ड प्रदान की गई।





दिनांक 26 नवंबर, 2024 को आयोजित नगर राजभाषा कार्यान्वयन समिति (का.2), देहरादून की छमाही बैठक में समिति की पत्रिका देवश्लोक का विमोचन किया गया और पिछले 04 वर्षोंसे इसके प्रकाशन और सम्पादन कार्य में सहयोग के लिए संस्थान की सराहना की गई.







नगर राजभाषा कार्यान्वयन समिति के तत्वावधान में आयोजित विभिन्न प्रतियोगिताओं में विजेता रहे संस्थान के प्रतिनिधि (डॉ. मृत्युंजय कुमार शुक्ला, डॉ.सुमन लता जैन तथा डॉ.राज कुमार सिन्ह) पुरस्कार प्राप्त करते हुए।





दिनांक **23/12/2024** को आयोजित संस्थान की राजभाषा कार्यान्वयन समिति (राकास) की तिमाही बैठक में 'नवोदित प्रवाह' के संपादक और वरिष्ठ साहित्यकार श्री रजनीश त्रिवेदी 'आलोक' विशिष्ट अतिथि के रूप में उपस्थित थे। इस अवसर पर उनके कर कमलों द्वारा संस्थान की हिंदी पत्रिका विकल्प के नवीनतम अंक का विमोचन भी किया गया.उन्होने राजभाषा की प्रगति सम्बंधी संस्थान के प्रयासों की सरहना की और मार्गदर्शन भी किया. इस अवसर पर अध्यक्ष तथा निदेशक, आईआईपी द्वारा उन्हें संस्थान की ओर से सम्मानित किया गया ।

संस्थान की राजभाषा कार्यान्वयन समिति (राकास) की दिनांक **20/03/2025**को आयोजित बैठक में वरिष्ठ साहित्यकार तथा उत्तराखंड भाषा संस्थान के पूर्व निदेशकडॉ मुनिराम सकलानी विशिष्ट अतिथि के रूप में उपस्थित थे। इस अवसर पर संस्थान के निदेशक डॉ. हरेन्द्र सिंह बिष्ट द्वाराडॉ मुनिराम सकलानी को .सम्मानित किया गया । डॉ. सकलानी ने संस्थान में राजभाषा की प्रगति के प्रयासों की सरहना करते हुए अपने अनुभव साझा किए और बेहतर कार्यान्वयन हेतु मार्गदर्शन भी किया।





9

सीएसआईआर–भापेसं परिवार

THE CSIR-IIP FAMILY

9.1 31 मार्च 2025 को संस्थान के कर्मचारीगण की स्थिति / Staff as on March 31, 2025

9.1.1 वैज्ञानिक गण समूह- IV / SCIENTISTS GROUP-IV

क्रम सं	कर्मचारी का नाम	पदनाम
1	डॉ. हरेन्द्र सिंह बिष्ट	निदेशक
2	श्री एस के गांगुली	मुख्य वैज्ञानिक
3	डॉ. एन विश्वनाधम	मुख्य वैज्ञानिक
4	डॉ. अनिल कुमार सिन्हा	मुख्य वैज्ञानिक
5	डॉ. मनोज श्रीवास्तव	मुख्य वैज्ञानिक
6	श्री हेमंत मधुकर कुलकर्णी	मुख्य वैज्ञानिक
7	डॉ. सनत कुमार	मुख्य वैज्ञानिक
8	डॉ. थल्लड़ा भास्कर	मुख्य वैज्ञानिक
9	डॉ. समीर कुमार मैती	मुख्य वैज्ञानिक
10	श्री सुनील कुमार पाठक	मुख्य वैज्ञानिक
11	श्री राजेश कुमार	मुख्य वैज्ञानिक
12	डॉ. सुमन लता जैन	वरिष्ठ प्रधान वैज्ञानिक
13	डॉ. ओ.पी. खत्री	वरिष्ठ प्रधान वैज्ञानिक
14	डॉ. जी डी ठाकरे	वरिष्ठ प्रधान वैज्ञानिक
15	डॉ. देवेंद्र सिंह	वरिष्ठ प्रधान वैज्ञानिक
16	डॉ. राजराम बल	वरिष्ठ प्रधान वैज्ञानिक
17	डॉ. नीरज आत्रे	वरिष्ठ प्रधान वैज्ञानिक
18	श्री सूर्यदेव कुमार	वरिष्ठ प्रधान वैज्ञानिक
19	डॉ. सौमेन दासगुप्ता	वरिष्ठ प्रधान वैज्ञानिक
20	डॉ. सुनिल कुमार	वरिष्ठ प्रधान वैज्ञानिक
21	श्री एल रोबीन्द्रो	वरिष्ठ प्रधान वैज्ञानिक
22	डॉ. अजय कुमार	वरिष्ठ प्रधान वैज्ञानिक
23	श्री विटीसन कामई	वरिष्ठ प्रधान वैज्ञानिक
24	डॉ. अतुल रंजन	वरिष्ठ प्रधान वैज्ञानिक
25	डॉ. डी वी नायक	वरिष्ठ प्रधान वैज्ञानिक
26	डॉ. बबीता बेहरा	वरिष्ठ प्रधान वैज्ञानिक
27	डॉ. राजकुमार सिंह	वरिष्ठ प्रधान वैज्ञानिक
28	श्री मृत्युंजय शुक्ला	वरिष्ठ प्रधान वैज्ञानिक
29	श्री पंकज कुमार आर्य	वरिष्ठ प्रधान वैज्ञानिक
30	डॉ. दीपतारका दासगुप्ता	प्रधान वैज्ञानिक
31	डॉ. दीप्ति अग्रवाल	प्रधान वैज्ञानिक
32	डॉ. सुनील कुमार सुमन	प्रधान वैज्ञानिक
33	डॉ. अंकुर बोर्डोलोई	प्रधान वैज्ञानिक
34	श्री स्वप्निल दिवेकर	प्रधान वैज्ञानिक
35	डॉ. देबाशीष घोष	प्रधान वैज्ञानिक
36	श्री प्रसेनजीत घोष	प्रधान वैज्ञानिक
37	श्री सलीम अख्तर फ़ारूकी	प्रधान वैज्ञानिक
38	डॉ. पंकज कुमार कन्नौजिया	प्रधान वैज्ञानिक
39	डॉ. आरती	प्रधान वैज्ञानिक

क्रम सं	कर्मचारी का नाम	पदनाम
40	डॉ. इंद्रजीत कुमार घोष	प्रधान वैज्ञानिक
41	डॉ. शुभम पॉल	प्रधान वैज्ञानिक
42	डॉ. रचा सूर्य मुरली	प्रधान वैज्ञानिक
43	डॉ. उमेश कुमार	प्रधान वैज्ञानिक
44	डॉ. श्रीनीवास पडाला	प्रधान वैज्ञानिक
45	श्री बी नीलम नायडू	प्रधान वैज्ञानिक
46	डॉ. गौरव गुप्ता	प्रधान वैज्ञानिक
47	डॉ. गणेश नारायण नाईक	प्रधान वैज्ञानिक
48	डॉ. शैलेश कुमार सिंह	प्रधान वैज्ञानिक
49	डॉ. अविनाश पालोडकर	वरिष्ठ वैज्ञानिक
50	डॉ. इन्दु शेखर	वरिष्ठ वैज्ञानिक
51	डॉ. बिपुल सरकार	वरिष्ठ वैज्ञानिक
52	श्री अविनाश म्हेत्रे	वरिष्ठ वैज्ञानिक
53	डॉ. प्रणब दास	वरिष्ठ वैज्ञानिक
54	डॉ. सुधाकर रेड्डी	वरिष्ठ वैज्ञानिक
55	डॉ. अंकुश बिंदवाल	वरिष्ठ वैज्ञानिक
56	डॉ. ए. सेल्वामणि	वरिष्ठ वैज्ञानिक
57	डॉ. ओजस्वी	वरिष्ठ वैज्ञानिक
58	डॉ. अनूप ताथोड	वरिष्ठ वैज्ञानिक
59	डॉ. टी सेंथिल कुमार	वरिष्ठ वैज्ञानिक
60	डॉ. प्रेम लामा	वरिष्ठ वैज्ञानिक
61	डॉ. वी चंद्रशेखर पल्ला	वैज्ञानिक
62	डॉ. तुहिन खान	वैज्ञानिक
63	डॉ. नानोजी इसलावथ	वैज्ञानिक
64	डॉ. कीर्तिका कोहली	वैज्ञानिक
65	डॉ. भरत सिंह राणा	वैज्ञानिक
66	डॉ. प्रकाशैया बी. जी.	वैज्ञानिक
67	डॉ. बिलाल हैदर	वैज्ञानिक
68	डॉ. ए. हरीश	वैज्ञानिक
69	श्री सत्यम कुमार प्रजापति	वैज्ञानिक
70	श्री मुकेश कुमार पोद्दार	वैज्ञानिक
71	डॉ. महक धीमान	वैज्ञानिक

9.1.2 तकनीकी कर्मचारीगण समूह - III / TECHNICAL STAFF GROUP-III

क्रम सं	कर्मचारी का नाम	पदनाम
1	डॉ. अजय कुमार गुप्ता	प्रधान तकनीकी अधिकारी
2	श्री हरिचन्द सिंह	प्रधान तकनीकी अधिकारी
3	श्री डी.के. पांडे	प्रधान तकनीकी अधिकारी
4	डॉ. सूचिस्मिता बेंजवाल	प्रधान तकनीकी अधिकारी
5	डॉ. घनश्याम ठक्कर	वरिष्ठ तकनीकी अधिकारी (3)

क्रम सं	कर्मचारी का नाम	पदनाम
6	श्री सी.डी. शर्मा	वरिष्ठ तकनीकी अधिकारी (3)
7	श्री सेठपाल सिंह	वरिष्ठ तकनीकी अधिकारी (3)
8	श्री सुनिल कुमार	वरिष्ठ तकनीकी अधिकारी (3)
9	श्री राकेश कुमार	वरिष्ठ तकनीकी अधिकारी (3)
10	श्री संदीप सरन	वरिष्ठ तकनीकी अधिकारी (3)
11	श्री सतीश कुमार	वरिष्ठ तकनीकी अधिकारी (3)
12	श्री जगदीश कुमार	वरिष्ठ तकनीकी अधिकारी (3)
13	श्री मनोज कुमार	वरिष्ठ तकनीकी अधिकारी (3)
14	श्री विनीत सूद	वरिष्ठ तकनीकी अधिकारी (3)
15	श्रीमति मनिन्दर कौर	वरिष्ठ तकनीकी अधिकारी (3)
16	श्री सर्वानन्द तिवारी	वरिष्ठ तकनीकी अधिकारी (2)
17	श्री एस.एन. यादव	वरिष्ठ तकनीकी अधिकारी (2)
18	श्री राजिन्दर बडोला	वरिष्ठ तकनीकी अधिकारी (2)
19	डॉ. कमल कुमार	वरिष्ठ तकनीकी अधिकारी (2)
20	श्री प्रेमचंद नेरुसू	वरिष्ठ तकनीकी अधिकारी (2)
21	श्री चन्द्र शेखर रेड्डी	वरिष्ठ तकनीकी अधिकारी (2)
22	श्री अमित शर्मा	वरिष्ठ तकनीकी अधिकारी (1)
23	श्री ओ.पी. शर्मा	वरिष्ठ तकनीकी अधिकारी (1)
24	डॉ. निशा	वरिष्ठ तकनीकी अधिकारी (1)
25	श्रीमती रेखा चौहान	वरिष्ठ तकनीकी अधिकारी (1)
26	श्री सुंदराम शर्मा	वरिष्ठ तकनीकी अधिकारी (1)
27	डॉ. ज्योति पोरवाल	वरिष्ठ तकनीकी अधिकारी (1)
28	डॉ. प्रवीण कुमार खत्री	वरिष्ठ तकनीकी अधिकारी (1)
29	डॉ. मनीषा सहाय	वरिष्ठ तकनीकी अधिकारी (1)
30	डॉ. रोहित कुमार	वरिष्ठ तकनीकी अधिकारी (1)
31	डॉ. प्रदीप कुमार	वरिष्ठ तकनीकी अधिकारी (1)
32	श्री विशवास सैनी	वरिष्ठ तकनीकी अधिकारी (1)
33	श्रीमति पूजा यादव	वरिष्ठ तकनीकी अधिकारी (1)
34	श्रीमती संध्या जैन	वरिष्ठ तकनीकी अधिकारी (1)
35	श्री यशवीर सिंह मीणा	वरिष्ठ तकनीकी अधिकारी (1)
36	श्रीमती कमला यादव	वरिष्ठ तकनीकी अधिकारी (1)
37	श्री मनोज कुमार	वरिष्ठ तकनीकी अधिकारी (1)
38	श्री एल. एन. शिवकुमार कोंथाला	वरिष्ठ तकनीकी अधिकारी (1)
39	श्री पियूष गुप्ता	वरिष्ठ तकनीकी अधिकारी (1)
40	श्रीमती रश्मी	वरिष्ठ तकनीकी अधिकारी (1)
41	डॉ.रघुवीर सिंह	वरिष्ठ तकनीकी अधिकारी (1)
42	डॉ. दीपेंद्र त्रिपाठी	वरिष्ठ तकनीकी अधिकारी (1)
43	डॉ. वी. भानु प्रसाद	वरिष्ठ तकनीकी अधिकारी (1)
44	श्री गोरधन जैन	वरिष्ठ तकनीकी अधिकारी (1)
45	श्री कसीना डी.पी. लक्ष्मी कुमार	तकनीकी अधिकारी
46	श्री जितेंद्र कुमार	तकनीकी अधिकारी
47	श्री अमित कुमार	तकनीकी अधिकारी

क्रम सं	कर्मचारी का नाम	पदनाम
48	श्री वैभव	तकनीकी अधिकारी
49	श्री मुदावत रवि	तकनीकी सहायक
50	श्री रोहित	तकनीकी सहायक
51	श्री हेमन्त कुमार साहू	तकनीकी सहायक
52	श्री राहुल कुमार	तकनीकी सहायक
53	कु. नैन्सी शर्मा	तकनीकी सहायक
54	श्री सचिन तोमर	तकनीकी सहायक
55	श्री ओम कृष्णा कश्यप	तकनीकी सहायक
56	कु. आशिता रतुड़ी	तकनीकी सहायक
57	कु.अल्पना	तकनीकी सहायक
58	श्री संतोष कुमार पासवान	तकनीकी सहायक
59	श्री पंकज कुमार	तकनीकी सहायक
60	श्री अवनीश तिवारी	तकनीकी सहायक
61	श्री अप्पीनायकर टी	तकनीकी सहायक
62	श्री प्रदीप कुमार जोशी	तकनीकी सहायक
63	श्री दिलीप महतो	तकनीकी सहायक
64	श्री गवीत रमेश धवालु	तकनीकी सहायक
65	डॉ. विजेंद्र सिंह	तकनीकी सहायक
66	श्री शासवत गुप्ता	तकनीकी सहायक
67	कु. निवेदिता राठोर	तकनीकी सहायक
68	श्री अनिल कुमार सिंह	तकनीकी सहायक
69	श्री मोनोजित नंदी	तकनीकी सहायक
70	श्री पुनित	तकनीकी सहायक
71	श्री अफ़सर अहमद	तकनीकी सहायक
72	श्री अभिजीत मोहन्ती	तकनीकी सहायक
73	श्री राहुल	तकनीकी सहायक
74	श्री प्रत्युष कुमार	तकनीकी सहायक
75	श्री संतोष कुमार शॉ	तकनीकी सहायक

9.1.3 तकनीकी कर्मचारीगण समूह- II / TECHNICIAN STAFF GROUP-II

क्रम सं	कर्मचारी का नाम	पदनाम
1	श्री टी.सी. शर्मा	वरिष्ठ तकनीशियन (2)
2	श्री एन.एन. बहुगुणा	वरिष्ठ तकनीशियन (2)
3	श्री परमजीत सिंह	वरिष्ठ तकनीशियन (2)
4	श्री राजीव शर्मा	वरिष्ठ तकनीशियन (2)
5	श्री रजनीश भटनागर	वरिष्ठ तकनीशियन (2)
6	श्रीमति अंजलि भटनागर	वरिष्ठ तकनीशियन (2)
7	श्री अनिल कुमार	वरिष्ठ तकनीशियन (2)
8	श्री राजपाल सिंह	वरिष्ठ तकनीशियन (2)
9	श्री एन.के. रावत	वरिष्ठ तकनीशियन (2)
10	श्री संजीव कुमार	वरिष्ठ तकनीशियन (1)

क्रम सं	कर्मचारी का नाम	पदनाम
11	श्री मयंक मिश्रा	वरिष्ठ तकनीशियन (1)
12	श्री प्रदीप सिंह नेगी	वरिष्ठ तकनीशियन (1)
13	श्री बिनोद कुमार	वरिष्ठ तकनीशियन (1)
14	श्री पूरण सिंह अस्वल	वरिष्ठ तकनीशियन (1)
15	श्री प्रदीप सिंह पँवार	वरिष्ठ तकनीशियन (1)
16	श्री रितुराज सिंह नेगी	वरिष्ठ तकनीशियन (1)
17	श्री परवेज़ आलम	वरिष्ठ तकनीशियन (1)
18	श्री विवेक कुमार शर्मा	वरिष्ठ तकनीशियन (1)
19	श्री राजेंद्र कुमार	वरिष्ठ तकनीशियन (1)
20	श्री नसीम अहमद	वरिष्ठ तकनीशियन (1)
21	श्री अशोक कुमार ठाकुर	वरिष्ठ तकनीशियन (1)
22	श्री गंभीर सिंह	वरिष्ठ तकनीशियन (1)
23	श्री अशोक कुमार	वरिष्ठ तकनीशियन (1)
24	श्री महेंद्र सिंह नेगी	वरिष्ठ तकनीशियन (1)
25	श्री शिव प्रसाद नौटियाल	वरिष्ठ तकनीशियन (1)
26	श्री मनमोहन सिंह गोसाईं	वरिष्ठ तकनीशियन (1)
27	श्री डेनियल शाह	वरिष्ठ तकनीशियन (1)
28	श्री राजीव पँवार	वरिष्ठ तकनीशियन (1)
29	डॉ. संदीप कुमार सक्सेना	वरिष्ठ तकनीशियन (1)
30	डॉ. अरुणा कुरेती	वरिष्ठ तकनीशियन (1)
31	श्री खेम सिंह	वरिष्ठ तकनीशियन (1)
32	श्री अब्बल सिंह	वरिष्ठ तकनीशियन (1)
33	श्री गिरीश चंद तिवारी	वरिष्ठ तकनीशियन (1)
34	श्री राजेश शर्मा	वरिष्ठ तकनीशियन (1)
35	श्री नवीन कुमार मौर्य	वरिष्ठ तकनीशियन (1)
36	श्री पुष्प राज शर्मा	वरिष्ठ तकनीशियन (1)
37	डॉ. पी. नगेन्द्रम्मा	वरिष्ठ तकनीशियन (1)
38	श्री तस्लीम खान	वरिष्ठ तकनीशियन (1)
39	**श्रीमती ऋतु मौर्य**	नर्स / तकनीशियन (2)
40	श्री हरी प्रकाश	फरमासिस्ट / तकनीशियन (2)
41	श्री ओमबीर सिंह	तकनीशियन (2)
42	श्री जितेंद्र सिंह	तकनीशियन (2)
43	श्री वी. वी. मगन भाई	तकनीशियन (2)
44	श्री गुरु जोती जी.	तकनीशियन (2)
45	श्री अमरदीप कुमार	तकनीशियन (2)
46	श्री प्रेम चन्द वर्मा	तकनीशियन (2)
47	श्री सर्वेश कुमार भीमटे	तकनीशियन (1)
48	श्री तनुज कुमार	तकनीशियन (1)
49	श्री संदीप कुमार चौहान	तकनीशियन (1)
50	श्री रौशन कुमार	तकनीशियन (1)
51	श्री रजनीश कुमार मौर्य	तकनीशियन (1)
52	श्री कलरकर प्रदीप दिवाकर	तकनीशियन (1)

क्रम सं	कर्मचारी का नाम	पदनाम
53	श्री लोकेश मावले	तकनीशियन (1)
54	श्री राहुल मीणा	तकनीशियन (1)
55	श्री गेंदला मालवी	तकनीशियन (1)
56	श्री कुत्तरमरे अक्षय भारत	तकनीशियन (1)
57	श्री अरविंद कुमार	तकनीशियन (1)
58	श्री चेतला महतो	तकनीशियन (1)
59	श्री विकास	तकनीशियन (1)
60	श्री पारस कुमार	तकनीशियन (1)
61	श्री सुनील	तकनीशियन (1)
62	कु. हर्षिता पटेल	तकनीशियन (1)
63	श्री रितेश यादव	तकनीशियन (1)
64	श्री अमित कुमार	तकनीशियन (1)
65	श्री उमाशंकर प्रसाद	तकनीशियन (1)

9.1.4 प्रयोगशाला कर्मचारीगण समूह - I / LABORATORY STAFF GROUP- I

क्रम सं	कर्मचारी का नाम	पदनाम
1	मोहम्मद परवेज़	प्रयोगशाला सहायक
2	श्री जय प्रकाश	प्रयोगशाला सहायक
3	श्री रनबीर सिंह	प्रयोगशाला सहायक
4	श्री सूरत राम	प्रयोगशाला सहायक
5	श्री संजय कुमार	प्रयोगशाला सहायक
6	श्रीमति कांता देवी	प्रयोगशाला सहायक
7	श्री नरेंद्र सिंह नेगी	प्रयोगशाला सहायक
8	श्री हेरोल्ड ग्लाड्विन	प्रयोगशाला सहायक
9	श्री मोहन सिंह	प्रयोगशाला सहायक
10	श्री ज्योति प्रसाद	प्रयोगशाला सहायक
11	श्री संजय कुमार	प्रयोगशाला सहायक
12	श्री शिवराम सिंह	प्रयोगशाला सहायक
13	श्री राकेश कुमार	प्रयोगशाला सहायक
14	श्री प्रदीप सिंह पुनड़ीर	प्रयोगशाला सहायक
15	श्री राम किशोर मौर्य	प्रयोगशाला सहायक
16	श्री सुरजीत सिंह थापा	प्रयोगशाला सहायक
17	श्री सतीश कुमार	प्रयोगशाला सहायक
18	श्री नरेश कुमार	प्रयोगशाला सहायक
19	श्री नवीन भट्ट	प्रयोगशाला सहायक
20	श्री सुनील कुमार	प्रयोगशाला सहायक
21	श्री सुरेन्द्र कुमार	प्रयोगशाला सहायक
22	श्री मुकेश कुमार	प्रयोगशाला सहायक
23	श्री दिनेश चन्द्र	प्रयोगशाला परिचर (2)
24	श्री अजय पाल	प्रयोगशाला परिचर (2)

क्रम सं	कर्मचारी का नाम	पदनाम
25	श्री देव सिंह अधिकारी	प्रयोगशाला परिचर (2)
26	श्री गोकुल प्रसाद	प्रयोगशाला परिचर (2)
27	श्री अरविंद कुमार खंडुरी	प्रयोगशाला परिचर (2)
28	श्री रमेश चन्द्र	प्रयोगशाला परिचर (2)
29	श्री चंदर सिंह	प्रयोगशाला परिचर (2)
30	श्री इरशाद खान	प्रयोगशाला परिचर (2)
31	श्री पंकज भास्कर	प्रयोगशाला परिचर (2)
32	सुश्री यशोदा	प्रयोगशाला परिचर (2)
33	श्री राजेंद्र प्रसाद	प्रयोगशाला परिचर (2)
34	श्री बीजेन्द्र सिंह बिष्ट	प्रयोगशाला परिचर (2)
35	श्री मुरलीधर चांदना	प्रयोगशाला परिचर (2)
36	श्री राजबीर सिंह	प्रयोगशाला परिचर (2)
37	श्री हेमंत कुमार तिवारी	प्रयोगशाला परिचर (2)
38	श्री राम चन्द्र बालूनी	प्रयोगशाला परिचर (2)
39	श्री सुदामा सिंह	प्रयोगशाला परिचर (2)
40	श्री टिका राम भट्ट	प्रयोगशाला परिचर (2)
41	श्री विवेक सिंह	प्रयोगशाला परिचर (2)
42	श्रीमती भारती पयाल	प्रयोगशाला परिचर (2)

9.1.5 प्रशासनिक कर्मचारीगण / ADMINISTRATIVE STAFF

9.1.5.1 सामान्य संवर्ग अधिकारीगण / COMMON CADRE OFFICERS

क्रम सं	कर्मचारी का नाम	पदनाम
1	श्री अंजुम शर्मा	वरिष्ठ प्रशासन नियंत्रक
2	श्री जे.के.चौरसिया	वित्त एवं लेखा नियंत्रक
3	श्री परवेश चंद	प्रशासनिक अधिकारी
4	श्री दिनेश कुमार	भंडार एवं क्रय अधिकारी (भंडार एवं क्रय)
5	श्री रमेश कुमार जोशी	अनुभाग अधिकारी (सामान्य)
6	श्री विश्वेन्द्र डोगरा	अनुभाग अधिकारी (सामान्य)
7	श्री बी. बी. डिमरी	अनुभाग अधिकारी (सामान्य)
8	श्री राकेश पंत	अनुभाग अधिकारी (सामान्य)
9	श्री सतीश चन्द्र	अनुभाग अधिकारी (वित्त एवं लेखा)
10	श्री पंकज कुमार मौर्य	अनुभाग अधिकारी (वित्त एवं लेखा)
11	श्री महेश कुमार जाटव	अनुभाग अधिकारी (वित्त एवं लेखा)
12	श्रीमती मीना कुमारी	अनुभाग अधिकारी (भंडार एवं क्रय)
13	श्री आर.के. भट्टाचार्य	अनुभाग अधिकारी (भंडार एवं क्रय)

9.1.5.2 निजी सचिव संवर्ग के कर्मचारीगण / PRIVATE SECTRETARY

क्रम सं	कर्मचारी का नाम	पदनाम
1	श्री देवेंद्र राय	प्रधान निजी सचिव
2	श्रीमती सरोज कुशवाहा	निजी सचिव
3	सुश्री रीना शर्मा	निजी सचिव
4	सुश्री कुसुम भट्ट	निजी सचिव
5	सुश्री भावना रावत	निजी सचिव

9.1.5.3 सहायक ग्रेड- I / ASSISTANT GRADE-I

क्रम सं	कर्मचारी का नाम	पदनाम
1	श्रीमती प्रतिमा राणा	सहायक अनुभाग अधिकारी (सामान्य)
2	श्रीमती किरण लता	सहायक अनुभाग अधिकारी (सामान्य)
3	श्रीमती आशा जोशी	सहायक अनुभाग अधिकारी (सामान्य)
4	श्री हिम्मत सिंह	सहायक अनुभाग अधिकारी (सामान्य)
5	श्री आदेश सेठ	सहायक अनुभाग अधिकारी (सामान्य)
6	श्रीमती प्रतिमा बग्गा	सहायक अनुभाग अधिकारी (सामान्य)
7	श्रीमती अनीता देवी	सहायक अनुभाग अधिकारी (सामान्य)
8	श्री जस्सू कुमार	सहायक अनुभाग अधिकारी (सामान्य)
9	श्री संजय पोखरियाल	सहायक अनुभाग अधिकारी (सामान्य)
10	श्री हरजीत सिंह	सहायक अनुभाग अधिकारी (सामान्य)
11	श्री कुलवंत सिंह	सहायक अनुभाग अधिकारी (सामान्य)
12	श्रीमती निशा	सहायक अनुभाग अधिकारी (सामान्य)
13	श्री बिजेंदर सिंह	सहायक अनुभाग अधिकारी (सामान्य)
14	श्री मुनिन्दर पाल सिंह आरोडा	सहायक अनुभाग अधिकारी (भ.व.क्र.)
15	श्री विक्रम सिंह रावत	सहायक अनुभाग अधिकारी (भ.व.क्र.)
16	श्री जितेंद्र सिंह नेगी	सहायक अनुभाग अधिकारी (वि.व.ले.)
17	श्री आशीष रतुड़ी	सहायक अनुभाग अधिकारी (वि.व.ले.)
18	श्री अस्मीत शुक्ला	सहायक अनुभाग अधिकारी (वि.व.ले.)

9.1.5.4 सहायक ग्रेड- II / ASSISTANT GRADE-II

क्रम सं	कर्मचारी का नाम	पदनाम
1	श्रीमती हर्विंदर कौर	वरिष्ठ सचिवालयीन सहायक (सा.)
2	श्री तनवीर अहमद कुरेशी	वरिष्ठ सचिवालयीन सहायक (सा.)
3	कु. स्तुति शर्मा	वरिष्ठ सचिवालयीन सहायक (सा.)
4	श्री सुनील रावत	वरिष्ठ सचिवालयीन सहायक (भ.व.क्र.)
5	श्री बीजेन्द्र दत्त बहुगुणा	वरिष्ठ सचिवालयीन सहायक (भ.व.क्र.)
6	श्रीमती साइमा नाज़	वरिष्ठ सचिवालयीन सहायक(भ.व.क्र.)

9.1.5.5 सहायक ग्रेड- III / ASSISTANT GRADE-III

क्रम सं	कर्मचारी का नाम	पदनाम
1	श्री घनश्याम	कनिष्ठ सचिवालयीन सहायक(भ.व.क्र.)

9.1.5.6 आशुलिपिकीय संवर्ग के कर्मचारीगण / STENOGRAPHIC CADRE STAFF

क्रम सं	कर्मचारी का नाम	पदनाम
1	श्री राजेंद्र कुमार	वरिष्ठ आशुलिपिक
2	श्रीमती शालू विनोदिया	वरिष्ठ आशुलिपिक

9.1.5.7 एकाकी पद / ISOLATED POSTS

क्रम सं	कर्मचारी का नाम	पदनाम
1	श्री सोमेश्वर पाण्डेय	वरिष्ठ हिन्दी अधिकारी
2	श्री रवीन्द्र सुंदरियाल	सुरक्षा अधिकारी
3	श्री धीरज झा	वरिष्ठ हिन्दी अनुवादक
4	श्री गोविंद सिंह मेहता	वरिष्ठ तकनीशियन (वाहन चालक)
5	श्री राजेंद्र प्रसाद	वरिष्ठ तकनीशियन (वाहन चालक)
6	श्री मुकेश कुमार	वरिष्ठ तकनीशियन (वाहन चालक)
7	श्री भूपेंद्र सिंह रावत	वाहन चालक (गैर-तक.)
8	श्री पंकज कुमार	वाहन चालक (गैर-तक.)
9	श्री अनूप	वाहन चालक (गैर-तक.)

9.1.5.8 जलपानगृह कर्मचारीगण /CANTEEN STAFF

क्रम सं	कर्मचारी का नाम	पदनाम
1	श्री भारत सिंह बिष्ट	सहायक हलवाई-सह कुक
2	श्री आशा राम	बेयरर (एम.ए.सी.पी.)

9.1.5.9 बहु कार्य कर्मचारीगण (एमटीएस) / MULTI-TASKING STAFF (MTS)

क्रम सं	कर्मचारी का नाम	पदनाम
1	श्री दीपक कुमार	समूह ग (एम.टी.एस./एम.ए.सी.पी.)
2	श्री राम पाल	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
3	श्री गोपाल सिंह	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
4	श्री राजेश कुमार	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
5	श्री दलीप कुमार	समूह ग (एम.टी.एस./एम.ए.सी.पी.)
6	श्री कमल कुमार शर्मा	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
7	श्री लक्ष्मण सिंह रावत	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
8	श्री अमित उपाध्याय	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
9	श्री शिव सिंह रावत	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
10	श्री विक्रम सिंह कंडारी	समूह ग(एम.टी.एस./एम.ए.सी.पी.)

क्रम सं	कर्मचारी का नाम	पदनाम
11	श्री विश्वास कुमार	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
12	श्री राजेश कुमार	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
13	श्री मनोज कुमार	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
14	श्री संजय कुमार	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
15	श्री कालु राम	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
16	श्री राजेंद्र प्रसाद डबराल	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
17	श्री मन्नू राम	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
18	श्री सुरेश कुमार	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
19	श्री केदार दत्त पांडे	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
20	श्री हरीश कुमार	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
21	श्री राजेश II	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
22	श्री तिलक कुमार	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
23	श्रीमती सर्वेश्वरी देवी	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
24	श्री कमल सिंह	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
25	श्री मुकेश कुमार	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
26	श्री किशोर कुमार	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
27	श्री राजेश कुमार	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
28	श्रीमती सुरेशी रावत	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
29	श्री मुकुल कुमार शर्मा	समूह ग(एम.टी.एस./एम.ए.सी.पी.)
30	श्री धर्मेंद्र सिंह पुंडीर	समूह ग (एम.टी.एस.)
31	श्रीमति उमा देवी	समूह ग (एम.टी.एस.)
32	श्री राम गोपाल	समूह ग (एम.टी.एस.)
33	श्रीमती नीतू	समूह ग (एम.टी.एस.)
34	श्रीमती सविता देवी	समूह ग (एम.टी.एस.)
35	श्री प्रवीण कुमार	समूह ग (एम.टी.एस.)
36	श्रीमती निशा राणा	समूह ग (एम.टी.एस.)
37	श्री सौरभ रावत	समूह ग (एम.टी.एस.)
38	श्री पंकज सुंदरियाल	समूह ग (एम.टी.एस.)
39	श्री लखन पाल	समूह ग (एम.टी.एस.)

9.2 वर्ष के दौरान हुई पदोन्नतियां / PROMOTIONS DURING THE YEAR

(इसमें सभी कार्यरत एवं सेवानिवृत्ति दोनों प्रकार के कर्मचारी सम्मिलित हैं /
Includes both who are on the rolls at present & those who have retired)

क्रम सं	कर्मचारी का नाम	पदोन्नति के बाद पदनाम	पदोन्नति की तिथि
1	डॉ. डी वी नायक	वरिष्ठ प्रधान वैज्ञानिक	12.07.2021
2	डॉ. विटीसन कामई	वरिष्ठ प्रधान वैज्ञानिक	13.06.2022
3	डॉ. बबीता बेहरा	वरिष्ठ प्रधान वैज्ञानिक	12.09.2023
4	डॉ. राजकुमार सिंह	वरिष्ठ प्रधान वैज्ञानिक	12.10.2023
5	श्री मृत्युंजय शुक्ला	वरिष्ठ प्रधान वैज्ञानिक	07.12.2023
6	श्री पंकज कुमार आर्य	वरिष्ठ प्रधान वैज्ञानिक	28.07.2023

क्रम सं	कर्मचारी का नाम	पदोन्नति के बाद पदनाम	पदोन्नति की तिथि
7	डॉ. गणेश नारायण नाईक	प्रधान वैज्ञानिक	29.04.2023
8	डॉ. शैलेश कुमार सिंह	प्रधान वैज्ञानिक	31.01.2023
9	डॉ. प्रेम लामा	वरिष्ठ वैज्ञानिक	19.09.2023
10	डॉ. अनूप ताथोड	वरिष्ठ वैज्ञानिक	04.09.2023
11	डॉ. ओजस्वी	वरिष्ठ वैज्ञानिक	09.04.2023
12	डॉ. टी सेंथिल कुमार	वरिष्ठ वैज्ञानिक	12.09.2023
13	डॉ. ए. सेल्वामणि	वरिष्ठ वैज्ञानिक	29.03.2022
14	श्री महेश कुमार जाटव	अनुभाग अधिकारी (वित्त एवं लेखा)	01.05.2024
15	श्री आर.के. भट्टाचार्य	अनुभाग अधिकारी (भंडार एवं क्रय)	30.07.2024
16	सुश्री भावना रावत	निजी सचिव	01.01.2025
17	श्री हरजीत सिंह	सहायक अनुभाग अधिकारी (सामान्य)	12.02.2025
18	श्री कुलवंत सिंह	सहायक अनुभाग अधिकारी (सामान्य)	12.02.2025

9.3 नए पदधारी / NEW INCUMBENTS

9.3.1 हमारी सहोदरी प्रयोगशालाओं संस्थानों से नवागत कर्मचारी / NEW ENTRANTS FROM OUR SISTER LABORATORIES/INSTITUTES

क्रम सं	नाम	पदनाम	तिथि	कहां से स्थानांतरित
1	श्री हेमंत मधुकर कुलकर्णी	मुख्य वैज्ञानिक	05.04.2024	सीएसआइआर मुख्यालय, नई दिल्ली
2	श्रीमती मनिन्दर कौर	वरिष्ठ तकनीकी अधिकारी (2)	09.09.2024	सीएसआईआर-सीईईरी, पीलानी
3	श्री परवेश चंद	प्रशासनिक अधिकारी	27.08.2024	सीएसआईआर-सीबीआरआई , रुड़की

9.4 जो हमसे विदा हुए / THOSE WHO HAVE LEFT US

9.4.1 अन्य वैऔअप प्रयोगशालाओं /संस्थानों को स्थानांतरण होने पर / On Transfer to Other CSIR Laboratories/Institutes

क्रम सं	नाम	पदनाम	कहां से स्थानांतरित
1	श्री भारत भूषण	भंडार एवं क्रय अधिकारी (भंडार एवं क्रय)	सीएसआईआर-सीबीआरआई , रुड़की
2	श्री सी. ए. बोध	प्रशासनिक अधिकारी	सीएसआईआर-इमटैक चंडीगढ़
3	श्री प्रमोद जोशी	अनुभाग अधिकारी (भ.व.क्र.)	सीएसआइआर मुख्यालय, नई दिल्ली
4	श्री शिव प्रसाद सकलनी	अनुभाग अधिकारी (वि.व.ले.)	सीएसआईआर-एनईआईएसटी, जोरहाट
5	श्री विक्रम सिंह	सहायक अनुभाग अधिकारी (सामान्य)	सीएसआईआर-आईएमटी, चंडीगढ़
6	श्री जितेंद्र सिंह रावत	वरिष्ठ सचिवालयीन सहायक (सा.)	सीएसआईआर-एनईआईएसटी, जोरहाट

9.4.2 अधिवर्षिता / स्वैच्छिक सेवा-निवृत्ति / त्याग-पत्र / ON SUPERANNUATION /VOLUNTARY RETIREMENT/ RESIGNATION

क्रम सं	नाम	पदनाम	तिथि	टिप्पणी
1	डॉ. भव्या बी	प्रधान वैज्ञानिक	19.12.2024	त्यागपत्र
2	श्री आर सी सक्सेना	प्रधान तकनीकी अधिकारी	30.04.2024	सेवानिवृति
3	श्रीमती पद्मा कुमारी एस	निजी सचिव	30.04.2024	सेवानिवृति
4	श्रीमती विनीता वालिया	अनुभाग अधिकारी (सामान्य)	30.04.2024	सेवानिवृति
5	श्री देवेंद्र सिंह बटोला	वरिष्ठ तकनीशियन (1)	30.06.2024	सेवानिवृति
6	श्री दीप चन्द	वरिष्ठ तकनीशियन (2)	10.07.2024	स्वैच्छिक सेवानिवृत्ति
7	श्री राकेश कुमार जोशी	वरिष्ठ तकनीकी अधिकारी	31.12.2024	सेवानिवृति

9.5 नई नियुक्तियाँ / New Appointment

क्रम सं	नाम	पदनाम	तिथि
1	श्री प्रेमचंद नेरुसू	वरिष्ठ तकनीकी अधिकारी (2)	18.11.2024
2	श्री चन्द्र शेखर रेड्डी	वरिष्ठ तकनीकी अधिकारी (2)	31.12.2024
3	कु. नैन्सी शर्मा	तकनीकी सहायक	03.09.2024
4	श्री सचिन तोमर	तकनीकी सहायक	05.09.2024
5	श्री ओम कृष्णा कश्यप	तकनीकी सहायक	06.09.2024
6	कु. आशिता रतुड़ी	तकनीकी सहायक	23.09.2024
7	कु. अल्पना	तकनीकी सहायक	24.09.2024
8	श्री संतोष कुमार पासवान	तकनीकी सहायक	27.09.2024
9	श्री पंकज कुमार	तकनीकी सहायक	27.09.2024
10	श्री अवनीश तिवारी	तकनीकी सहायक	30.09.2024
11	श्री अप्पीनायकर टी	तकनीकी सहायक	30.09.2024
12	श्री प्रदीप कुमार जोशी	तकनीकी सहायक	30.09.2024
13	श्री दिलीप महतो	तकनीकी सहायक	01.10.2024
14	श्री गवीत रमेश धवालु	तकनीकी सहायक	07.10.2024
15	डॉ. विजेंद्र सिंह	तकनीकी सहायक	09.10.2024
16	श्री शासवत गुप्ता	तकनीकी सहायक	11.10.2024
17	कु. निवेदिता राठोर	तकनीकी सहायक	14.10.2024
18	श्री अनिल कुमार सिंह	तकनीकी सहायक	14.10.2024
19	श्री मोनोजित नंदी	तकनीकी सहायक	15.10.2024
20	श्री पुनित	तकनीकी सहायक	21.10.2024
21	श्री अफ़सर अहमद	तकनीकी सहायक	24.10.2024
22	श्री अभिजीत मोहन्ती	तकनीकी सहायक	05.11.2024
23	श्री राहुल	तकनीकी सहायक	08.11.2024
24	श्री प्रत्युष कुमार	तकनीकी सहायक	18.11.2024
25	श्री संतोष कुमार शॉ	तकनीकी सहायक	04.12.2024
26	श्री कलरकर प्रदीप दिवाकर	तकनीशियन (1)	17.03.2025
27	श्री लोकेश मावले	तकनीशियन (1)	17.03.2025

क्रम सं	नाम	पदनाम	तिथि
28	श्री राहुल मीणा	तकनीशियन (1)	17.03.2025
29	श्री गेंदला मालवी	तकनीशियन (1)	19.03.2025
30	श्री कुत्तरमारे अक्षय भारत	तकनीशियन (1)	19.03.2025
31	श्री अरविंद कुमार	तकनीशियन (1)	20.03.2025
32	श्री चेतला महतो	तकनीशियन (1)	20.03.2025
33	श्री विकास	तकनीशियन (1)	21.03.2025
34	श्री पारस कुमार	तकनीशियन (1)	21.03.2025
35	श्री सुनील	तकनीशियन (1)	24.03.2025
36	कु. हर्षिता पटेल	तकनीशियन (1)	26.03.2025
37	श्री रितेश यादव	तकनीशियन (1)	27.03.2025
38	श्री अमित कुमार	तकनीशियन (1)	27.03.2025
39	श्री उमाशंकर प्रसाद	तकनीशियन (1)	28.03.2025
40	श्री रवीन्द्र सुंदरियाल	सुरक्षा अधिकारी	24.03.2025
41	श्रीमति निशा	सहायक अनुभाग अधिकारी (सामान्य)	17.03.2025
42	श्री बीजेंदर सिंह	सहायक अनुभाग अधिकारी (सामान्य)	21.03.2025
43	श्री अस्मीत शुक्ला	सहायक अनुभाग अधिकारी (वि.एवं.ले.)	12.03.2025
44	श्री लखन पाल	समूह ग (एम.टी.एस.)	04.10.2024
45	श्री पंकज सुंदरियाल	समूह ग (एम.टी.एस.)	03.10.2024

CSIR- Indian Institute of Petroleum, Dehradun
Allocation & Expenditure from 2024-25

		(Rs in Lakhs)
Allocation and Expenditure from 2024-25	**Allocation**	**Expenditure**
NAME OF LAB. CSIR-IIP Dehradun	**Project & No-Project**	**Project & No-Project**
Financial year	**202425**	**202425**
A.Salary		
1. Salary & Sal. Linked Allowances	4607.000	4607.000
2. Other Allowances	219.554	219.554
Total Salary	**4826.554**	**4826.554**
B. General		
3. P07 Chemical/Consum.& Other Res.Exp.	1117.200	1117.200
4. P-804 Pension & Other retirement benefits	5085.000	5085.000
5. P04 & P06, P701 - Other Revenue	593.870	593.870
Total General	**6796.070**	**6796.070**
C. Capital		
6. P-50 Works & Services/Elec. Installations	127.209	127.209
7. P-50 App. & Equip./Computer Equipment	862.814	862.814
8. P-50 Other Capital	4.500	4.500
Total Salary	994.523	994.523
Total A+B+C	**12617.147**	**12617.147**

सी एस आई आर - भारतीय पेट्रोलियम संस्थान
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