वार्षिक प्रतिवेदन
ANNUAL REPORT
2023-24

सीएसआईआर
CSIR
भारत का नवाचार इंजन
The Innovation Engine of India

भापेसं

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

Editorial Committee

Acknowledgements

All Heads of Divisions/Cells/Sections
for providing inputs for the reports

Published by

The Director
CSIR-Indian Institute of Petroleum

From the Director's Desk

Greetings from CSIR-IIP, Dehradun

It is indeed my privilege to present the highlights and significant achievement of CSIR-IIP during 2023-24. With over six decades of rich legacy CSIR-IIP continues to serve Energy & Chemical sector by developing fundamental knowledge and cutting-edge technologies.

I would like to express my sincere thanks and appreciations to Shri Arun K Singh, Chairman ONGC for gracing Dr B R Ambedkar Jayanti and 64thCSIR-IIP Foundation Day celebration as Chief Guest on14th April 2023 and Prof Durgesh Pant, DG UCOST as Chief Guest of 82nd CSIR Foundation Day celebrations held on 4th October, 2023. I also wish to express my gratitude to all our partners who enthusiastically participated and supported several events and meets organized during the year.

I am delighted to inform you that CSIR-IIP's DILSAF^{TM} technology for Sustainable Aviation Fuel (SAF) is at advanced stage of approval for setting up a demo plant at MRPL, Mangalore. On 26th Jan 2024 during Republic Day parade two Dornier 228s planes flew over Kartavya Path with jet fuel having blend of conventional ATF and SAF made by DILSAF^{TM} technology. This year CSIR-IIP's pine needle briquetting process has been taken up for implementation at village Bhingrara under 'Adarsh Champawat' program in partnership with Uttarakhand State Council of Science and Technology (UCOST). This year we have licensed our patented Advanced Vacuum Swing Adsorption for Renewable-biomethane(AVSAR-Biomethane^{TM}) technology for upgrading raw biogas to pipeline quality bio-methane to M/s Mailhem Environment Pvt Ltd, Pune. We believe this technology would help in achieving the goals of "Sustainable Alternative Towards Affordable transportation (SATAT)" scheme of Government of India.

I feel happy to report that this year CSIR-IIP made significant contributions in several areas of fundamental sciences also. CSIR-IIP has published 168 research papers in peer reviewed journals having average impact factor of 5.89, filed 7 Indian and 5 International patents and got 9 Indian and 6 international patents granted. CSIR-IIP has vibrant young research community having ~99 research scholars. During 2023-24, 14 research scholars completed their Ph.D. and three scholars received awards for the Best Ph.D. Thesis at major conferences. To nurture and develop scientific temperament among young talent, CSIR-IIP conducted several experiential research activities in which more than 1800 students participated under Jigyasa program. 40 young Indian Diaspora youth from different countries visited CSIR-IIP under Know India Programme (KIP) of the Ministry of External Affairs and 5 CSIR-IIP scientists visited various countries to participate in scientific events.

During 2023-24, CSIR-IIP executed 22 Indian & 3 Foreign MoU's/Agreements with various organizations and has achieved an ECF of Rs. 13.04 Cr. We sincerely acknowledge the continued support of all our stakeholders and determined to take our collaborations to newer heights in the future.

Jai Hind.

(Dr H S Bisht)
Director

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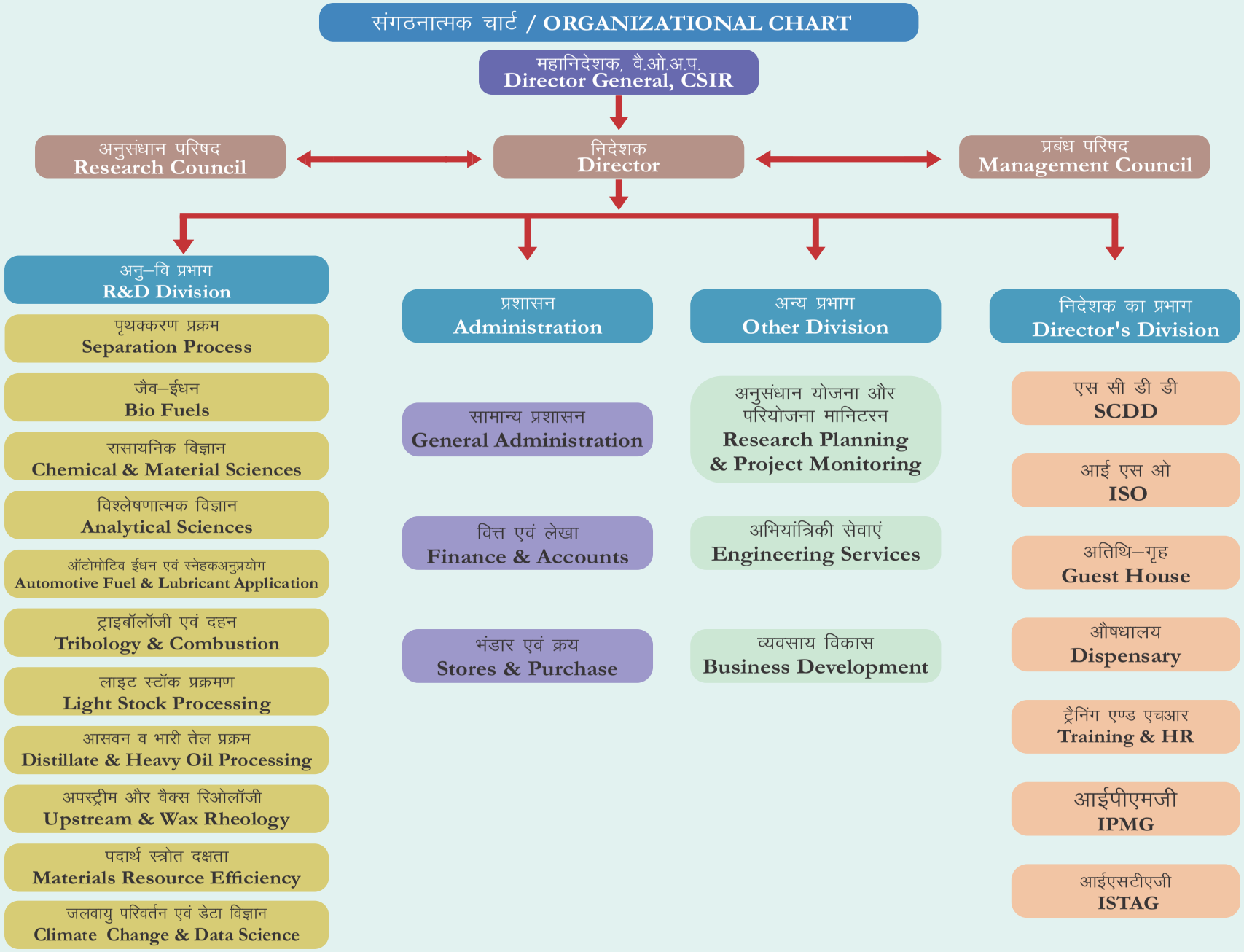


उपलब्धियाँ एक नजर में- शोध पत्र एवं एकस्व

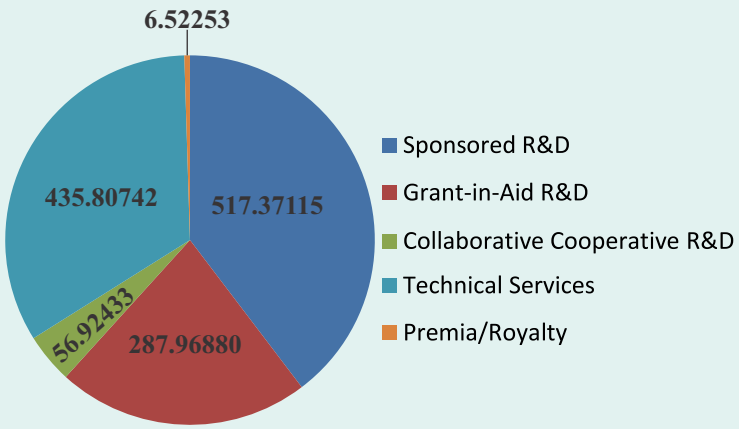
ACHIEVEMENTS AT A GLANCE: PAPERS & PAENTS

Papers in Journals	168
Papers in International Journal	168
Papers in SCI Journal	168
Average Impact Factor	5.89
Papers in Conference	108
Number of Persons Attended Seminar/Conference	402
No. of Patents Filed in India	07
No. of Patents Filed Abroad	05
No. of Patents Sealed in India	09
No. of Patents Sealed Abroad	06
No. of Training Programmes	12
No. of Persons attended Training Programmes	58
No. of Sponsored Training Programme	12
Skill Development Programme	07
No. of Persons who attended Skill Development Programme	70 Nos
No. of Ph.D Awarded	14
No. of Foreign Visits	08

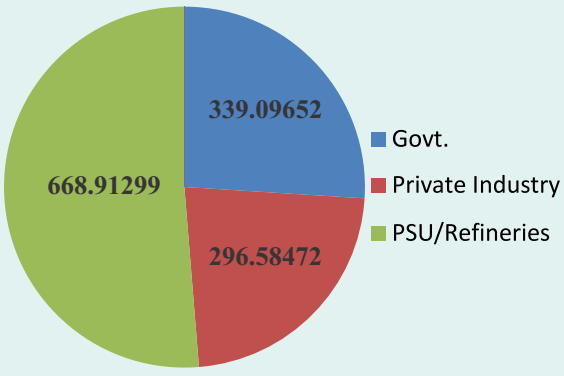
बाह्य नकदी प्रवाह से वित्तीय वर्ष 2023–24 के दौरान सीएसआइआर–भापेसं की आय : / रू0 1304.59423 लाख /

The CSIR-IIP's ECF during the Financial Year 2023-2024 : Rs. 1304.59423 lakhs.

परियोजनावत् / **Project-wise**



क्षेत्रवत् / **Sector-wise**



01

विज्ञान एवं प्रौद्योगिकी में योगदान

CONTRIBUTIONS TO SCIENCE & TECHNOLOGY

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

1.1 पृथक्करण प्रक्रिया प्रभाग / Separation Processes Division

1.1.1 अधिशोषण तथा मेम्ब्रेन पृथक्करण / Adsorption and Membrane Separation

Development of a Vacuum Swing Adsorption (VSA) Process for the Recovery of High Purity CO_2 from the Tail Gas of a SMR Coupled Hydrogen Generation Unit-CSIR CCUS Mission Project

The major CO_2 footprint of petroleum refining industry is associated with hydrogen production which corresponds to around 30% of the total refinery CO_2 emission combining both SMR and H_2 PSA plant. Hydrogen is a premium commodity in today's refinery and its consumption has increased over the years because of the need for treating increasingly heavier and sour crudes and also for processing more bottom-of-the-barrel products. There is also the urgency to meet the increasingly stricter government specifications for auto fuel sulphur which requires increasing use of secondary hydrotreaters. The current hydrogen demand in India is around 26 bcm, 90% of which is consumed in petroleum refining. It has been estimated that production of hydrogen can account for 20% of refineries energy consumption and one ton of hydrogen production can generate 8-12 tons of Co_2.

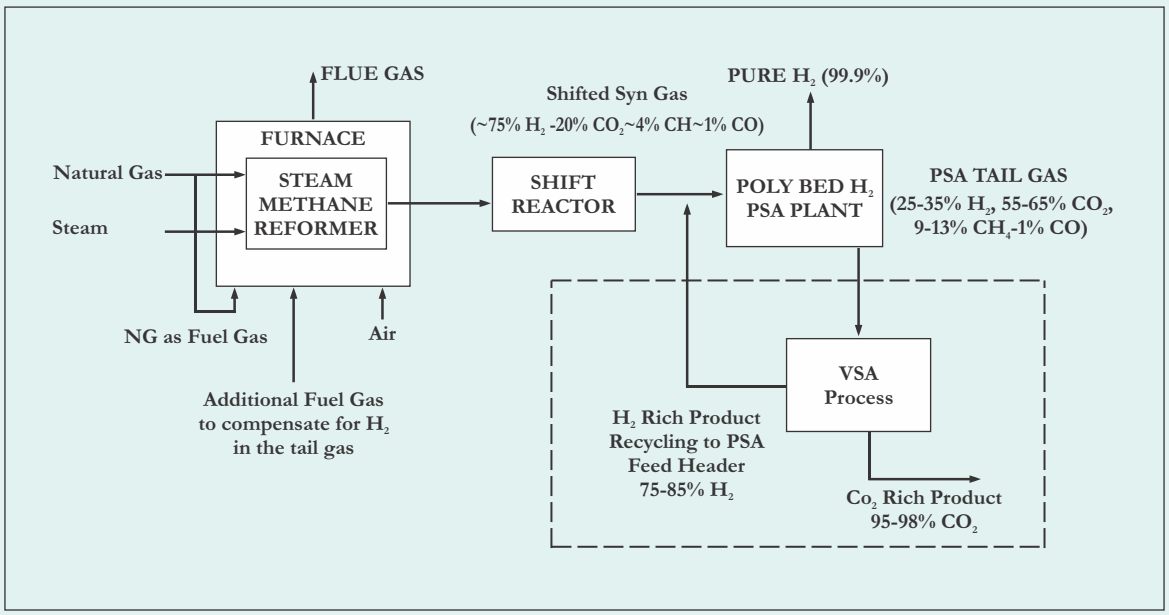
Capacities of PSA plants for hydrogen production range from a few hundred Nm^3/h to more than 400,000 Nm^3/h. The H_2 PSA plant also produces a tail gas consisting of 20-40% hydrogen which is normally sent to the fuel header of the reformer. Approximately 60% of the CO_2 produced is present in the PSA tail gas along with other impurities like CO_2 and C1 to C2+ hydrocarbons. The PSA tail gas could be an ideal feed gas for CO_2 capture as well, as it has very high concentration of CO_2 Hence there is possibility of high degree of enrichment of CO_2 from the H_2 PSA tail gas which could be utilized for merchant applications such as carbonated beverage production, dry ice, supercritical food application, welding, neutralization of industrial waste water, desalinated water mineralization, semiconductor cleaning etc. Beside this, concentrated CO_2 can also be used for enhanced oil recovery (EOR) and coal based methane recovery (CBM) application. Simultaneously H_2 can also be recovered up to the level of H_2 PSA feed gas (70-80% H_2) for possible recycling to the H_2 PSA feed header. There is thus opportunity for developing an efficient process for the recovery of CO_2 as well as H_2 and from PSA tail gas which will decrease the overall CO_2 footprint of the refinery. The Adsorption and Membrane Separation Area of CSIR-IIP is working towards developing a Vacuum Swing Adsorption (VSA) based process which can capture CO_2 at high purity and recovery (>95%) from the tail gas of a refinery hydrogen generation unit.

A process has been designed and tested for CO_2 capture from the tail gas of a conventional hydrogen generation unit of a petroleum refinery using adsorbents selected on the basis of high CO_2/CH_4 loading ratio, dynamic CO_2 capacity and adsorbent regenerability under the vacuum swing mode.

Parameter	VSA Process for CO_2 Recovery from H_2PSA Tail Gas
Mode	Two-bed, Vacuum Swing
Highest Operating Pressure, $Bar_{abs.}$	2-5
Bed Regeneration Pressure, $Bar_{abs.}$	0.05-0.1
Temperature, °C	25-50 °C
Feed Composition	Co_2: 53%, H_2: 33%, CH_4:14%

The bench scale VSA setup and process parameters operating range

CO_2 could be enriched from 53% level in the tail gas feed to up to 99 mol% purity at a CO_2 recovery up to 94%. The process simultaneously enrich H2 from 33% level to 65-70% level suitable for recirculation to the feed header of main poly bed PSA for hydrogen purification whereby ~10% increase in the H2 recovery by the HGU can be obtained. The hydrogen rich off gas from the VSA can also be injected to the refinery fuel header if recirculation to the PSA feed header is not an option. Up to 85% reduction in the CO_2 footprint of the refinery HGU can be achieved with simultaneous increase in the hydrogen productivity of the HGU by 10% by integrating the VSA process with the existing HGU setup.



Envisaged integration of the proposed VSA process with polybed PSA of the SMR coupled hydrogen generation unit in order to recover high purity CO_2 from the tail gas of the H_2 PSA

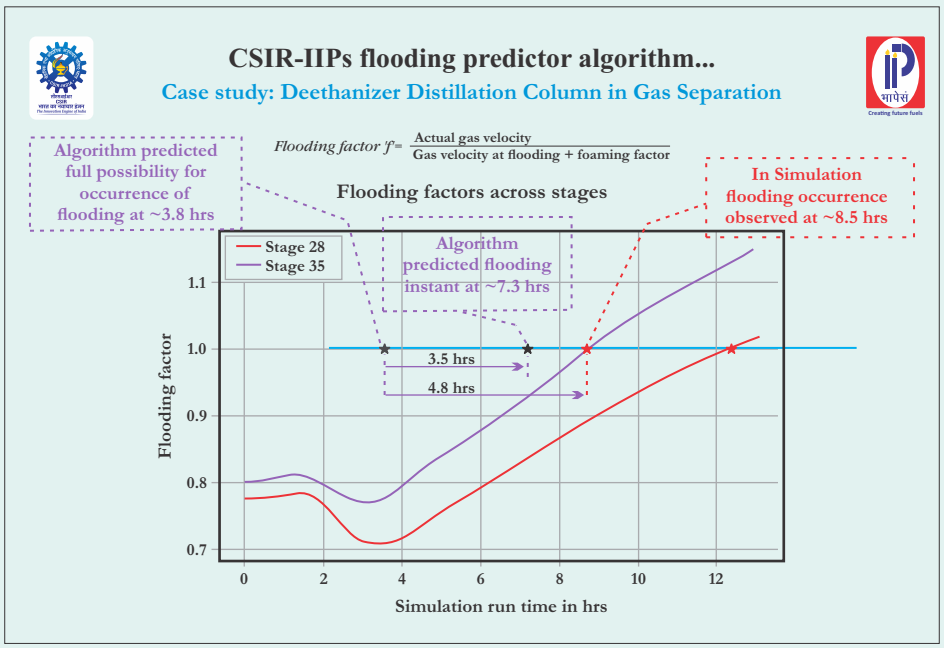
Digital Twinning based Flooding Predictor Algorithm for Distillation Columns (Inhouse Project)

The objective of this Project was to develop an algorithm that is capable of predicting the column flooding occurrence before ~60 minutes of actual flooding event.

First and foremost, an apt multi component system was chosen for which column flooding was reported in open literatures. Based on the extensive literature search, Deethanizer process was identified, upon which flooding predictor algorithm development was envisaged. We started building the steady state base case design for a Deethanizer process using literature data. The steady state model was transformed into a dynamic simulation model. Later process disturbances (viz., feed throughput change or overloading, ramp rate disturbances in boil-up, and, ramp rate disturbances in reflux rate) were induced in the dynamic simulation model. Further, a correlation matrix was developed for transient behavior between important measuring variables. This helped us identify the exact variables useful for building the flooding correlation model.

Finally using these selected measuring variables, flooding predictor algorithm was developed. We checked the theoretical efficacy of this algorithm on two disturbance scenarios and the algorithm was successful in predicting flooding before ~3-4 hours of actual flooding occurrence.

We have developed a column flooding predictor algorithm on a case study of deethanizer column of refinery process. The application is tray temperature inferential-based approach. The developed algorithm has shown results where it was successfully predicted column flooding approximately 3 to 4 hrs. prior to actual flooding occurrence when subjected to external disturbance in throughput change.



1.1.2 अनुकरण और प्रतिरूपण क्षेत्र / Modelling and Simulation Area

Feasibility Study for Implementation of Pinch Analysis in Crude Distillation Unit-II at CPCL Manali, Chennai (Sponsor : CPCL Manali, Chennai)

This project was sponsored by. The project's objective was to develop the simulation models of CDU-II to optimize the operating parameters to meet the products specifications and carry out the pinch analysis of CDU-II to improve the preheat temperature and reduce the furnace load and CO2 emission to the environment.

The CDU-II simulation model for the design case and test run cases using design and test run data were developed on the hardware details provided in design data for BH and BL crudes to validate the simulation model and identify the gaps for improvement of process operating conditions. Subsequently, two simulation cases termed as test run desired properties (BH-TRDP and Mix-TRDP) cases for BH and Mix crudes were developed by fine-tuning the operating conditions like furnace temperature, pump arounds and stripping steam to meet the desired product properties as needed by CPCL. The flow rates and temperatures predicted for products and pump arounds in the simulation were used to develop an improved heat exchanger network. Further, the existing heat exchanger network (HEN) simulation model for design and test run cases were developed using the respective hot and cold streams. In view of considerable differences in the temperatures and duties of some of the exchangers for test run cases, the fouling parameters were fine-tuned to reduce the deviation in crude preheat temperatures at major locations in the preheat train. Further, the pinch analysis for TRDP cases for BH and Mix crude was carried out using the hot and cold streams' enthalpy data extracted from their respective simulation models. Subsequently, improved HENs for BH and Mix crudes were developed using the observations from composite and grand composite curves, maximum utilization of existing heat exchangers with rerouting of their hot/cold streams or through heat exchangers relocation The key findings of the Study/ Project are given below.

- The improved HENs for BHTRDP and Mix TRDP cases provided increased crude preheats by 17-19 °C compared to the test run cases of the existing HEN.
- This increased crude's preheat temperatures leads to energy savings of 5.56 MMkcal for BH crude and 7.33MMkcal/h for mixed crude. The energy savings lead to financial savings of ₹13.23 Crores per annum for BH crude and ₹16.8 Crores per annum for mixed crude for the fuel oil price of ₹30000/- per tonne.
- Reduced 11200-15680 tonnes of CO2 emission per annum to the environment.
- Moreover, energy savings will also result in foreign exchange savings of 10-14 Crores per annum because India is Net crude oil importer.

1.1.3 एरोमेटिक्स निष्कर्षण / Aromatic Extraction

Separation and Recovery of Bicyclic Aromatic Chemicals (BAC) from Carbon Black Feedstock (CBFS) and Light Cycle Oil (LCO)/ कार्बन ब्लैक फीडस्टांक ;सीबीएफएसद्धऔर लाइट साइकिल आंयल ;एलसीओद्ध से बाइसाइक्लिक एरोमैटिक केमिकल्स ;बीएसीद्ध का पृथक्करण और रिकवरी (In-house OLP-1181)

The objective of this Project was to develop a process for separating and recovering bicyclic aromatic hydrocarbons (BAC) from mixtures of the BAC with other hydrocarbons such as paraffins, naphthenes, olefins, and aromatics. The targeted BAC is naphthalene, and feedstocks are carbon black feedstock (CBFS) and light cycle oil (LCO). Our target level of performance is to achieve at least 95% yield based on the initial amount of naphthalene present in feedstocks with purity higher than 97%.

LCO and CBFS feedstocks were collected and characterized. The extraction performances of LCO (as received) and CBFS (< 250°C fraction) were evaluated using different solvents such as NMP, DMF, DMSO, and combination with co-solvents. Reaction optimization studies were performed considering parameters such as reaction temperature, solvent to feedstock ratio, and reaction time.

Dimethyl sulfoxide can be utilized as an effective solvent for separating aromatic hydrocarbons from LCO feedstock because of its high performance and non-toxic nature. Process flow scheme and material balance to extract naphthalene and its derivatives from LCO was documented. Aromatic recovery of 63% with high purity was observed with the dimethyl sulfoxide solvent and the tested solvent exhibits high distribution coefficient along with high selectivity for aromatic separation with LCO.
The extract hydrocarbons extracted from the LCO were rich in naphthalene derivatives such as naphthalene 2-methyl, naphthalene 2,6-dimethyl, and naphthalene 1,4,6-trimethyl. However, the extract hydrocarbons from the CBFS (< 250°C fractions) were rich in mainly pure naphthalene. That means these feedstocks can contribute to the petrochemical sector.

Feasibility Studies of Repairing Sanitary Napkin from Cellulosic Materials of Forest Residues/ वन अवशेषों के सेल्यूलोसिक पदार्थों से सैनिटरी नैपकिन तैयार करने की व्यवहार्यता अध्ययन (In-house OLP-1216)

To establish a demonstration facility to produce biodegradable sanitary napkins. The aim is to develop an economical and environmentally friendly method to prepare absorbent materials from agricultural residues and the prepared absorbent materials will be utilized for making sanitary napkins.

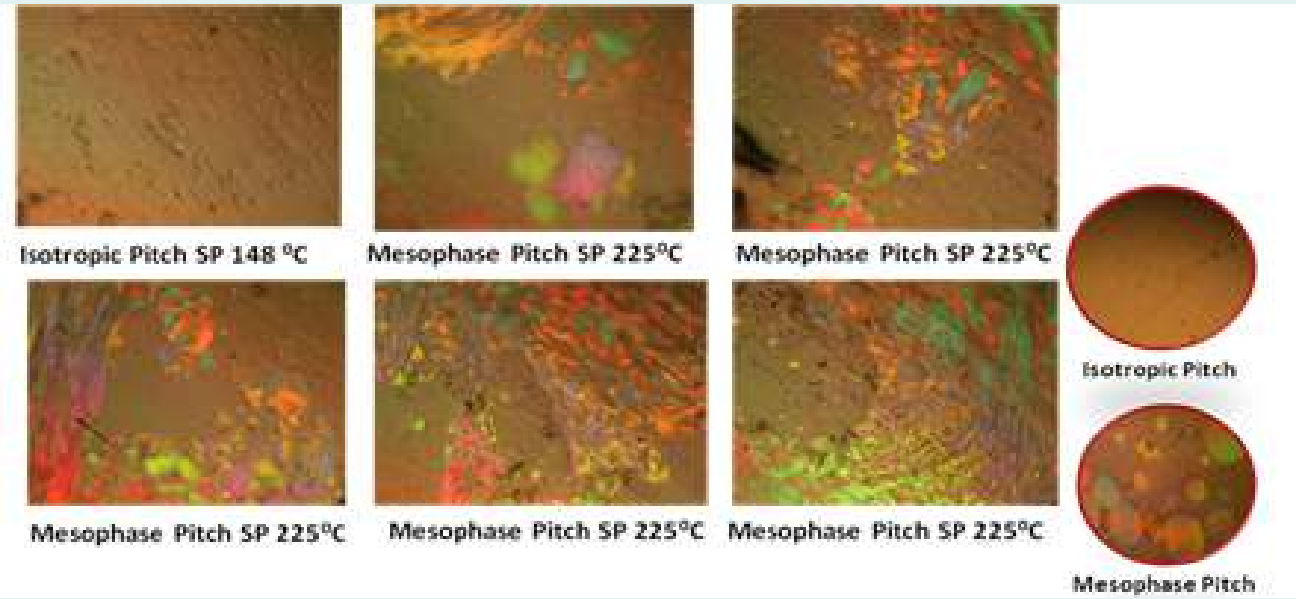
The project involved collecting Banana Pseudostem and Paper Mulberry residues and developing a process to extract cellulosic materials and pulp from them. The extracted material was used as the main constituent for creating absorbent hygiene products. Sanitary pads were the final product developed from the prepared absorbent hygiene material.

A demonstration facility for producing biodegradable sanitary pads using agricultural and forest residues was established at CSIR-IIP. A method was developed for creating biodegradable absorbent materials from Banana Pseudostem and Paper Mulberry. The sanitary pads produced from this process were certified to meet ISO norms and were found to be both biodegradable and compostable.

1.1.4 ल्यूब्स, वैक्स, बिटुमिन, डिस्पाल्टींग एवं कार्बन मटीरियल एरिया / Lubes , Wax , Bitumen, Deasphalting and Carbon Material Area

Development of Coal Tar – Petroleum Hybrid Pitches

CSIR-IIP has carried out research work to develop a new type of 'Coal Tar - Petroleum Hybrid Pitch'. Generally, Pitches are prepared from Coal Tar or Petroleum derived feed stocks. These pitches are used as a precursor for making carbon materials such as Carbon Fibers, C-C Composites, Carbon Foam, Anodes for Li-ion Battery and Needle Coke etc. Considering the inherent properties of 'Coal Tar' and 'Petroleum' feed stocks and no suitability of one type of feed stock for making pitch of desired properties, CSIR-IIP has developed a new type of 'Coal Tar - Petroleum Hybrid Isotropic and Mesophase Pitches' to get the advantages of hydrocarbon molecules present in both Coal and Petroleum derived feed stocks suitable for different end-use applications.



Optical Micrographs of Hybrid Isotropic and Mesophase Pitches

Investigation on Excessive Blackening of Aero-Engine Lubricating Oil Samples

Recently, excessive blackening of Engine Oil in two aero-engines was observed. CSIR-IIP investigated the possible root cause of excessive blackening of Engine Oil. CSIR-IIP has carried out a comprehensive study using multi-prong approaches including characterization of Fresh and Used Aero Engine Oil Samples, their oxidation behavior under actual aircrafts service conditions, role of anti-oxidants, Carbon Soot formation tendencies etc. and indentified the root cause and provided the solutions for the same.

Fresh Aero Engine Lubricating Oil and its Oxidation Products under Different Lab Conditions

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

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

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 (DST Project)

Himachal-Dehradun Cluster: CSIR-IIP is the Nodal Lab and Dr Suman Lata Jain is Nodal Officer for this Cluster. First year budget 108.00 Lakhs.

Objective of the Project

Under the Dehradun-Himachal Cluster Nodal Centre following Institutes are participating:

- CSIR-Indian Institute of Petroleum, Dehradun
- Indian Institute of Technology (IIT) Roorkee
- Indian Institute of Technology (IIT) Ropar
- CSIR-Central Drug Research Institute (CDRI), Lucknow
- Indian Institute of Technology (IIT) Mandi

The main objective of creating this nodal centre is to provide indigenous technology for the identified molecules which are highly important in Pharma sector. For the first year following molecules have been identified:

Sl. No	Organization	Proposed molecule	Proposed Activities
1	CSIR-Indian Institute of Petroleum (CSIR-IIP)	3- Chloro-4-fluroaniline	• Process development for 100 g scale synthesis of 3-chloro-4-fluroaniline. • Technology Information package for 100 g scale process
2	Indian Institute of Technology Roorkee	Paracetamol	Process development with complete TIP for the production of 1 kg of APAP
3	Indian Institute of Technology Ropar	Carbidopa	100 g, Lab scale synthesis with complete TIP
4	CSIR-Central Drug Research Institute (CSIR-CDRI)	Acyclovir	100g, Lab scale synthesis with complete TIP
5	Indian Institute of Technology Mandi	Diclofenac Sodium	The process development and process validation up to three batches as well as Technology Information Package (TIP) for 100g of product

Work Done in the Project

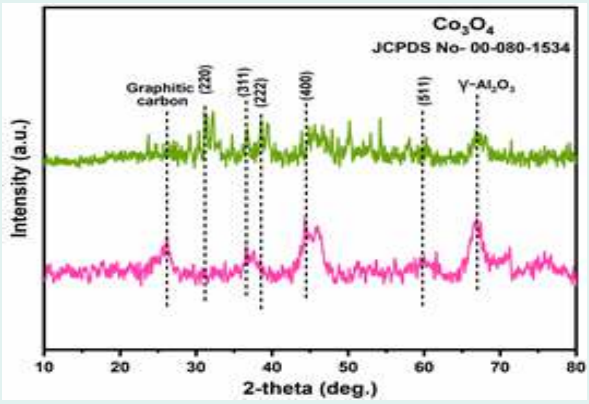
Following work has been done at CSIR-IIP under this project:

- We developed a series of heterogeneous iron and cobalt-based nanocatalysts using the wet impregnation technique and screened them for the proposed reaction. The iron based catalysts performed excellently at a 1 g scale but showed significantly reduced performance at 5 g and 10 g scales. After extensive experimentation, we transitioned to Co-based catalysts.
- The synthesis of the Co-catalyst has been optimized from a 1 g to a 100 g scale. The catalyst has been thoroughly characterized using various analytical techniques, including XRD, XPS, TGA, ICP-OES, and TEM.
- The catalyst was then applied to the synthesis of 3-chloro-4-fluoroaniline from 3-chloro-4-fluoronitrobenzene. The process was optimized stepwise at scales of 0.1 g, 0.5 g, 1 g, 10 g, 50 g, and 100 g. At each scale, the reaction conditions were optimized to achieve complete conversion and excellent product selectivity.
- We have completed catalyst recyclability studies, demonstrating that the catalysts can be reused for up to three cycles.
- Currently, we are working on the cost-benefit analysis at 100 g scale.

Key Findings of the Study

Process development for 100 g scale synthesis of 3-chloro-4-fluroaniline.

Final catalyst Co-Phen-Al2O3



Final product (3-chloro-4-fluoro-aniline)

Catalyst synthesis and reaction set-up for hydrogenation

1.2.2 पॉलिमर सामग्री / Polymeric Materials

Scale up of CSIR-IIP Developed Polymeric Flow Improver (PFI) to 1 kg Scale
Sponsoring Agency: Oil India Limited, Duliajan

Objective of the Project

The objective of project is to scale up the best performing PFI additives to 1 kg scale systematically (50g – 100g – 250g – 1kg) and test their yield and performance for reduction in wax deposition. The scope of the Phase-II study includes development of liquid slurry of additive and its stability at 15 °C for 15 days.

Work Done in the Project

Oil India Limited has been facing problems of severe paraffin / asphaltene deposition during transportation of its crude oil to the refinery through the 8-inch / 16-inch diameter trunk pipelines, which requires frequent pigging, the frequency of which varies from every alternate day to fortnight, depending on the severity of deposition. Subsequently after the completion of Phase I, for the synthesis and testing of polymeric additives were successful, the OIL has have shown interest for the Phase II to validate the synthesis process at 1 kg scale at laboratory level. Since the scale of synthesis of additive in Phase-I was only 5 grams, hence the Phase-II of the work was initiated for validation of the synthesis protocol of PMA-8 at 1 kg scale. Moreover, in Phase-II, OIL indicated that the additive would also be converted into liquid form so as to simplify additive dosing process during field trials.

The polymeric wax inhibitor additive PMA-8 was synthesized by using the commercial grade chemicals. The desired yield of the additives i.e. >90% was achieved successfully with fine tuning of the reaction parameters. The additives were scaled up to 1kg from 5 g scale in a step wise manner (5g – 50g – 100g – 250g – 1kg). The additive is scalable and >90% yield was achieved at 1kg scale also. The performance of the prepared additives at 1kg scale was similar to the additive at 5g scale and the additives were sent and evaluated independently at OIL R&D. The development of liquid phase additive is under progress and its stability test at 15 °C for 15 days is also under progress. Several combinations of surfactants and solvents were tried for the liquid phase preparation. But most of them solidify at 15 °C. A combination of solvent to prepare a solution form of additive is stable up at 15 °C. Now 8 days has been passed and found stable solution form at 15 °C.

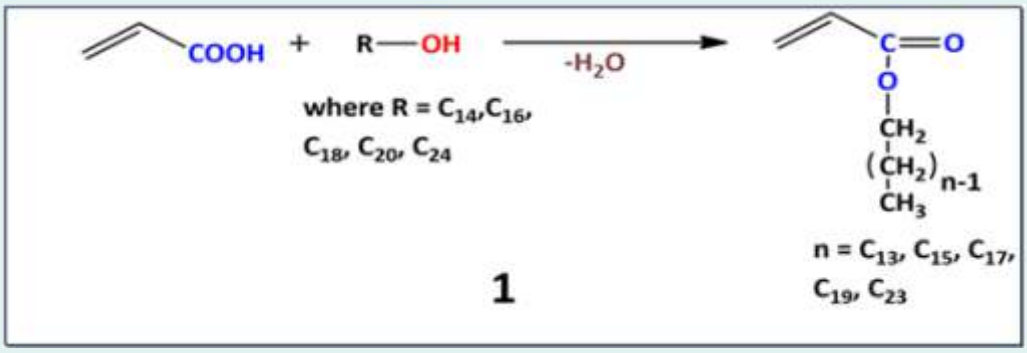
Key Findings of the Study/ Project

The OIL crude oil is a low asphaltic and medium waxy type of crude oil. The pour point of the undoped crude oil OIL1, OIL2 and OIL4 received from Oil India Limited is 15 °C while those of additive doped crude oils OIL3 and OIL5 are 21 and 18°C respectively. Structural characterization of crude oil using NMR and FTIR indicate that the crude oils are mostly paraffinic in nature, with predominantly straight chain hydrocarbons. WAT analysis of the oil samples using rheological studies indicates that the WAT of OIL1 is 32.3, of OIL2 and OIL4 are 31.37, of OIL3 and OIL5 are 34.43 °C. 7 commercial and 3 in-house developed additives are being evaluated for reduction in wax deposition. 2 commercial additives have shown a reduction in wax deposition by 39-43% at a dosage of 1 wt. %. The initial results using in-house developed additive PMA1 indicate a reduction in wax deposition by ~ 70 % at 0.1wt% (1000ppm). The wax deposition studies under flowing condition are in progress in the lab scale flow loop. The polymeric wax inhibitor additive PMA-8 was synthesized by using the commercial grade chemicals. The desired yield of the additives i.e. >90% was achieved successfully with fine tuning of the reaction parameters. The additives were scaled up to 1kg from 5 g scale in a step wise manner (5g – 50g – 100g – 250g – 1kg). The additive is scalable and >90% yield was achieved at 1kg scale also. The performance of the prepared

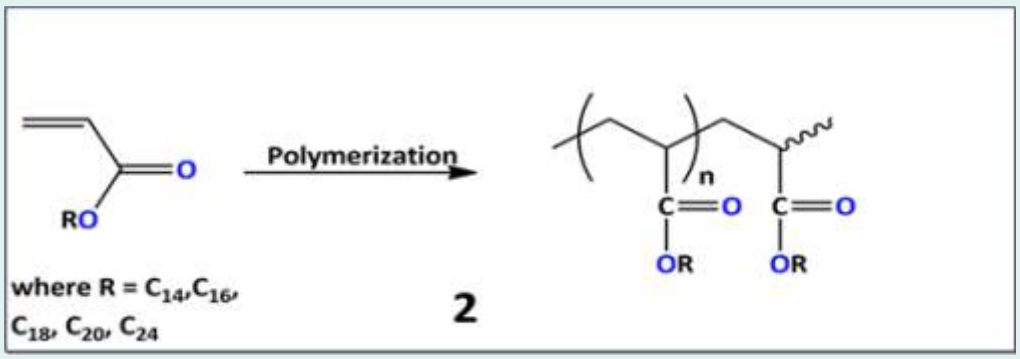
additives at 1kg scale was similar to the additive at 5g scale and the additives were sent and evaluated independently at OIL R&D. The development of liquid phase additive is under progress and its stability test at 15 °C for 15 days is also under progress. Several combinations of surfactants and solvents were tried for the liquid phase preparation. But most of them solidify at 15 °C. A combination of solvent to prepare a solution form of additive is stable up at 15 °C. Now 8 days has been passed and found stable solution form at 15 °C.

Synthesis of Wax Inhibitor

The planned wax inhibitor was prepared in two steps. 1. Esterification of long chain alcohols single or a combination of C-14 to C24 with acrylic acid (Scheme 1). 2. Polymerization of acrylate prepared in step -1 (scheme 2).



Scheme 1: General scheme for the synthesis of monomer for wax inhibitor at CSIR-IIP.



Scheme 2: General scheme for the synthesis of wax inhibitor at CSIR-IIP (polymer)

Table-1: Effect of In house Synthesized Additives on pour point

Additive Code	Sample Composition	Pour point	Change in pour point, oC
AD PMA1	OIL 2 + 1 wt% PMA1	12	-3
ADX PMA1	OIL 2 + 0.3 wtwt% PMA1% Xylene + 1	3	-12
AD PMA2	OIL 2 + 1 wt% PMA2	21	+6
ADX PMA 2	OIL 2 + 0.3 wt% Xylene + 1 wt% PMA2	3	-12
AD PMA3	OIL 2 + 1wt% PMA3	18	+3

1.2.3 संक्षारण / Corrosion

Corrosion Inhibitors Performance Evaluation Studies (Chennai Petroleum Corporation Limited)

Objective of the Project

To carry out evaluation studies of eight commercial corrosion inhibitors at three recommended dosage levels

Work Done in the Project

Evaluated the anticorrosion performance of eight commercial corrosion inhibitors that CPCL supplied and the test procedure is as follows.

Test procedure: 2700 ml of distilled water is collected in a standard flask. 135 grams of sodium chloride is dissolved in it to make a 5% brine solution. Three sets of experiments were prepared by transferring 900 ml of the brine in standard solution bottles (Borosil Glass). These bottles were labeled accordingly (blank, A 4, A 8, A12, etc.,). All the bottles containing brine solution were purged for three minutes each with sour gas H2S and stop cork was fixed. Sufficient corrosion inhibitors (4, 8, and 12 mg) were dissolved in 100 ml diesel to make 4, 8, and 12 ppm each of total volume. Each of the bottles with respective labels was added with a 100 ml diesel sample containing respective corrosion inhibitors. The blank solution was kept with pure 100 ml diesel. Accurately weighed mild steel coupons were suspended in brine solution in such a way that it took 10 seconds for each coupon to be completely immersed in brine solution through the diesel layer. The labeled bottles were then kept in an air oven at 55 + 1o C for six days (144 hrs.). After 144 hrs of exposure, mild steel coupons were removed and washed with water followed by a toluene-iso propyl alcohol mixture (1:1). These steel coupons were photographed. After taking photographs, the corroded surface of the coupons was cleaned using the de-rusting solution. The weight of each coupon was recorded and the corrosion rate of each coupon was calculated in mpy.

Key Findings of the Study/ Project

The corrosion inhibition performance of eight commercial corrosion inhibitors was evaluated and a report was submitted to CPCL within the committed period.To carry out evaluation studies of eight commercial corrosion inhibitors at three recommended dosage levels

Table 1: Performance of corrosion inhibitor A in diesel-sour brine mixture at 55°C, 144 h

Dosage ppm	Corrosion Rate, mpy	Efficiency, %	Visual Observations of Test Coupons	Visual Observations of Test Solutions
None	105.27	-	Black corrosion product on surface	Black powder layer suspended in both diesel, brine and settled at the bottom of the bottle
4	87.72	16.66	Light brown and black spots on surface with visible pits	Black powder layer suspended in both diesel, brine and settled at the bottom of the bottle
8	63.66	39.51	Light brown and black spots on surface with visible pits	Black powder layer suspended in both diesel, brine and settled at the bottom of the bottle
12	54.93	47.81	Light and dark brown spots on metal surface with roughness	Black powder layer suspended in both diesel, brine and settled at the bottom of the bottle

***Average corrosion rate of triplicate experiments**

A 4 A 8 A 12

Performance of corrosion inhibitor A (After Test)

Development of Corrosion Inhibitor Formulation for Up and Mid Stream Applications

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 CO2 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

The following list of corrosion inhibitors and formulations are synthesized and investigated for their anti-corrosion performance via electrochemical and gravimetric methods.

SI No	Name of molecules	Corrosion inhibition efficiency for carbon steel in an acidic environment
1	Benzaldehyde thiosemicarbazide	> 90
2	Cinnamaldehyde thiosemicarbazide	> 95
3	Dimethylamine benzaldehyde thiosemicarbazide	> 90
4	Diethylamine benzaldehyde thiosemicarbazide	> 90
5	3,4-Dihydroxybenzaldehyde thiosemicarbazide	> 90
6	2,3,4, - Trihydroxybenzaldehydethiosemicarzide	> 90
7	Ionic liquids (Amino acid-based)	> 95
8	Formulation (benzaldehyde + ethylene diamine)	> 98

Key Findings of the Study/ Project

Thiosemicarbazone derivatives were proven effective corrosion inhibitors for carbon steel in acid environments. These derivatives will be employed for formulations of inhibitors in the process.

The weight loss values for corrosion of MS which had been exposed to 15% HCl in the absence and the presence of 4mM corrosion inhibitor formulation(Aldehyde + diethylene amine)

Inhibitor	Concentration	Media	Initial Weight	Final Weight	Weight loss	Efficiency
Cn1	1000 PPM	15% HCl	5.1263	4.0815	0.4107	96.58%
Cn1	500 PPM	15% HCl	4.7265	3.4873	1.2392	60.69%
Cn1	250 PPM	15% HCl	4.1577	2.7799	1.3778	56.29%
Cn2	1000 PPM	15% HCl	4.9678	4.8548	0.1130	96.41%
Cn2	500 PPM	15% HCl	4.5000	4.2496	0.2504	92.06%
Cn2	250 PPM	15% HCl	4.6033	2.9738	1.6295	48.30%

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

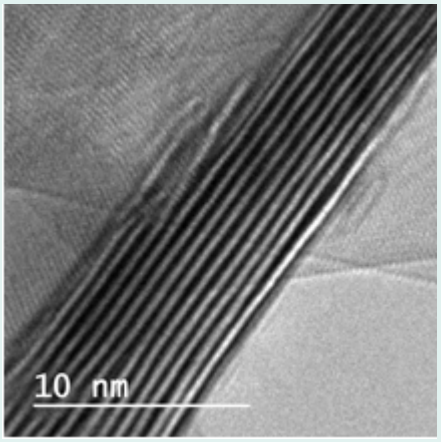
Development and Certification of New Generation Lubricant Formulations for Aerospace Surfaces and Components (WP-05)
CSIR Mission Mode Project (HCP-0036)
CSIR-National Aerospace Laboratories Bangalore

Objective of the Project

- To develop indigenous MoS2-based lubricant for the aerospace contact surfaces. Furthermore, graphene would be blended with MoS2 for enhancement of lubricant performance.
- The MoS2-based lubricant and its blend with graphene would be benchmarked against the existing lubricants, in-terms of lubrication performance (Coefficient of friction: 0.1; the operating temperature of MoS2-based lubricant < 400 C). Furthermore, the synthesis of MoS2 will scale-up to 1 kg scale (Batch size; 100 gm).
- To certify the developed product by CEMILAC

Work Done in the Project

A single-step hydrothermal approach was established for the preparation of nanostructural MoS2. In this context, ratio of precursors, hydrothermal processing temperature, time, and precursors' quantity were varied for optimum yield of nanostructured MoS2. A process was successfully scaled-up with a batch size of 200 gm. The structural, morphological, and chemical characterization of nanostructured was carried by FTIR, XRD, XPS, Raman, and HRTEM analyses. A transmittance peak at 465 cm−1 in FTIR spectrum signified the stretching mode of Mo−S in MoS2. Intense peaks at 395 and 420.6 cm−1 (Figure 2b) in Raman spectrum correspond to E12g (in-plane vibration) and A1g (out-of-plane vibration) phonon modes revealed 2H-MoS2 nanosheets. Moreover, 25.6 cm−1 frequency difference between Raman modes (Δ = A1g −

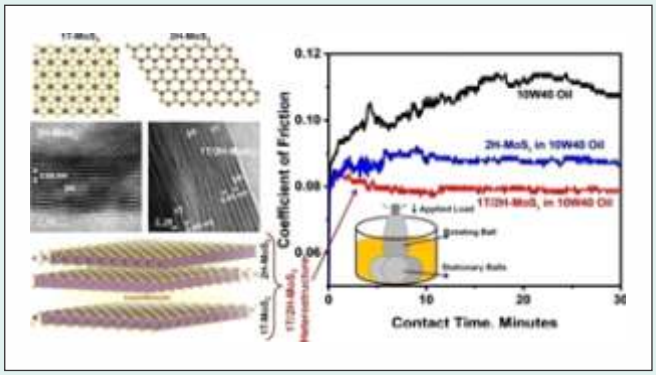


E12g) suggests a limited number of lamellae in MoS2. The diffraction peaks in XRD pattern at 2θ of 14.4, 33.9, 39.8, and 59.5° corresponding to the (002), (101), (103), and (110) planes, respectively, confirmed the crystallinity of two-dimensional (2D) MoS2 nanosheets. A (002) plane at 2θ of 14.4° suggests the interlayer spacing of 6.2 Å between the adjacent lamellae of MoS2, linked by weak van der Waals interactions. The electron micrographs of MoS2 based on HRTEM measurements suggest that each nanosheet comprises 10 − 15 molecular lamellae with interlayer spacing of 0.62 nm. High-resolution Mo 3d XP spectrum of nanostructured MoS2 comprises chemically shifted doublet at 229.4 and 232.6 eV with spin-orbit difference of 3.2 eV between 3d5/2 and 3d3/2 (232.6 eV), signifying the tetravalent molybdenum in nanostructured MoS2. The high-resolution S 2p XP spectrum having a doublet of 2p3/2 (162.3 eV) and 2 p1/2 (163.5 eV) components with a spin-orbit difference of 1.2 eV revealed the divalent sulfur in MoS2. The lubrication Performance was evaluated by dispersing the nanostructured MoS2 in ethanol with aid of sonication and sprayed on the steel disc to form the uniform thin film. The thin film of MoS2 showed significant reduction in coefficient of friction (72%) under the maximum Hertzian contact stress of 1.3 GPa. Further experiments on surface analysis of worn scar are under progress to reveal the role of nanostructured MoS2 for lubrication enhancement.

Key Findings of the Study/ Project

A single-step hydrothermal method is developed for synthesis of nanostructured 2H-MoS2 at a batch size of 200 gm. The thin film prepared by MoS2 on mild steel showed >70% decline in coefficient of friction, promising immense potential for lubricant applications.

R & D Work Carried which has Great Impact



1T/2H-MoS2 Heterostructure for Remarkably Enhanced Lubrication Performance

Heterostructures comprising two-dimensional (2D) nanomaterials of dissimilar lattice constants govern the interfacial interactions, induce structural strain, and influence the mechanical properties, resulting in a low shear strength to minimize friction. A facile hydrothermal approach is developed to synthesize an ammonium surfactant-stabilized 1T/2H-MoS2 heterostructure comprising van der Waals interaction-driven interfacially stacked 1T metallic and 2H semiconducting phases of MoS2. The long alkyl chain of the ammonium surfactant grafted on the surface of the 1T/2H-MoS2 heterostructure extended its dispersibility in fully formulated 10W40 engine lube oil. A minute quantity of 1T/2H-MoS2 in engine lube oil (optimum dose: 0.3 mg•mL–1) improved the lubrication performance of the steel tribopair by minimizing friction (24%) and wear volume (76%). Raman analyses of the worn area after the lubrication test with the 1T/2H-MoS2 heterostructure revealed the tribo-induced transformation of 1T into the 2H phase and formed a 2H-MoS2-based tribo thin film on contact surfaces of steel balls for enhancement of lubrication properties. The significantly low weak van der Waals interaction between interfacially stacked lamellae of 1T and 2H phases in the 1T/2H-MoS2 heterostructure furnished a lower coefficient of friction than that of 2H-MoS2 under identical tribological conditions. These findings promise the use of 2D heterostructures for tribological applications to enhance lubrication properties.

Ti3C2Tx MXene-Polyaniline Nanocomposites for Enhancement of Corrosion-Resistance Performance of Mild Steel in Accelerated Corrosive Environment

Corrosion, a gradual deterioration of metallic bodies, poses significant risks, along with massive monetary and material losses. Surface coatings enriched with corrosion inhibitors and nanostructural fillers play vital roles in protecting the metal substrate against the corrodents. The Ti3C2Tx MXene, synthesized by selective

chemical etching of an aluminum layer from the Ti3AlC2 MAX phase, is used as a platform material to interfacially grow the polyaniline (PANI) via oxidative polymerization of aniline for preparing the Ti3C2Tx-PANI nanocomposites. The reinforcement of the epoxy matrix via multiple interactions with ample nitrogen and oxygen functionalities of Ti3C2Tx-PANI-ES nanocomposites enhanced the structural compactness, elastic modulus, and hardness of the resultant epoxy coatings. The Ti3C2Tx-PANI nanocomposites as a protective filler to the epoxy coating improved the corrosion inhibition properties in the accelerated corrosive environment (3.5% saline solution). The Ti3C2Tx-PANI increased the total electrochemical impedance of epoxy coating by 11 orders of magnitude, which is further corroborated by the protection of the underlying steel substrate under continuous exposure to salty fog. The Ti3C2Tx MXene as a structural barrier impedes the diffusion of corrodents, and the electroactive PANI minimizes the galvanic events by trapping the electrons released during the anodic oxidation of iron and forms a passive layer to protect the underlying mild steel. Therefore, Ti3C2Tx-PANI nanocomposites can be promising materials for corrosion inhibition applications.

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

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 प्रयोग प्रभाग/ Automotive Fuels & Lubricants Application Division

Performance Evaluation of New Engine Lubricants Formulated for Motorcycles Sponsor: Shell India Markets Private Ltd.

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 a total of 30 vehicles, which were of 2 different types. Six distinct oils were evaluated during the trial, with testing carried out over two different drain intervals. By the end of March-2024, around 60 % of the field trial activity was completed with a total distance of 3.52 lakh kilometers accumulated across the vehicles, and the trials included two specific driving routes. This study provided valuable insights into the performance of various oils under different conditions and drain intervals.

To meet the project's demands for precise data collection and to address time constraints due to the unavailability of high-quality local GPS devices, high-accuracy GPS devices integrated with data acquisition system were developed. This innovative solution not only ensured seamless execution of the project but also established a valuable in-house capability, positioning the Institute to efficiently conduct future field trials with enhanced accuracy and reliability.

Key Findings of the Study/Project

This project provided valuable insights into the performance of various oils under different conditions and drain intervals.

Relevant Photographs/Flow Diagram etc along with Captions.

(a) Vehicles ready to go on field trials

(b) Engines dismounted from vehicles after completing the field trials

(c) The engine parts which are ready for deposit rating

(d) Driving route profile.

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

National GHG Inventory for the Road Transport Sector for BTR-1, BUR-4, and FNC

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

- The Biennial Update Report (BUR-4) for the National Greenhouse Gas inventory for the road transport sector has been submitted to the nodal agency MoEFCC.
- First Biennial Transparency Report (BTR-1) for National GHG emission for years 2005 (base-year), 2020, 2021, and 2022 initial draft report submitted to MoEFCC.
- Disaggregated GHG emissions in the road transport sector by vehicles and fuel types have been reported in BTR-1.
- In-house software has been developed to analyze the sectoral fuel consumption data and related GHG emissions.

Key Findings of the Study/Project

- ~ 10 % of India's total GHG emission is due to the transport sector.
- The road transport sector contributes ~ 94 % of the emissions caused by the transport sector.
- High-speed diesel and Gasoline are the main fuel consumed in the road transport sector.
- Cars and Trucks are the main GHG emitters in the road transport sector

Life Cycle Assessment of RT- Biodiesel and DILSAAF™ Processes Environmental Impact Assessment of Room-Temperature Bio-Diesel and DILSAAF™ Sustainable Aviation Fuel Production Processes

Objective of the Project

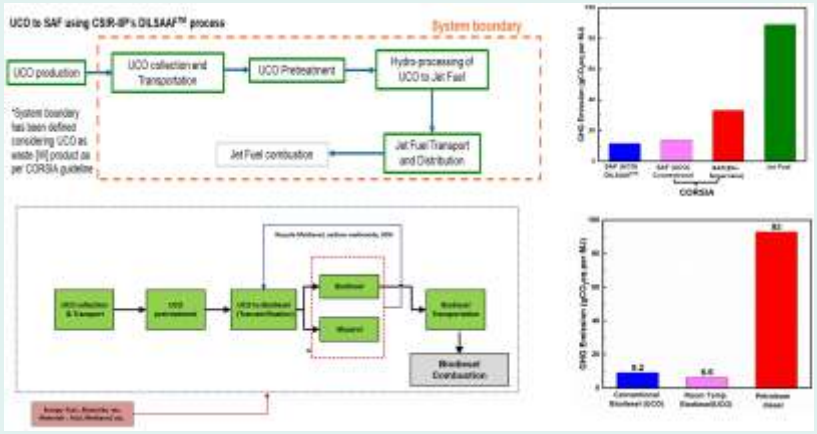
- LCA analysis of SAF produced from Used Cooking oil via DILSAAF™ process
- LCA analysis of Biodiesel produced from Used Cooking Oil (UCO) via RT- Biodiesel Process

Work done in the Project

- LCA model for DILSAAF™ processes for SAF production (with UCO as feedstock)
- LCA model for CSIR-IIP's RT-Biodiesel and Conventional biodiesel processes (with UCO as feedstock)

Key Findings of the Study/Project

- GHG emission of SAF produced from UCO via DILSAAF™ process is ~ 90 % lower than conventional Jet Fuel.
- GHG emission of Biodiesel produced from UCO via RT-Biodiesel process is ~ 93 % lower than petroleum diesel



Life Cycle Assessment of RT- Biodiesel and DILSAAF™ Processes and their Comparison to Conventional Processes

Certification of Registered Vehicle Scraping Facility

Sr. No	Name/Address of RVS*F	Name of the Sponsor	Inhouse/Collob/ Sponsored/Consultancy
1	Certification of Registered Vehicle Scrapping Facility CNP-0182	Pine View Technology Private Limited	Consultancy
2	Certification of Registered Vehicle Scrapping Facility CNP-0183	Nirvana Scrapers	Consultancy
3	Certification of Registered Vehicle Scrapping Facility CNP-0184	GADAR KhardaPvt. LTD.	Consultancy
4	Certification of Registered Vehicle Scrapping Facility CNP-0190	GADAR KhardaPvt. LTD.	Consultancy

Objective of the Project

- CSIR-IIP is among the test agencies specified in Rule 126(A) of CMVR.
- CSIR-IIP is doing the regulatory and compliance audit of the Registered Vehicle Scrapping facility as per GSR 653(E)

Work done in the Project

Pre-audit, Audits and Enhancement of Audit compliance carried out for RVSF facilities as per the regulatory framework.

Key Findings

RVSF improvements suggested to the RVSF operators and necessary facility/operational implementations by RVSF operators.

Rating of Engine Components

Sr. No	Project Title	Name of the Sponsor	Inhouse/Collob/ Sponsored/Consultancy
1	To study the deposits & distresses characteristics of a four-cylinder diesel engine SSP-0139	Shell India	Sponsored
2	To study the deposits &distresses characteristics of 3 passenger car engine components. SSP-0142	IDIADA, INDIA PVT LTD, PUNE	Sponsored
3	To study the deposit and gear distresses characteristics of selected components of two-wheeler engines. SSP- 0147	AVL, Technical Centre	Sponsored
4	To study the deposits &distresses characteristics of 3 passenger car engine components.SSP-0153	IDIADA, INDIA PVT LTD, PUNE	Sponsored
5	To study the deposits & distresses characteristics of 08 nos. of two-wheeler engines. SSP-0170	FEV India Ltd., Pune	Sponsored
6	To study the deposits & distresses characteristics of components of two commercial engine .SSP – 0194	IDIADA, INDIA PVT LTD, PUNE	Sponsored
7	To study the deposits & distresses characteristics of the components of two diesel engines. SSP – 0198	IDIADA, INDIA PVT LTD, PUNE	Sponsored

Objective of the Project

- To study the deposit/distress/sludge characteristics of engines components

Work done in the Project

Clients namely M/s Shell India Markets Pvt Ltd, M/s Lubrizol India Pvt. Ltd, M/s AVL Technical Centre Pvt. Ltd, M/s IDIADA Automotive Technology India Pvt., and M/s FEV India Pvt. Ltd, Pune requested CSIR-IIP to study the deposit/distress characteristics of the components of diesel and petrol engines after the completion of the trial at their end. CSIR-IIP's rater carried out the deposit rating of critical engine components as per the procedure of ASTM manual # 20/21. This report describes the results of the deposit/distress rating carried out. The final report submitted to client summarizes the performance of engine oil with respect to engine deposits build-up (Carbon, Sludge & Varnish) and assessment of condition of critical engine components.

Key Findings of the Study

Outcomes of these types of projects are really helpful for the automobile and related industries for following GHG protocol, by evaluating a carbon-neutral lubricant for reducing fuel consumption and carbon footprints in modern vehicles.

Design and Development of High-entropy Alloys using Artificial Intelligence for Gas Turbine Applications, Sponsored: 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

We have compiled a comprehensive High Entropy Alloy (HEA) database and utilized various machine learning algorithms to predict strength and ductility. To enhance and validate the ML model, we incorporated multi scale and multi phasic simulations, refining our predictions with experimental data. Through a multi objective optimization approach, we determined optimal compositions for achieving target properties, 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, we developed a high-temperature strength map for HEAs and created an algorithm capable of generating similar maps for various alloy compositions. To make this research accessible, we designed a graphical user interface (GUI) 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

- 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

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

1.5.1 अपशिष्ट प्लास्टिक रूपांतरण– प्रक्रिया प्रौद्योगिकी / Waste Plastic Conversion–Process Technology Area

Depolymerization and Upcycling (DEPOLUP): Improving TRL of CSIR-IIP-GAIL Technology for Waste Plastics to DieselPlastic: (CSIR funded)

Objective

- **Production of diesel with 80% throughput and 63% conversion to diesel with segregated waste plastics**

CSIR-IIP alongwith GAIL has developed a thermo-catalytic pyrolysis process for conversion of waste plastic (majorly composed of polyolefins)to gasoline, diesel and aromatics. The process being developed at lab scale has been validated at the bench scale and a 1 TPD plant along with necessary pre-treatment facilities has been set up for converting waste plastics to diesel. The 1 TPD plant is operational in CSIR-IIP campus and the fuel produced from 1-TPD pilot plant meets most of the parameters of diesel specifications (BS-VI). CSIR-IIP has taken trial runs on 1 TPD plant and has identified a few areas for further improvement. In this mission mode project, the aim is to increase the TRL through technical intercessions like incorporating of minor design changes and process optimization. This would facilitate adoption of technology for setting up commercial plants that can utilize waste plastics, majorly polyolefins into drop in substitute diesel fuel.

Conversion of Waste Plastics to Fuels

An enormous plastics generation across the globe without the feasible and efficient recycling technology have resulted the severe environmental impacts (soil, marine and air pollutions). Therefore, it is essential to invent a viable solution for utilization of these waste plastics (especially single used plastics). In this view, CSIR-IIP in association with GAIL India has conceptualized, designed, developed and evaluated a novel process of converting polyolefin waste plastics like polyethylene and polypropylene into any one of the products, i.e., gasoline or diesel or aromatics along with liquefied petroleum gas (LPG). The 1 ton per day (TPD) demo plant has already been set up along with GAIL (India) Ltd. at CSIR-IIP Dehradun. Currently, we are evaluating the developed process to achieve the desired/designed capacity of the process. Besides, we are working towards improving the scale of technology readiness level (TRL) by amending the issues related to operation and design. This can be achieved by optimizing the process parameters to maximize the yield and quality (as per BS-VI specification) of desired fuel and optimizing the catalyst performance.

1-TPD Pilot/Demo Plant for Conversion of Waste Plasticsto Diesel at CSIR-IIP Dehardun

Apart from the aforementioned research works, we are making efforts towards understanding of the correlation between the

structure and composition of polyolefin feedstock with pyrolysis oil. Importantly, we also evaluated the kinetics and thermodynamics of the thermal breakdown (pyrolysis) of real-world waste plastics (majorly composed of polyolefins) like mixed waste plastics, packaging plastic bag waste, personal protective equipment kit waste, and milk pouch waste obtained from the local dumping sites. This kinetic analysis confirmed that the mixed waste plastics consume significantly higher energy than the other types of waste plastics to initiate the thermal breakdown reaction. This thermo-kinetic investigation can contribute towards comprehensive understanding and utilization of waste plastics collected from actual dumping sites for optimizing the real-time reaction devices and producing useful petrochemical products like diesel, gasoline, benzene, toluene, and xylene in an eco-friendly and sustainable way.

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

(a) Feasibility of producing benzene-rich aromatics from waste cooking oil (WCO) (HCP-054)-CSIR funded

(b) Development of catalyst(s) based on nano concepts for the Dehydrogenation of Propane to Propylene (GAP-0141) - SERB/ANRF Sponsored

(c) Analysis and Up-gradation of Pyrolysis oils for meeting fuel specification as per BS-IV/VI (HCP-0046) – DEPOLUP Mission mode project

Objective of the Project

(a) Develop a proof of concept consisting of a catalyst and process for the production of benzene-rich BTX by utilising 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) Process technology to upgrade pyrolysis oil to transportation fuel as per BS-IV/VI specification

Work done in the Project

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

(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) Suitable catalyst compositions have been identified and established the proof of concept at a 5g scale for upgradation of pyrolysis oil.

1.5.3 अपस्ट्रीम क्षेत्र / Upstream Area

A Bench Scale High Pressure Visual Autoclave: Assessment of Green Hydrate Inhibitors for Deepwater Energy Production

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

Objective of the Project

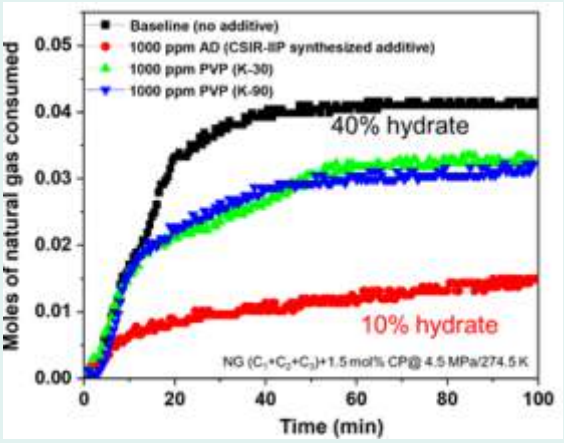
To develop new biocompatible additives (low-dosage hydrate inhibitors) to delay the onset of hydrate formation or prevent the agglomeration of hydrate particles in subsea oil and gas pipelines to ensure the flow.

Work done in the Project

Hydrate Inhibition Performance of Newly Synthesized Additives (Patent filed)

In response to the growing demand for natural gas, oil & gas industries are moving toward deep-water or ultradeep-water gas fields, wherein the subsea flow lines transporting unprocessed fluid to the processing facility are at high risk of gas hydrate formation and blockage due to the highly favorable thermodynamic conditions of flow lines for hydrate deposition. In order to make the deepwater NG fields economically viable, considerable research and development are required for the design and deployment of "make in India" hydrate inhibition products.

Herein, we have identified/synthesized new hydrate inhibitors that simultaneously prevent both particle agglomeration and hydrate deposition in the pipelines. we synthesized a new class of hydrate inhibitors and accessed their performance using a high-pressure visual reactor at 4.5 MPa pressure and 274.5K temperature. A synthetic natural gas mixture (methane 92% + ethane 5% + propane 3%) and cyclopentane was used for hydrate formation. This figure presents the comparison of natural gas consumption due to hydrate formation, which is a measure of hydrate fraction in the liquid phase. As can be seen in the figure, ~40% hydrate is forming in the baseline (no additive) experiment, which was reduced to ~30% with the commercially available hydrate inhibitors (PVP). With the addition of 1000 ppm of our additive, only~10% hydrate was formed in the liquid phase, representing the excellent performance of our additive for hydrate inhibition.



Comparison of Hydrate Formation Kinetics in the Presence of Commercial and our Additives

Key Findings of the Study

- We developed new hydrate inhibition additives (Patent filed) that not only reduce the rate of hydrate formation but also prevent the agglomeration of hydrate particles in subsea pipeline conditions. These additives would have application in deep-water gas fields located in the KG basin, India.

CSIR-CCUS Program: CO_2 Sequestration in Subsea Sediments as Gas Hydrates

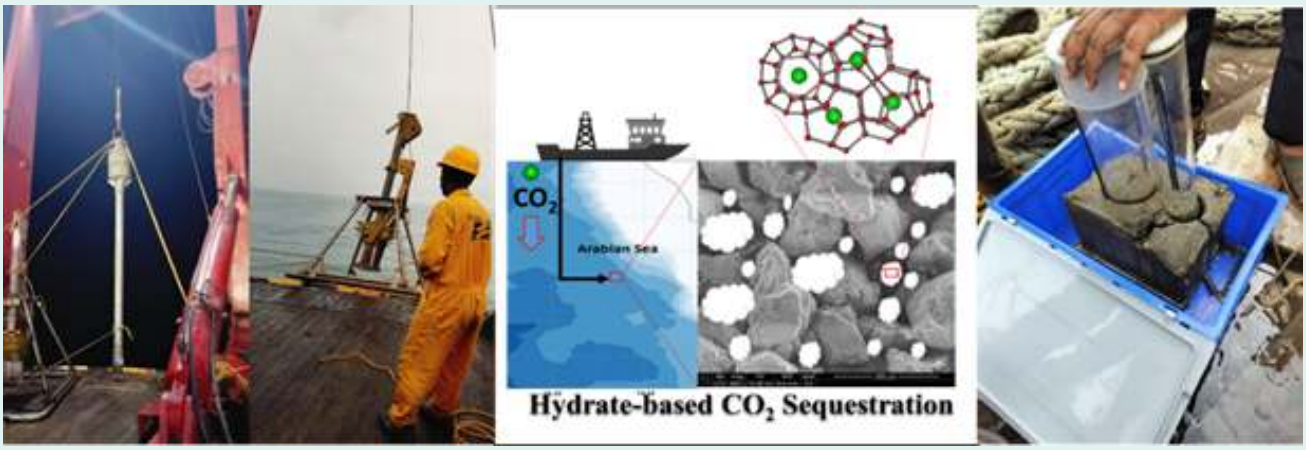
Name of the Sponsor: Council of Scientific & Industrial Research (CSIR)

Objective of the Project

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 in the Project

To achieve Panchamrit's targets of net zero by 2070, announced by the Hon'ble PM, India has to adopt carbon-neutral technologies like carbon capture and sequestration (CCS). In this direction, we are working on a new technology of CO_2 hydrate formation in sub-sea sediments. Herein, we would be able to sequester the flue gas/CO_2 coming from thermal power plants and refineries located in the coastal states. One of the objectives of the project is 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. In this direction, a new high-pressure reservoir mimicking setup that can represent the realistic subsea CO_2 injection process has been commissioned at CSIR-IIP. Moreover, we explored the deep Arabian Sea and collected various gravity cores/ sediments and seawater from various sites/depths ranging from 100 meters to 2000 meters. CO_2 storage capacity in these sediments will be obtained using the high-pressure setup.



Gravity Core and Sediments Collected from Deep Arabian Sea

Key Findings of the Study

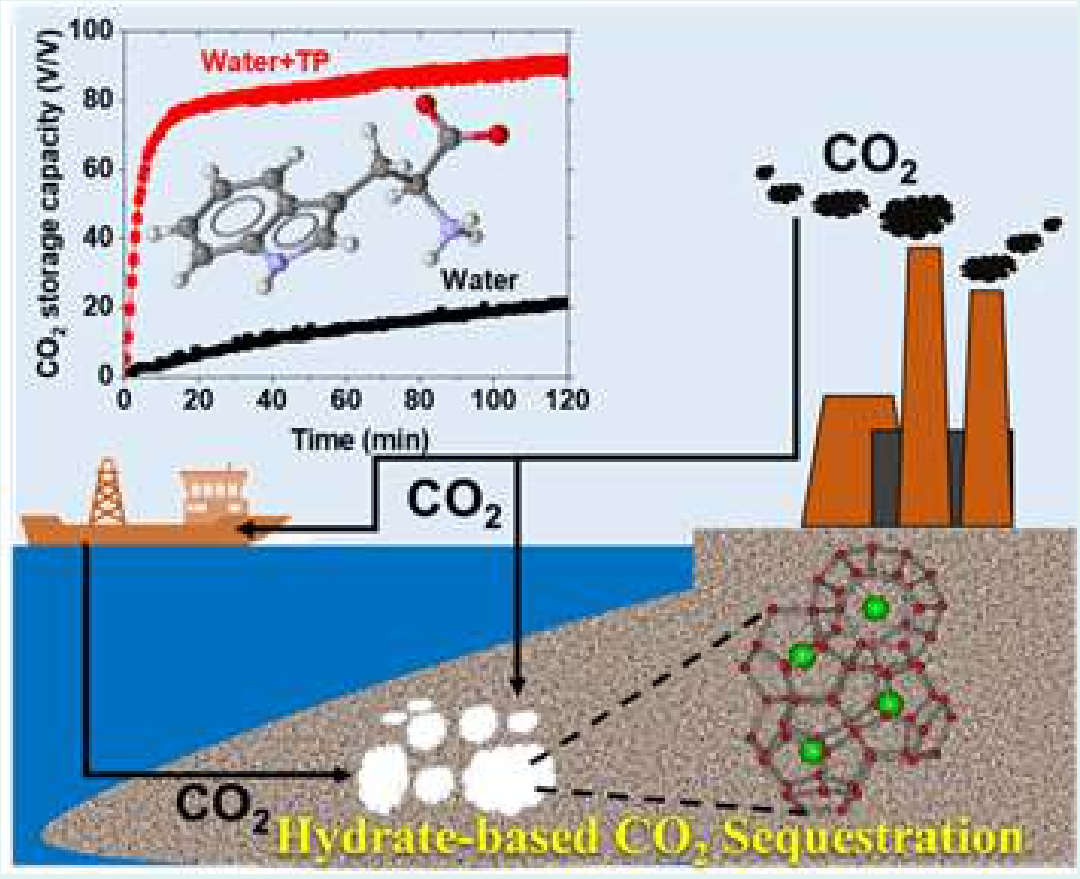
- Commissioned a bench-scale hydrate-based CO2 sequestration prototype.
- Collected the deep water Arabian sea sediments/cores and seawater from various depths and areas for CO_2 sequestration tests.

Carbon Dioxide Sequestration in Arabian Sea

Carbon dioxide (CO_2) is the primary greenhouse gas responsible for global warming and climate change. According to a report from the International Energy Agency (IEA), global energy-related CO_2 emissions increased by 1.1% in 2023, amounting to 410 million tonnes (Mt) of $CO_2$and reaching a record high of 37.4 billion tonnes (Bt).

Carbon capture and sequestration (CCS) is a crucial strategy for achieving global net-zero emission targets. Among the various options, gas hydrate-based CO_2 sequestration in subsea sediments has attracted significant attention due to its high storage capacity—about 3.5 cubic meters of hydrate can store one tonne of CO2 and long-term stability in the sediments. Understanding the kinetics of hydrate formation and its stability in natural subsea sediments and seawater is essential for advancing this technology. Therefore, in this study, we investigate the kinetics of CO_2 hydrate formation in sediments and seawater collected from the Arabian Sea. We use both pure CO2 and a mixed gas of CO2/N2 for our experiments. These tests are conducted in the presence of biocompatible kinetic promoters, specifically amino acids, under subsea pressures and temperature conditions using our high-pressure reactor facility.The conclusions and

recommendations drawn from this study are as follows: The sandy sediments of the Arabian Sea exhibit a wide particle size distribution, ranging from 74 to 250 μm, while the clayey particles are significantly smaller, measuring between 0.5 and 6.0 μm. The study successfully demonstrated CO2 hydrate formation using sandy sediments from the Arabian Sea. It was found that approximately 148.56 mg of CO2 can be stored per cubic centimeter of sediment pore volume. In contrast, this storage capacity decreased to 59.98 mg in clayey sediments and 45.57 mg in mixed sediments (sandy + clayey). These results indicate that the presence of clay restricts mass transfer and limits further contact between CO2 and water molecules within confined spaces, thereby reducing the sediment's CO2 storage capacity. For future studies, it is recommended to characterize hydrate-bearing sediments using X-ray Computed Tomography (X-CT) or magnetic resonance imaging (MRI). Additionally, the introduction of amino acids (AAs) during CO2 hydrate formation in sandy and clayey sediments was found to enhance the growth kinetics of CO2 hydrates. Overall, this investigation could substantially contribute to CO2 storage in Arabian Sea sediments in the form of CO2 hydrates.
Additionally, we developed a dynamic model to predict the kinetics of CO2 hydrate formation in porous media. This model demonstrated excellent performance across all clayey-sandy sediments studied. Our findings can serve as a benchmark for future field scale tests in deep-sea sediments.



Co2 Sequestration in Subsea Sediments in the form of Solid Gas Hydrate Crystals (Adapted from Gurjar et al., 2023)2

1.6 सामग्री संसाधन दक्षता प्रभाग /Material Resource Efficiency Division

The Material Resource Efficiency Division (MRED) at CSIR-Indian Institute of Petroleum (CSIR-IIP) is dedicated to promoting sustainable practices in material use and resource management. This division seeks to enhance the efficiency of material resources through research and development across various domains, including waste management. It aims to create technologies for the effective recycling and recovery of valuable materials from agricultural and industrial wastes, such as biomass, used oil, and other byproducts. By integrating the tools of biotechnology, thermochemistry, and life cycle analysis, MRED strives to develop innovative materials that are both efficient and sustainable, ultimately reducing the environmental impact of material extraction and usage. Over the past year, CSIR-IIP MRED has diligently addressed various research challenges, including predicting health profiles of individuals through the CSIR-PHENOME program, developing deployable technologies like mobile pyrolysers for waste biomass disposal, and creating new products with zero waste management strategies. A brief overview of these initiatives is provided below.

1.6.1 जैव रसायन और जैव प्रौद्योगिकी / Biochemistry & Biotechnology

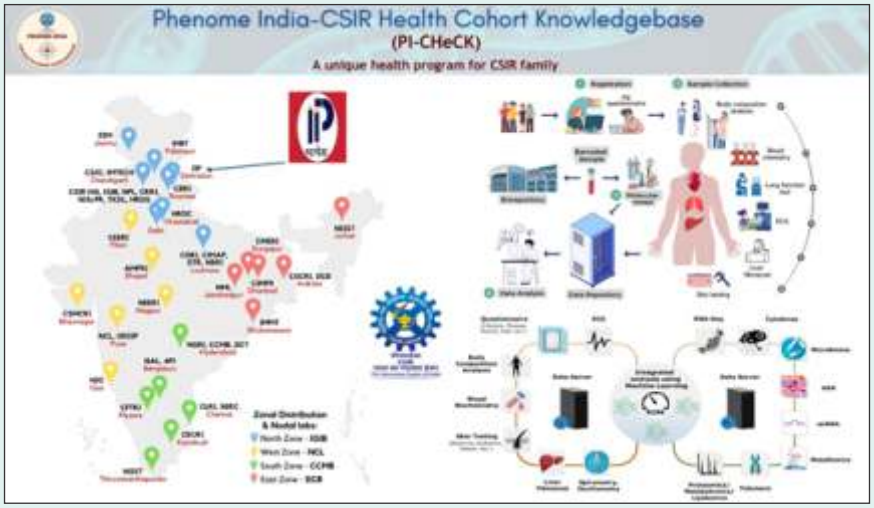
Phenome India-CSIR Health Cohort Knowledgebase (PI-CHeCK): A Prospective Multi-modal Follow-up Study on a Nation-wide Employee Cohort and Role of CSIR-IIP (CSIR Flagship Project)

One of the holy grails of preventive precision medicine is to predict the health trajectories of individuals to allow early intervention and prevent the onset or complications of the disease. Such prediction of health outcomes has traditionally been accomplished by developing risk scores based on limited data from prospective cohort studies. The advent of multi-omics data and artificial intelligence-based big-data analytical tools has opened an unprecedented opportunity for developing novel personalized risk matrices to predict health outcomes. This was evident during the recent pandemic of COVID-19 when CSIR, in its more than forty constituent laboratories and centers spread all over the country, initiated a longitudinal cohort study (Phenome-India Cohort) to estimate the burden of COVID-19 and to assess antibody stability.

About the Initiative

The ability to predict the health trajectories of individuals based on their personalized risk scores can help formulate a preventive roadmap before the onset of the disease or its complications. Currently, most of these risk prediction algorithms are based on epidemiological data from the Caucasian population, and there is liberal evidence that they do not work well for the Indian population due to ethnic diversity, varied dietary and lifestyle patterns, and altered risk profiles. In this multi-centric pan-India study, CSIR aims to address these challenges to develop clinically helpful personalized risk prediction scores for cardio-metabolic diseases that will apply to the Indian population. This multi-centric program involves the longitudinal collection and bio-banking of biological samples from ~10,000 CSIR employees, pensioners, and their

spouses with a concurrent collection of multi-parametric data that include clinical questionnaire, lifestyle and dietary habits, anthropometric parameters, imaging/scanning, biochemical data, and molecular data including genomics, plasma proteomics, metabolomics, and fecal microbiome among others. In addition to exploring the data for associations between various parameters and cardio-metabolic outcomes, CSIR intended to develop predictive models using artificial intelligence algorithms to predict phenotypic conditions and create an integrative network of various genomics, proteomics, and metabolomics parameters to understand systemic regulation. The study would help realize the realms of precision medicine for the Indian population, and the data generated in the study may have the potential to refine the normative values of several parameters in the context of the Indian population.



Phenome India-CSIR Health Cohort Knowledgebase (PI-CHeCK)

Outcome

The project is being led by CSIR-IGIB, and all CSIR sister labs, including CSIR-IIP and CSIR-HQ, are involved. Along with the Nodal lab, the first nationwide sampling (limited to CSIR labs) was executed in June 2024. In CSIR-IIP, 394 participants gave samples during 1-6 May 2024. All participants received reports for blood analysis, gut microbiome, skin, liver, lungs, and ECG reports through their secured portals. The second sampling phase is planned for 2025, between January and April.

Valorizing de-oiled Yeast Biomass for Sustainable Biorefinery Applications: Sponsored by CSIR

Objective of the Project

Valorization of de-oiled yeast biomass into the quality compound

Work done in the Project

The growing and evolving industrial system demands multiple methods for optimum conversion of resources. The transition from fossil-based resources to renewable carbon-based bioprocesses as an essential component of bio-economy generates various waste/by-product streams that require addressing. One such solid by-product stream is valuable carbohydrates-rich de-oiled yeast biomass originating from the oleaginous fermentation process, which can be extracted and modified for application in different industries. The present study deals with the valorization of de-oiled yeast biomass to a glucan-chitin

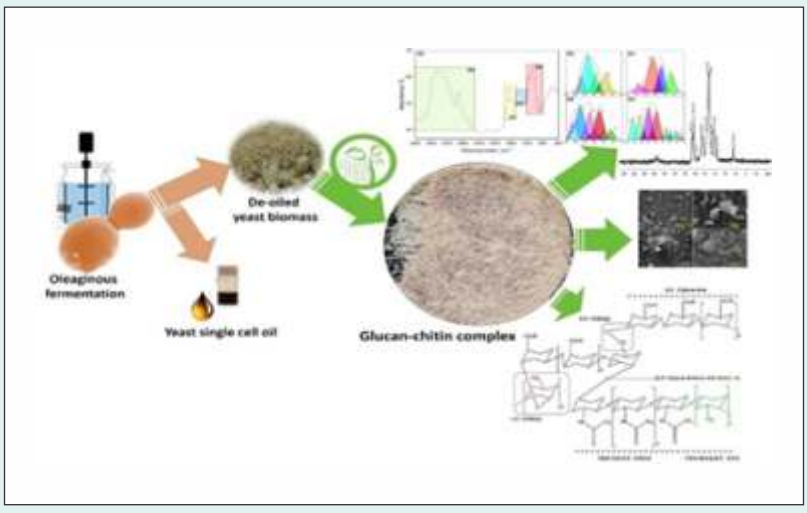
complex. The process of extraction investigated was based on scalability and minimal release of chemical load to the environment. The obtained complex was assessed through vibrational, resonance, and photoelectron spectroscopy for quality and structural profiling.

Further, de-oiled yeast biomass can be carbonized to develop biochar as a sustainable resource for fabricating coin cell supercapacitors. The investigation on direct and indirect CO_2 activation demonstrated a high efficiency of direct processing of this carbon-rich feed in the charge storage application. Electrostatic double-layer capacitance (EDLC) and pseudo-capacitance were observed as the charge storage mechanisms. Notably, the supercapacitor exhibited promising energy and power density measurements of 13.5 Wh/kg and 2113 W/kg, respectively. The study highlighted the potential of de-oiled yeast cake-derived biochar as a suitable and environmentally friendly electrode material for energy storage applications, emphasizing its importance and use in sustainable innovations in developing super capacitor technology.

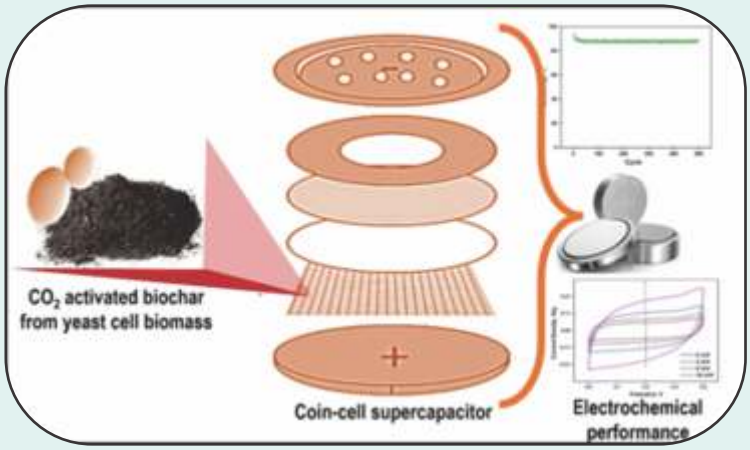
Key Findings of the Study/Project

A glucan-chitin complex with 49.22 wt.% glucan and 17.07 wt.% chitin was obtained, exhibiting a helical arrangement of β-(1→3) and β-(1→6) glucan chains linked to chitin via β-(1→4) linkage. The results showed that the investigated valorization route could be integrated with the yeast lipid production chain to obtain these quality compounds from the process by-product stream. The green chemistry metrics indicated the need to recover compounds from the by-product stream for process, atom economy, and minimal waste generation.

The de-oiled yeast biomass-derived super capacitor exhibited promising energy and power density measurements of 13.5 Wh/kg and 2113 W/kg, respectively. The study highlighted the potential of de-oiled yeast cake-derived biochar as a suitable and environmentally friendly electrode material for energy storage applications, emphasizing its importance and use in sustainable innovations in developing supercapacitor technology.



De-oiled Yeast Valorized to Glucan-Chitin Complex



De-oiled Yeast Carbonized for Coin-cell Super Capacitor Application

Transforming Waste: Lipase Production from Used Cooking Oil for Environmental Biodegradation

Objective of the Project

Lipase enzyme production from Used Cooking Oil (UCO) and its application in bioremediation

Work done in the Project

India generates about 3.2 million tonnes (MT) of used cooking oil (UCO) annually. UCO poses significant environmental challenges, as it clogs municipal sewer systems and reduces the efficiency of wastewater treatment plants. It can also severely impact aquatic and marine life, forming a coating that suffocates fish, birds, and plants, hindering their respiratory processes and leading to their death. Therefore, addressing UCO disposal is also essential for safeguarding urban infrastructure and natural ecosystems. UCO collected from a local NGO was characterized in detail against a commercial olive oil for its fatty acid composition and used as a cheap and inexpensive feedstock for lipase production using a mesophilic yeast. It was observed that apart from low pH and it's unpleasant odour, UCO typically had similar composition as that of commercial OO with slightly higher amount of free fatty acids, notably Palmitic and Linoleic. Lipase production was optimized by varying the physical parameters (pH, temperature and time) and media composition (mineral salts, carbon and nitrogen sources). It was observed that temperature and time were the most significant factors influencing lipase production and a UCO concentration of 1% w/v was optimal for lipase yields with activities > 100 IU/mL. The crude lipase demonstrated an impressive capability to degrade approximately 46 ± 0.70% of used engine oil (UEO) over a 15-day period. In comparison, the lipase extracted from Candida rugosa, which served as a reference, achieved only 30% degradation of UEO within the same timeframe. Notably, the crude lipase was effective in breaking down both short-chain and long-chain hydrocarbons, a feature that is typically not accomplished by other varieties of lipases.

Key Findings of the Study/Project

Lipase could be produced using cheap and inexpensive feedstock such as UCO. Under optimized conditions, the lipase yield was enhanced ~2 folds. The biodegrading activity of the enzyme resulted in the removal of linear, branched, and cyclic alkanes with chain lengths ranging from C4 to C40 in the UEO.

Glycerol Valorization to 1, 3-Propanediol (PDO) using Newly Isolated Citrobacter Freundii IIPDR3

Objective of the Project

To develop an end-to end process for glycerol-based 1,3 PDO production from a newly isolated Citrobacter freundii IIPDR3, including its downstream processing.

Work done in the Project

Glycerol-based biotechnological production of 1, 3-propanediol (PDO) has taken center-stage after its recent commercialization by Metabolic Explorer. During 2023-2024, batch fermentation studies were conducted to unveil the potential of a novel alkalophilic, BSL-1 bacterium Citrobacter freundii IIPDR3 to produce 1,3-PDO from glycerol. The culture conditions were optimized at shake flask level using one variable at a time (OVAT) approach and statistically significant parameters were identified.

Key Findings of the Study/Project

i. The optimal conditions for batch production of 1,3-PDO were: phosphate buffered glycerol-based medium essentially containing 1.5 g/L ammonium sulfate, 3 g/L yeast extract, 0.5 g/L magnesium sulphate; temperature: 36°C; pH-stat of 8.0 and inoculum size being ≥ 35 µg bacterial cells/ml on dry cell weight (DCW) basis.

ii. Incorporation of 0.2% Tween-80 in the fermentation medium, improved glycerol uptake rate and prevented self-flocculation of bacterial cells.

iii. Using liquor NH3 as a neutralizing agent, C. freundii IIPDR3 produced a maximum of 18.04 ± 0.76 g/L 1,3-PDO from pure glycerol, with productivity and yield being 1.72 g/L/h and 0.53 gg-1, respectively.

iv. When the robustness of the strain was tested on crude glycerol (CG), it accumulated 9.65 and 11.11 g/L 1,3-PDO in 7h and 10.5 h with initial glycerol concentrations of 20 and 40 g/L, respectively.

Fisheries waste Utilization & Product Development for Growth & Propagation of Microorganisms, Sponsored by CSIR

Objective of the Project

Formulation of low-cost microbial culture medium (at two kg scale) from fishery wastes and validation onBacteria (E.coli) and Yeast (Saccharomyces cerevisiae).

Work done in the Project

A study was undertaken to develop a high-quality nitrogen supplement (substitute of peptone and tryptone) from mixed fisheries waste through the production of fish silage. The work done in the process included the optimization of key hydrolysis parameters such as temperature, hydrolyzer concentration, hydrolysis time, and agitation speed (RPM). These parameters were fine-tuned to maximize the recovery of bioavailable nutrients, including proteins, peptides, amino acids, and short-chain fatty acids. The resultant hydrolysate was further processed into a stable, solid powdered form through encapsulation. This encapsulated powder

was evaluated for its efficacy as a complete nitrogen source, substituting peptone and tryptone in microbial culture media. The growth performance and kinetics of bacterial and yeast strains were assessed using the developed supplement in suspension culture. Additionally, a cost analysis for small-scale production (1 kg) of the encapsulated product was carried out to evaluate its economic feasibility. This approach demonstrated the potential of fish silage-derived supplements to serve as an affordable and sustainable alternative to conventional nitrogen sources in microbial culture systems.

Key Findings of the Study/Project

The study demonstrates the successful development of a sustainable and cost-effective nitrogen supplement from mixed fisheries waste through fish silage production. By optimizing hydrolysis parameters such as temperature, time, and agitation speed, high recovery of proteins was achieved. The results indicated that the highest protein concentration of 76mg/g in fish silage was achieved at a temperature of 30°C and a shaking speed of 150 rpm. Additionally, a formic acid concentration of 3% was found to be optimal for producing fish silage, as evidenced by the elevated protein concentration in the final product. Furthermore, the study revealed that silage formation from fish chunks required 30 days, whereas minced fish waste achieved silage formation in only 6 days. Notably, after optimizing the shaking speed, the silage formation time was further reduced to just 2 days. Encapsulation converted the hydrolysate into a stable powdered form, making it suitable for storage and transport. The encapsulated powder effectively replaced conventional nitrogen sources like peptone and tryptone, supporting robust growth and favorable kinetics for bacterial and yeast strains in suspension cultures. The study revealed that the fish silage can replace the peptone derived from animal and plant sources. Additionally, the amount of yeast extract required for the proper growth of microbes can be minimized while using the fish silage-formulated medium. A growth enhancement of 11-13% was observed when commercial yeast extract and peptone were replaced with our in-house developed fish waste-derived medium. A cost analysis for small-scale production (1 kg) confirmed its economic feasibility, with potential for cost reduction at larger scales. This approach offers a renewable alternative to traditional nitrogen sources, reduces fishery waste pollution, and supports industrial applications in fermentation, probiotics, biofertilizers, and bioremediation. The findings highlight its potential to promote circular bioeconomy models while addressing sustainability and cost-efficiency in microbial production systems. The outcome revels that the fish silage can be a better substitute for peptone derived from animal and plant sources.

1.6.2 सतत प्रभाव मूल्यांकन / Sustainable Impact Assessment Area

Valorisation of Spent Aroma Biomass through Thermochemical Methods (HCP-0007), Sponsored by CSIR

Objective of the Project

To carry out value addition to the distilled spent aromatic biomass through pyrolysis and hydrothermal liquefaction route

Work Done in the Project

Slow pyrolysis of Lemongrass was conducted at various temperatures. 400 °C was concluded as the optimised temperature, and 60 mL of bio-oil was sent for further testing. Slow pyrolysis of *Tagetes minuta* biomass was conducted at various temperatures. 450 °C was concluded as the optimised temperature, and 100 mL of bio-oil was collected and sent for further testing. Hydrothermal liquefaction reactions of Lemongrass and Tagetes were performed. Slow pyrolysis of Mentha, Palmarosa, and Tulsi was carried out to optimise the reaction parameters. Catalytic pyrolysis of Mentha, Palmarosa, Eucalyptus, Lemongrass, and Tagetes with ZSM-5, Y-zeolite, and Mordenite was performed at their respective optimised temperatures.

Slow pyrolysis of Geranium Marc and Marigold Flower Waste was performed at various temperatures. The concluded optimised temperature for Geranium Marc and Marigold Flower Waste was at 400 °C for both feedstocks.

Key Findings of the Study/Project

Optimisation of the reaction conditions for the slow pyrolysis of all the spent aroma biomass provided. The characterisation of biomass, bio-oil and biochar obtained from the slow pyrolysis has been done. The GCMS analysis concluded that the bio-oil from the spent aroma biomass contained a high concentration of phenolics. The various characterisations of biochar concluded that it has a good porous structure. The bio-oil obtained from the catalytic pyrolysis was characterised through GCMS, revealing that it contains increased concentrations of phenolics as compared to non-catalytic slow pyrolysis.

1.6.3 थर्मो-कैटेलिटिक प्रक्रिया क्षेत्र/ Thermo-Catalytic Processes Area

Demonstration of Mobile Pyrolyser for Conversion of Agricultural Residues for Production of Bio-oil and Bio-char, Sponsored by Government of Odisha

Objective of the Project

To demonstrate the effective utilization of waste agricultural biomass through production of biomass pellets for energy application and production of bio-char for soil amendment and bio-oil for value addition

Work Done in the Project

CSIR-IIP has installed and demonstrated biomass hammer mill, conveyor system, biomass Pelletisation unit (50 kg/hr), Biomass pellets burner and biomass pyrolysis unit (30 kg/hr) for the production of bio-char and created Common Facility Centre (CFC) at Agricultural farm, Umerkot, Nabarangpur, Odisha which was inaugurated on 14th June 2023 By Dr. K.L Mishra, IAS Collector/DM Nabarangpur. CSIR-IIP has provided first operational and maintenance training to Mr. Saurabh Gain (AAE) incharge CFC facility as nominated by DM Nabarangpur, provided during 8-15th June 2023 and second handholding training provided during 7-14th February 2024. During the training session, biomass pellets from rice straw, ragi straw, ragi husk Arhar twigs, rice husk were produced and mobile pyrolyser was demonstrated with rice straw pellets and approximately 120 kg biomass was processed. Approx. 35 kg bio-oil handover to Dr. Manish Kumar (CSIR-IMMT) however 40 kg bio-char kept at CFC facility. Biomass Pellets was also tested to run a cold storage at Borigumma Village to store local produces like vegetables, fishes, fruits, etc. and plant owner was interested to buy pellets on regular basis.

1.7 ट्राइबॉलॉजी एवं दहन /Tribology & Combustion

1.7.1 ट्राइबॉलॉजी / Tribology

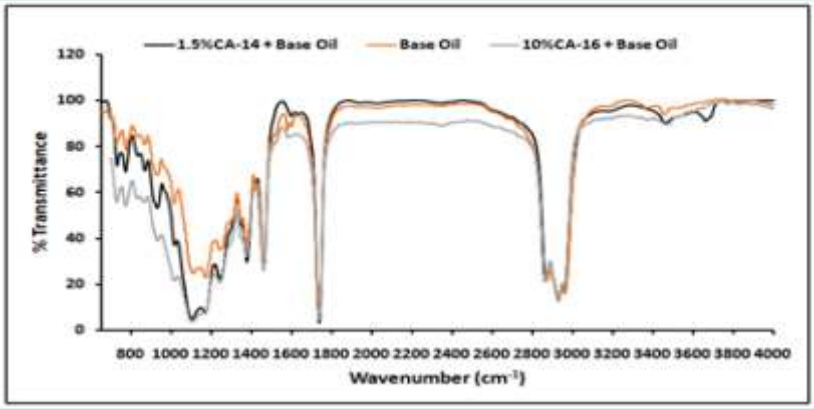
Development of Lubricating Oil (HALRC-35M) for Helicopter Transmission Gear Box
Sponsor: Hindustan Aeronautics Limited, Bangalore

Objective

- To develop/select EP additive as per the desired gear lubricant specifications.
- Modify the gearbox lubricating oil used in helicopter transmission by using an additive to improve the load-carrying capacity performance and maintain the film thickness of the lube oil as per the desired specifications.

Work done

The fully formulated synthetic gearbox lubricating oil reported inferior extreme pressure behaviour and poor friction and wear resistance. Lubricating oil was characterised by its physical, chemical, and tribological characteristics, which were determined using various experimental and analytical techniques. Accordingly, an additive package of Polyoxyethylene Oleyl Ether Phosphate blended with an optimised dose of seal swell agent and the anti-oxidant was added to the lubricating oil to its performance behaviour. The laboratory tests reported the desired performance behaviour. However, when blended and stored in the tin cans, the newly blended lubricant corroded the can's surface. Hence, the additive package was replaced with an Anionic Phosphate Ester-based additive. The laboratory tests, along with the complete physico-chemical characterisation, confirmed the eligibility of the additive for its use in gear oil formulation. The lubricant blend was also tested for its corrosion resistance and compatibility with the tin material.



FTIR Spectrum of used and Fresh Lubricating Oil after Oxidation-Corrosion Test

Key Findings of the Study/Project

To booster dose a fully formulated lubricant, the additive to be blended must be compatible with the existing lubricant additive package. A non-compatible additive can negatively affect the lubricant's performance, resulting in malfunction and failure of the entire system.

Testing of Fire-Resistant Hydraulic Fluids as per IS 10532 and IS 7895 Sponsor: M/s Quaker Chemical India Ltd. and M/s. Hydrocarbons & Chemicals Kolkata

Objective

To test and evaluate the Fire Resistant Hydraulic Fluids(FRHF) for their characteristic properties as per the standard test procedures.

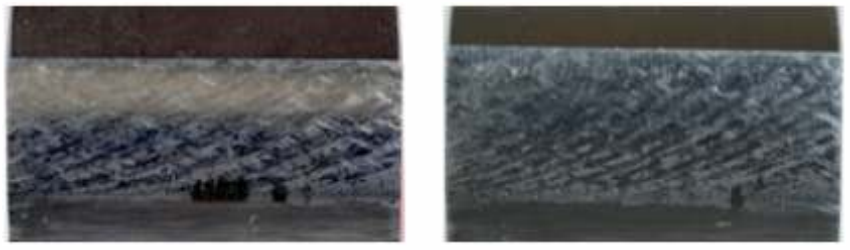
Work done

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 Quaker Chemical India Pvt. Ltd. Kolkata and M/s. Hydrocarbons & Chemicals Kolkata wanted their FRHF of the category HFDU 68 to be tested and evaluated as per standard test procedures prescribed in IS 10532 Part V and IS 7895. The lubricants were tested for their 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, thermal and hydrolytic stability, fire resistant characteristics, four ball wear, FZG EP and Biodegradability properties.

Pinion Surface after the 12th Load Stage



Mating Gear surface after the 12th Load Stage

Key Findings of the Study/Project

The HFDU 68 lubricant samples from M/s. Quaker Chemical India Ltd. and M/s. HydrocTarbons & Chemicals Kolkata are synthetic, water free, Polyol ester-based fire resistant hydraulic fluids. The lubricants meet the norms and standards for the FRHF fluids as per Indian Standards.

Compatibility Studies of Lubricating Greases
Sponsor: Balmer Lawrie & Co. Ltd. Kolkata

Objective

To investigate the compatibility between the greases of two different make.

Work done

Lubricating greases are "solid to semifluid product of dispersion of a thickening agent in liquid lubricant". The greases are used to lubricate the contacting surfaces and are expected to remain in contact with the surfaces under any given operating condition without leaking out. Greases usually lubricate machine parts exposed to heavy loads at lower speeds. There are a wide range of greases available in the commercial market. The OEM-recommended greases are typically used to achieve the desired life expectancy and machinery performance. However, due to the improved chemistry and availability of enhanced products, it is being explored to change/exchange or top-up the existing greases with the competitively new ones available in the market. The greases of similar NLGI consistency, possessing similar characteristic properties and intended for similar applications but of different make, are likely to be interchanged. However, for this, the two interchangeable greases should be compatible.

The compatibility of the two greases ascertains compatibility between the base oil, thickener and additive package of the two greases being considered. It is quantified quantitatively and qualitatively by considering the improvement or decrease in the performance of the resultant grease obtained after mixing the two candidate greases in varying concentrations. The compatibility of greases is of utmost importance as mixing two greases can produce a substance markedly inferior to either of its constituent materials. A mixture of incompatible greases most often softens, sometimes excessively. Occasionally, it can harden. In extreme cases, the thickener and liquid lubricant will completely separate. Bleeding can be so severe that the mixed grease will run out of an operating bearing. Excessive syneresis can form pools of liquid lubricant separated from the grease. Dropping points can be reduced to the extent that grease or separated oil runs out of bearings at elevated operating temperatures. Such events can lead to catastrophic lubrication failures.

The compatibility of the greases is assessed using ASTM D: 6185 standard test procedure. The study evaluated the compatibility of the binary mixture of lubricating greases supplied by M/s. Balmer Lawrie & Co. Ltd. Kolkata. M/s Balmer Lawrie & Co. Ltd. Kolkata provided an adequate quantity of the test sample coded as (i) CLW (Sample collected 07/12/2023) and (ii) Synthplex EM-2 Grease (Batch No. ARL/01-2023, Month: December 2023).

The compatibility of the binary mixture of supplied lubricating greases was evaluated as per ASTM D: 6185. The standard specifies the protocol for assessing the compatibility of a binary mixture of lubricating greases by comparing their properties or performance to those of neat greases. Three properties are evaluated in a primary testing protocol using standard test methods: (1) dropping point by Test Method D566, (2) shear stability by Test Method D217, 100 000-stroke worked penetration; and (3) storage stability at elevated temperature by change in 60-stroke penetration (Test Method D217).

Key Findings of the Study/Project

Based on the study undertaken, it was concluded that;

- The dropping point of the mixture is equal to or greater than that of either constituent grease, and the greases are considered compatible
- The penetration of the mixture is equal to or between those of the constituent greases, and the greases are regarded as compatible with the shear stability test
- The penetration change of the mixture is equal to or between those of the constituent greases, and the greases are considered compatible in storage stability at elevated temperature test

Compatibility/Miscibility Tests for HPCL Grade HP ENKLO FRDU 46 Sponsor: HPCL Ahmadabad

Objective

To investigate the compatibility and miscibility of FRDU 46 with lubricants of different kinds intended for similar applications.

Work done

In industrial applications, lubricants reduce friction and wear and act as heat/power transfer mediums and cleaning/cleansing agents. The type and chemistry of lubricants vary from product to product and from make to make. The selection approach and screening of lubricants depend on specific characteristic properties. The OEM often recommends the lubricant for a given application and machinery. With the availability of various products in the market, users can select the best-performing lubricant for their use. This approach is cost-competitive and can help reduce the organisation's purchase and logistic costs. However, the chosen lubricant must be homogeneous and miscible with the one already used. Accordingly, the replacement or mixing/top-up of lubricants of different make for a given application is gaining significant importance in industrial practices. Lubricants should be compatible, homogeneous, and miscible to replace or mix/top-up with lubricants of different makes. Hence, the Compatibility and Miscibility of FRDU 46 with D 46, DU 4600 LLN, Sump Oil (Mixture of D 46 and DU 4600 LLN in unknown composition) was undertaken as per IS 13656:2002. The oil samples were analysed for Kinematic Viscosity and Pour Point. FRDU 46 was blended with three samples (D 46, DU 4600 LLN, and Sump Oil) by mixing the samples in a 50:50 by volume ratio. The samples were then analysed for Kinematic Viscosity at 40°C and 100°C and Pour Point.

Key Findings of the Study/Project

The homogeneity and miscibility of the FRDU 46 blend with the other three samples (DU 4600 LLN, Sump Oil and D 46) revealed No separation. This determines that the oil will remain homogeneous, miscible, and stable when blended with reference oil after being submitted to a prescribed cycle of temperature changes.

Evaluation of Friction and Wear Behaviour of Friction Wedge Material for Railway Applications
Sponsor : M/s. Raneka Industries Ltd. New Delhi

Objective

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

Work done

A friction wedge with a metallic/composite liner is often desired to enhance the damping characteristics and improve the dynamic behaviour and speed potential in railway applications. 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, reduce 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 pin was run-in on the plate at loads of 25-50N for 20-30mins 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 laboratory balance to the fourth decimal place of 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 weighted with the help of 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.

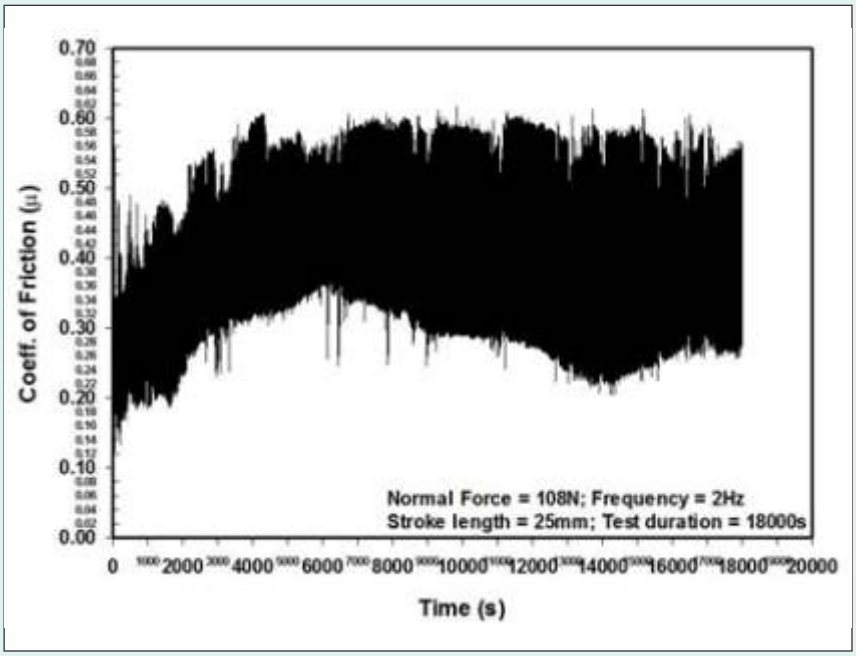


Figure: Frictional Force at 2Hz and 108N for 5hr test duration

R&D of Significant Impact

Influence of Genetic Algorithm Optimized Vein Bionic Surface Texture on the Performance of Hydrodynamic Journal Bearing

Surface texturing is an efficient approach for boosting bearing performance. Therefore, a vein bionic texture was applied to the surface of the hydrodynamic journal bearing to improve its bearing performance. The bionic texture was inspired by the pattern of a peepal (ficusreligiosa) leaf and optimised by a bio-inspired genetic algorithm technique. The GA-optimized vein bionic texture significantly improved bearing performance, with the stability parameter increasing by up to 19% and friction torque being reduced by up to

47%. This class of surface texture improves both static and dynamic characteristics of the bearing. The Bifurcation diagram was plotted to examine the system's stability. The outcome of this work will be a valuable contribution to bearing design and lubrication analysis.

Fluid-film journal bearings are integral machine components of heavy rotating machinery systems. These classes of bearings have high load-carrying capacity. In machines, they support the loaded rotating members and provide a low-friction environment. Rotating machines' stability and performance depend entirely on these bearings' performance. The fluid film acts as a barrier between the contacting surfaces, preventing direct contact and reducing friction. The pressurised lubricating film also helps to dissipate heat and increase the bearing's lifespan. Additionally, fluid film journal bearings can help reduce vibration and noise, allowing for smoother machinery operation. These fluid film bearings provide excellent stability to the system.

Over the past decade, surface texturing has emerged as a technique to improve the performance of lubricated tribo-contacts. It modifies the surface fluid film pattern and enhances the performance of tribo-contacts. Surface texturing in fluid film journal bearings can help improve the life of the bearing, as well as its stability and operation in extreme environments. One of the texturing patterns is bionic texture, found on leaves and has evolved over millions of years in nature for selective adaptation. Applying bionic textures on the bearing surface alters the hydrodynamic performance of the bearings, which in turn affects the machine's overall performance. This texture provides a smooth flow of fluid on the surface. Since it is a continuous texture, it improves the bearings' lubrication performance. The increased demand for rotating shaft support systems with lower initial and operating costs has promoted the idea of optimum bearing design. The genetic algorithm is an effective multi-objective optimisation technique based on natural genetic selection. The best solution is produced using a genetic algorithm, which manages the population growth rate of encoded solutions. Stability in these bearings is a vital parameter, and the texture pattern profoundly influences hydrodynamic bearing stability. In most studies, surface texture results in a decrease in dynamic performance parameters. This performance parameter results in a reduction of the stability parameter. Numerous academic studies have looked into the usage of surface texture to improve the load-carrying capacity of tribo-contacts. However, the application of bionic surface texturing techniques and Genetic Algorithm (GA) optimisation strategies to enhance the dynamic performance characteristics of hydrodynamic journal bearings has not yet been effectively studied. Hence, the current study explored the influence of bionic texture and its potential application in fluid film journal bearings. This study implements the GA and finite element method to optimise the bionic texture pattern. Introducing bionic texture with the GA technique in hydrodynamic journal bearing improved the bearing's dynamic performance and stability. The results are projected to be helpful in the domain of bearing design.

Mathematical Formulation

The Reynolds equation was used to characterise the flow of non-Newtonian lubricant in finite-width journal bearings. The bionic texture of a semi-cylindrical shape was applied on the journal bearing surface to accommodate the lubricant on the bearing surface easily.

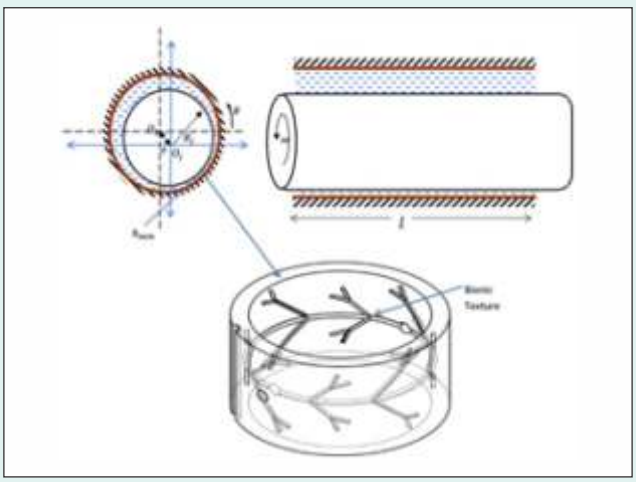


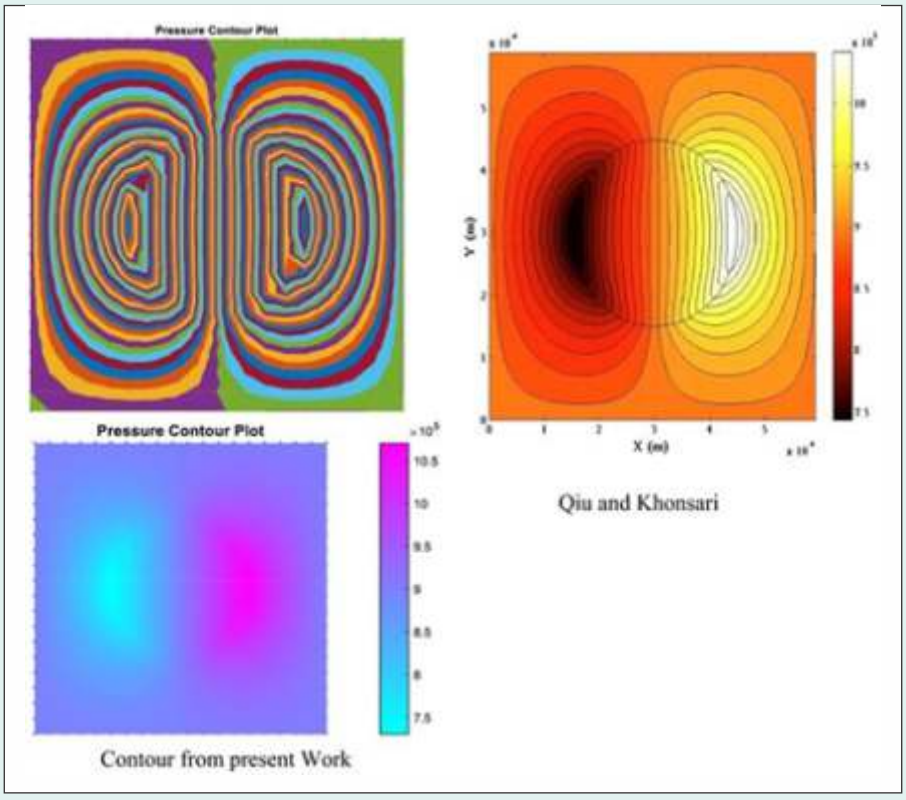
Figure: Schematic diagram of bionic textured hydrodynamic journal bearing

The Reynolds equation was solved to obtain nodal pressure. The pressure was derived with the help of a very accurate and effective solution technique based on the idea of nonlinear finite elements. The complete lubrication domain was split into 4-noded iso-parametric quadrilateral elements. Using the four nodes, the Reynolds equation was used to calculate the pressure at each node and the pressure inside the elements.
The distribution of nodal pressure in the fluid flow field was established to calculate static/dynamic performance parameters. The static performance characteristics are the minimum film thickness, fluid-film pressure distribution, and frictional coefficient. Further, stiffness/damping coefficients, stability speed margin and critical mass are examples of the dynamic performance parameters. By studying static/dynamic performance characteristics, the impact of genetic algorithm-based optimisation on the bionic textured journal bearing's performance was further ascertained.

An oil film's essential characteristics are the fluid film's stiffness/damping coefficients, obtained by integrating the oil film over its entirety. Therefore, the 4-direct stiffness coefficients (which measure the resistance of the oil film to deformation) and the 4-direct damping coefficients (which measure the resistance of the journal velocity) were simulated using appropriate equations.

Solution Procedure

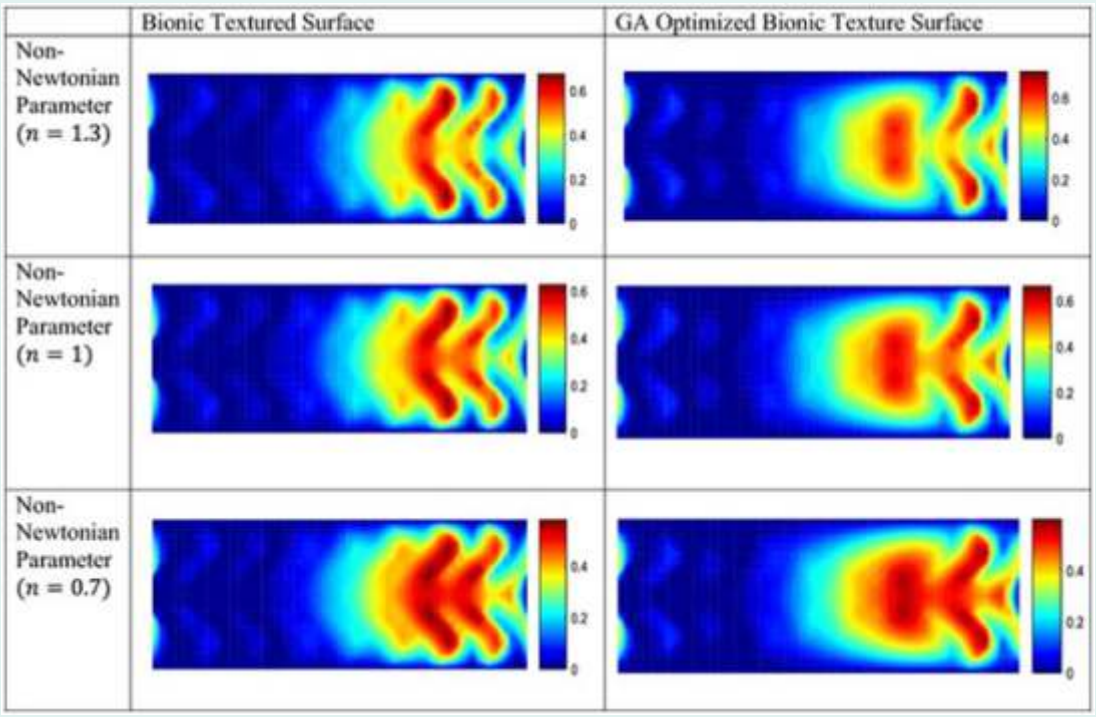
The FEM approach was utilised to solve the Reynolds equation for non-Newtonian lubricants to simulate the converged nodal pressure. The type of mesh and its density affect the accuracy of the finite element analysis. Therefore, after doing a lot of convergence studies, a suitable mesh was used for further simulation. The solution of the Reynolds equation for non-Newtonian lubricant using the FEM technique resulted in the prediction of the dynamic performance and stability of the bearing system under different operating conditions. The prominent Newton-Raphson technique was applied to solve the FEM system of equations to determine the pressure distributions and flow rate inside the bearing. The process was repeated until the cumulative difference between succeeding iterations' nodal pressures was less than 0.001.
The developed simulation program was validated by solving a benchmark lubrication problem. A non-cavitation single-cell model was created using current numerical analysis and validated using Qiu and Khonsari's results. The results of pressure variation are well congruent with the findings of Qiu and Khonsari. The validation finds that the results of the earlier publications were satisfactorily accurate, and the proposed algorithm and method are valid for estimating the fluid film pressure.



Pressure contour for the single unit cell of texture surface

Fluid Film Pressure Contour Map

The hydrodynamic film pressure contour of a journal bearing with optimised bionic textures operating with pseudo plastic, Newtonian, and dilatant lubricants reveal that the pressure values are higher in the bearing's centre than on the outer edges. The pressure also varies with different lubricants. The pressure contour maps of the journal bearing with optimised vein bionic texture provide valuable insight into the performance of the bearing. The maps show the pressure distribution within the bearing and can be used to identify areas with higher/lower pressure. This information can help identify areas of possible wear and tear and areas of optimal performance. The pressure contour maps of the journal bearing with optimised bionic texture also provide insights into the effects of different lubricants on the bearing performance. Contour maps show that the maximum fluid film pressure (p_{max}) is higher for dilatant lubricants than Newtonian lubricants and pseudoplastic lubricants. Further, it is also seen that the GA-optimized vein bionic surface texture generates a higher value of (p_{max}) for all lubricants compared to regular bionic texture.

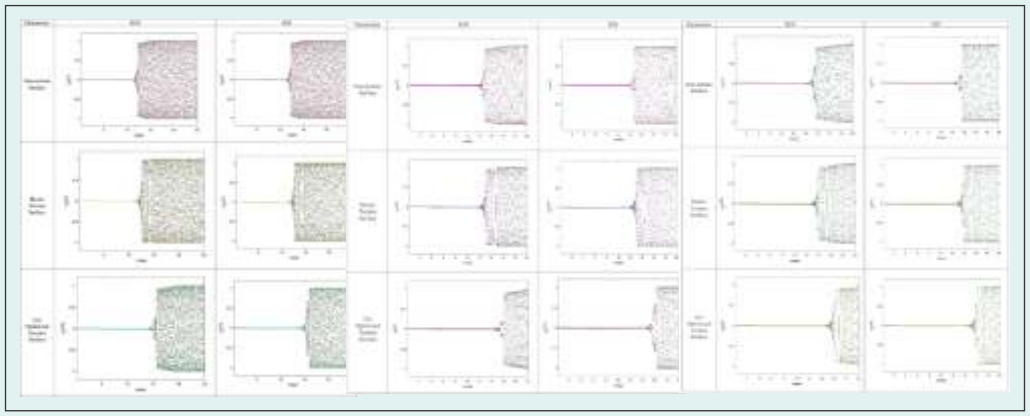


Pressure contour for the bionic textured hydrodynamic journal bearing

Bifurcation Diagrams

The stability of hydrodynamic journal bearings is described by the trend of bifurcation diagrams. The bifurcation map is a crucial tool for understanding a system's stability and performance since it lets one see how it will respond to different disruptions. One can locate both areas of instability and stability in the system with the help of a bifurcation map. This map can be used to optimise the system's design and recognise the best parameters for achieving maximum system performance. The bifurcation map can also examine the system's sensitivity to various disturbances. The most efficient set of settings for achieving the necessary level of stability can be found by evaluating the stability of different texture patterns and lubricants. The results of this study can then be used to decide the system's design, ultimately leading to better system performance.

The bifurcation diagrams of smooth/bionic textured/optimised textured hydrodynamic journal bearings with various non-Newtonian fluids reveal that the pseudoplastic fluid (n=0.7) presents better stability over the Newtonian fluid (n=1.0), and dilatant fluid (n=1.3). Moreover, the GA-optimized bionic texture approach offers higher stability, followed by non-textured surfaces and bionic textures without using the GA technique. The analysis also shows that the GA-optimized bionic texture with pseudoplastic fluid(n=0.7)is the most stable among all other lubricants and texture patterns. In contrast, the plain surface with dilatant fluid=1.3 is the least stable.



Bifurcation diagram of textured/non-textured hydrodynamic journal bearing for dilatant (n=1.3), Newtonian (n=1) and pseudoplastic (n=0.7) lubricant

Conclusion

The current work has examined the effects of vein bionic texture with genetic algorithm technique under the behaviour of power-law fluid on the static/dynamic performance of hydrodynamic journal bearing. The present investigation has successfully explored the impact of surface textures on the vibration reduction characteristics of the bearing. It proves that applying GA-optimized bionic texture on the bearing can significantly enhance its dynamic performance. In addition, the Bifurcation diagrams have provided an insight into the bearing's stability, making the present simulated results useful for rotor-dynamic engineers.

1.7.2 दहन / Combustion

Exhaust Gas Analysis for NOx Reduction in Industrial Furnace through a Novel Exhaust Recirculation Technology of Alternative Innovations Pvt. Ltd., Sponsored by : M/s Alternative Innovations Pvt. Ltd., Faridabad, Haryana

Objective of the Project

The main objective of the project is "Technical assessment of the NOx reduction potential of novel EGR technology developed by M/s Alternative Innovations Pvt. Ltd".

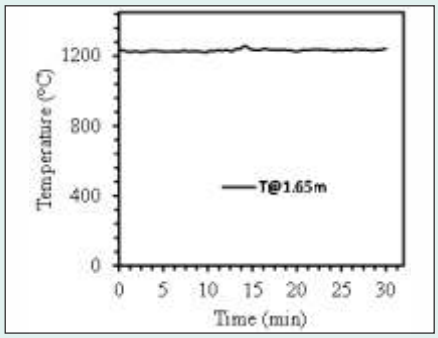
Work done

To do the project, the liquid fuel supply system is revamped. For exhaust gas recirculation a duct is fabricated with a provision to insert the Alternative Innovations Pvt. Ltd., developed catalyst. The flue gas is drawn using a with a customized hot air blower which has an operating temperature of around 350 oC. The liquid fuel meters, thermocouples, pressure sensors and portable gas analyzer are calibrated and additional airflow meters are purchased. A stable flame have been established buy firing furnace oil (180 cSt) with a flow rate of around 24-26 kg/hr. Multiple trails have been conducted by firing furnace oil in the horizontal furnace and the measurements of temperature and flue gas composition are recorded at steady state conditions of the furnace using a data logger and Horiba PG350 gas analyzer

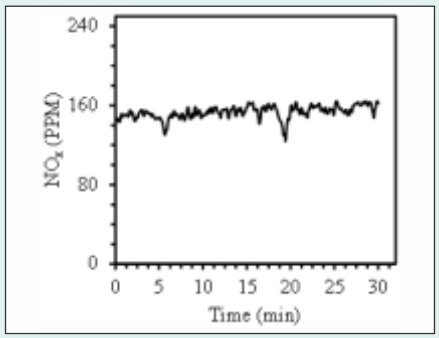
Key Findings of the Study/Project

It has been found that a maximum of around 150 PPM NOx when furnace oil is fired in CSIR-IIP developed duel-fuel Encon-2A low air pressure burner.

Pipe and Blower arrangement for Exhaust Gas Recirculation



Pipe and Blower arrangement for Exhaust Gas Recirculation



Variation of NOx Emissions at the Exit of the Furnace over a period of 30 min

Installation of 50 kg/h Agro-waste to Briquettes Unit and Generating livelihood thereby Empowering the Women of Champawat
Sponsored by: Uttarakhand State Council for Science & Technology (UCOST), Dehradun, Uttarakhand

Objective of the Project

The objectives of the project are: (1) Installation, commissioning, and skill development of local beneficiaries on a 50 kg/hr agro-waste (Pine Needles, Lantana, Mexical Devil etc.) briquetting unit, (2) Implementation of agro-waste based improved cook-stoves (500 nos.) with at least 15% improved energy efficiency and generating permissible pollution levels as per WHO norms in ten villages of Champawat of Uttarakhand., (3) Skill Development of min. 100 local artisians of Champawat block on briquetting unit and improved cook stoves for their operation, repair and maintenance.
The project is awarded in March 2024 and a plan has been made to visit champawat to identify the briquetting installation site. Further, the specification of the briquetting unit has been drafted.

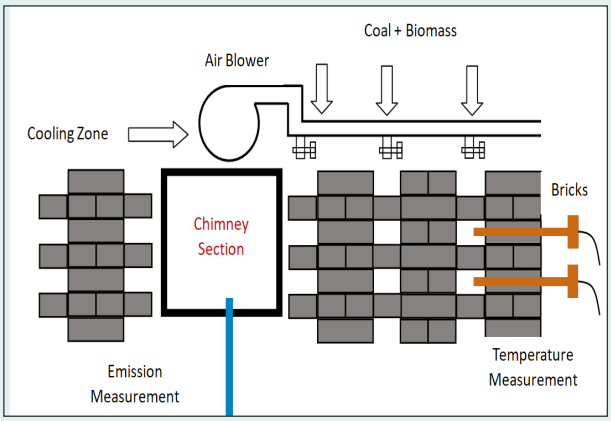
Pine Needle Briquetting Unit at Champawat

Great Impact Work
Indian Brick Kilns

Significance

Brick manufacturing is the biggest rural industry in India, where bricks are prepared from mud by local artisans and supplied to various construction sites. After China, India is the second largest manufacturer of bricks employing millions of rural masses (approx. 50 – 60 persons work in a single brick kiln). The brick kilns remain operational for 200 days a year; however, due to various environmental regulations, these kilns now operate for only 100 days a year. On the other hand,, the infrastructural demand in India is growing by 20 – 25% per annum. Still, many brick kilns are closed due to stringent pollution norms. Incomplete combustion of fuel, heavy pollution and low profitability are some of the major reasons for the closure of brick kilns in India.

There is an improvement in the fuel efficiency and brick quality based on our preliminary improvements done to the existing brick kiln.



Field Trial Experiments on Brick Kiln

1.8 आसुत एवं भारी तेल प्रसंस्करण प्रभाग / Distillate and Heavy Oil Processing Division

Production of Needle Grade Coke from Coal Tar (ongoing project)

Objective

Feasibility study for the production of needle grade coke from coal tar in Delayed Coker Unit

Project Duration and budget

November 2019 – February, 2024, Total Budget: 56 lakh

Progress

- **A new coking unit was installed and commissioned**

Institute has 30 years old delayed coker pilot plant which is a totally manual mode of operation. Occasionally, the plant gives trouble shooting problem. Therefore, our area of thermal conversion urgently needs a new unit. Recently a unit was procured and installed in bay no 5. Correctly unit is operational and under testing with actual feed.

- **Coke was produced under different operating conditions**

We have a joint collaborative work with our sister laboratory, CIMFR, Dhanbad where CSIR-IIP main responsibility is to run delayed coker unit as different conditions whereas CSIR-CIMRF responsibility is to provide coal tar and perform characterization of produced coke.

- **Other experiment runs with coal tar**

- **Detailed coke characterization**

CSIR-IIP has performed four different experiments and provided to CIMFR for the characterization of calcined raw petroleum coke

Crude to Chemical: Maximization of Olefins(Ongoing Project)

Objective

- Development of a process for the conversion of crude oil to olefins

Project Duration and budget

October, 2021 - September 2025, Total Budget: 30 lakh

Progress

- Catalyst development of high-severity FCC and Slurry hydrocracking

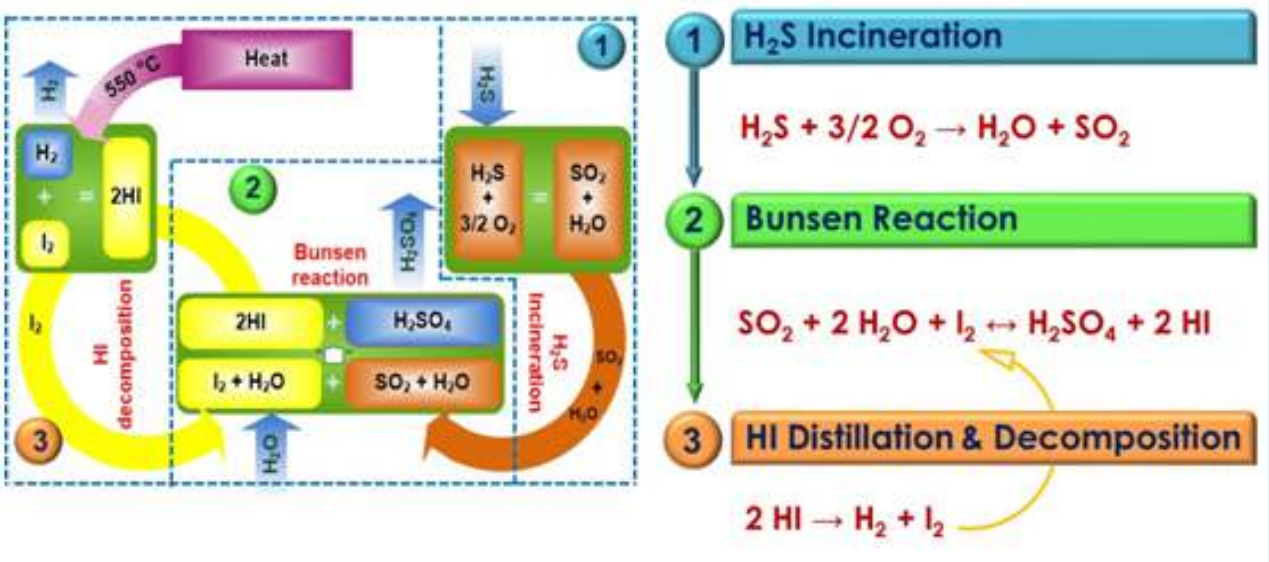
A refinery's main pillar for producing petrochemical starting materials is high severity FCC and steam cracking processes. CSIR-IIP has also started work in both area where our division is principally devoted to catalyst development of FCC process. At the initial stage, E-Cat catalyst was obtained from one of the

Indian refinery. Presently, evaluation of this catalyst is under progress at different reaction conditions to understand the catalyst and operating conditions with respect to olefin yield and coke formation. It is an integrated approach where crude oil is first hydrotreated and then affluent is send to 2nd conversion process i.e. FCC in this case. In this regard, our hydroprocessing area has synthesized three–four catalysts and their performance has been tested in a HTHP batch reactor.

- Screening of the catalysts
- Optimization of process conditions

Thermo-chemical Hydrogen Generation through Partially Open-Loop S-I Process Involving H2S Incineration: Coupling of Individual Sections for Laboratory Integrated Operation (New project)

It is a unique concept to produce hydrogen from refinery waste i.e. hydrogen sulphide. Total refining capacity at present is around 250MMTPA where the average sulphur content in crude oil is 2 to 2.5 wt%. It indicates that each and every refinery produces a huge amount of hydrogen sulphide and that can be used for the production of hydrogen. It is a ONGC-sponsored project. In the 1st stage the proof of concept as discussed above has been established. In the 2nd stage, the integration of three main reactions-H2S incineration, Bunsen reaction, and HI distillation cum decomposition are planned.



Concept of S-I cycle

Objective

Coupling of sub-sections of S-I cycle (H2S Incineration, Bunsen reaction and HI Decomposition) using existing lab scale glass set-up for hydrogen production @ 1 LPH

Project Duration and budget

November 2019 – February, 2024, Total Budget: 56 lakh

Progress

- Manpower recruitment
- Procurement of materials
- Repairing and modification of experimental setups

Development of Catalytic Membrane Reactor for Water Gas Shift Reaction(New project)

A membrane reactor (MR) is a device which can be used simultaneously performing a reaction as well as separation of the products. Therefore, the membrane not only plays the role of a separator, but also takes place as a reactor itself. The discovery of suitable membrane materials was the key factor for increasing the application of the membrane in the catalysis field. The goal of the project is to develop innovative multifunctional catalytic membrane reactors (CMR) based on nano-catalysts and selective membranes materials to improve their performance, durability, and sustainability. At present phase the CMR will be developed with primary focus on partial oxidation (CPOX) of methane to achieve 80% methane conversion with 1:2 syngas ratio. Later the same may be applied for several other applications related to CO2 hydrogenation and hydriodic acid decomposition to hydrogen etc.

Objective

Development of catalytic membrane reactor for water gas shift to produce hydrogen and capture of CO2 from reaction medium by simultaneous reaction and separation to get cleaner hydrogen

Project Duration and budget

May 2023 - March 2026, Total Budget: 48.24 lakh (CSIR-IIP)

Progress

- Manpower recruitment
- Procurement of materials
- Catalyst synthesis going on (CSIR-IIP)
- Ongoing synthesis of ceramic membrane for H2 separation (CSIR-CGCRI)

1.9 लाइट स्टॉक प्रोसेसिंग प्रभाग / Light Stock Processing Division

1.9.1 उत्प्रेरक सुधार / Catalytic Reforming

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

Objective

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 C4 alcohol.

Work done

In the present study, various catalysts have been prepared and evaluated for the production of fuel grade C4 alcohol from the bio-ethanol in a fixed bed reactor set up. So far, various metal functionalized acido-basic catalysts 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 35% conversion of ethanol to 55% C4 alcohol. The process optimization is under progress to increase the yield of C4 alcohol upto desirable value as given in the objective.

Key Findings

- 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 C4 alcohol fuel features are similar to commercial gasoline.

Production of Xylene-rich Alkylated Aromatics using CO2 as an Alkylation Reagent (GAP -0127), Sponsored by SERB, GOI

Objective

The main objective of the project is to develop single-pot catalytic process for the production of alkylated aromatics using Co2

Work done

An efficient catalytic process for the production of alkylated aromatics has been developed wherein, CO2 derived species serves as an active alkylating reagent. This is the first-of-its-kind process wherein liquid organic hydrogen carrier is used to hydrogenate CO2 to form alkylation reagent. The catalysts prepared in our laboratory showed very promising results for the intended reaction. However there is enough scope for the further improvement in the product yield. In long term, the outputs of project will provide a firm foundation for the development of similar catalytic processes for the alkylation of other aromatic hydrocarbons using CO2. Ultimately, the work will contribute for the development of CO2-to-Chemical indigenous technologies.

Key Findings

- Catalytic process has been developed for the efficient utilization of CO2 for the production of valuable alkylated aromatics.
- Approximately 20wt% yield of alkylated aromatics was achieved.
- Selectivity of mix-xylene in aromatics was found to be~50wt%.

Plastic Depolymerization and Upcycling (DEPOLUP)
Value Addition to by-products from IIP/Commercial Plants (HCP 0046), CSIR Mission Mode Project

Objective

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

Work done

The project deals with the development of catalytic process for the production of aromatics from waste plastic derived naphtha. This olefin-rich plastic derived naphtha can be used efficiently for the production of valuable aromatics. Aromatics are of paramount importance owing to its utility as a precursor for various chemicals, as an octane buster, as a solvent and so forth. Zeolite based catalyst has been developed and evaluated for the production of aromatics from plastic derived olefinic naphtha. The catalyst prepared in our laboratory showed excellent catalytic performance and more than 60wt% yield of aromatics could be achieved from waste plastic derived naphtha.

Key Findings

- Composition of the waste plastic derived naphtha has been determined and olefins are found to be major components of the naphtha.
- More than 60wt% yield of aromatics is achieved through the processing of waste plastic derived naphtha using zeolite based catalyst.

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

1.9.2 गैस–टू–लिक्विड / Gas-to-Liquid

Development of a Catalyst for the Production of Lower Olefins by Catalytic Cracking of Naphtha co-processed with CO_2 (In-house, OLP-1185)

Objective

To obtain total lower 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
The project aligns with the emerging global scenario of Crude to Chemicals. Zeolite-based solid acidic catalysts, including metal-doped modified catalysts, have been explored for high catalytic activity with long-term stability. The prepared catalysts were initially tested using model component n-Hexane. Higher lower olefins yields (C2-C4) ~45wt% with C3/C2 olefins ratio ~1.8 obtained over a promising metal-modified zeolite-based catalyst. Further, the catalytic stability measurements are in progress.

Title

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.%.

A lab-scale catalytic process was developed using a non-noble metal based supported catalyst. Obtained high low-temperature activity and long-term stability of the catalyst with feed CO_2 Conv. ~98mol.% with >99mol.% product CH4 selectivity. The process may also be applied to various feedstock containing mixtures of CO_2 and (or) CO.

Kinetic Evaluation and Reactor Design Aspects using Multi-physics Methodology for Catalytic Steam Naphtha Cracking and Crude Bio-glycerol bi-reforming Processes (In-house, OLP-1218)

Objective

Development of a suitable kinetic model and design of reactor for production of lower olefins by catalytic steam naphtha cracking and for production of bio-hydrogen by bi-reforming of crude bio-glycerol.

The thermodynamic study of the glycerol bi-reforming has been carried out, and the genetic algorithm for the optimization of crude bi-glycerol reforming has been developed using the Gibbs free energy minimization method. In addition, the key process parameter affecting the reaction has been identified, and the catalyst variation is being conducted for hydrogen production and CO_2 conversion maximization while minimizing the coke deposition.

1.9.3 नैनो कैटेलिसिस / Nano Catalysis

Development of an Indigenous Catalyst for Hydrogenation of CO_2 to Methanol and Design of a Pilot Scale Unit for 10 kg/day Methanol Production
NTPC-NETRA

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

- **Cu-based catalyst has been prepared**
- **Catalyst Preparation**

1) based on the economy of raw materials & preparation method
2) employed sol-gel method

- **The catalyst formulation promotes the formation of**

1) Higher Cu metallic surface area
2) Higher Cu dispersions
3) Smaller metal particle size

- **The CO_2 to methanol process is optimized for >10% CO_2 conversion and >99% MeOH purity**

Key Findings

MeOH production of 75 ml/day at 240 oC and 50 bar pressure (CO_2 conversion >10% and MeOH selectivity ~50%)

The Reactor used along with the Catalyst Developed for the CO_2 to Methanol Conversion

1.10 जैव ईंधन प्रभाग / Bio Fuels Division

1.10.1 हाइड्रो प्रसंस्कृत अक्षय ईंधन / Hydro Processed Renewable Fuels

DILSAAF™, Drop-in Liquid Sustainable Aviation, and Automotive Fuel Technology

Objective

To convert lipids (plant-derived oil and animal-derived fats) into hydrocarbons along with aromatics.

Work Done in the Project

CSIR-IIP is working on a Feedstock supply chain based on used cooking oil, palm stearin, and other non-edible tree borne oils. CSIR-IIP has so far produced 10000 Liters (~2400 US Gallons) of SAF from this unit since it was commissioned in early 2018 and supplied to IAF, SpiceJet, and ASTM International. The SAF has been supplied to Spicejet Ltd. for India's 1st Biofuel flight on August 27, 2018, and the IAF during the Indian Republic Day fly-past on January 26, 2019 and 2024. 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 approached the ASTM International Committee and the Federal Aviation Administration (FAA) to approve CSIR-IIP developed SAF and presented the technology in August 2020. After this, CSIR-IIP continuously pursued its case with the ASTM. So far, CSIR-IIP has sent three batches of fuel (in the years 2021, 2022, and 2023) to ASTM clearinghouse Labs in the USA (Dayton University and Southwest Research Institute, USA). 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).

The report, along with the new Annexure, has been under OEM review since November, 2023. After completing this review, the OEMs are expected to recommend balloting.

Key Findings

- CSIR-IIP SAF process scalable and economically viable for commercial implementation
- CSIR-IIP SAF under final stage of approval at ASTM

Two Dornier 228s flying with Blended Mixture of ATF & CSIR-IIP's SAF on Republic Day (2024) Fly-past over Raj-path

1.10.2 जैव एस्टरीफिकेशन क्षेत्र / 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 Head Quarter, New Delhi, India, Duration : April 01, 2023 to Aug. 31, 2024

Objective

- Validation of the bench-scale studies for the production of biodiesel meeting IS:15607 specifications.
- Establishment of the process parameters as mentioned below that would facilitate successful commercialization, field deployment (at least 5 installations in India) and licensing of technology.
- Effect of various impurities present in the feedstock on the quality and yield of product.
- Post-treatment steps for product quality assurance.
- Effluent characterization for environmental compliance.
- Modifications based on (2) in the pilot plant for mobile demo unit of 50 lit/batch.
- Demonstration of the process to at least 10 potential clients.
- Set up of mobile unit at Sansad Bhawan.

Work Done

- An awareness program was conducted for used cooking oil (UCO) collection on December 16, 2023, at Ram Nagar, Uttarakhand to establish a supply chain in Ram Nagar and nearby Uttarakhand regions. Successful run of College bus (using B-10 blends) of SCG-IMT college, Kashipur (Uttarakhand) since Dec. 2023.
- Material Balance for the biodiesel production is also done and the performance evaluation studies with B-0, B-10 and B20 blends are in progress.
- Completed Process parameter optimization on pilot plant with UCO.
- Modification in pilot plant for mobile unit has been successfully completed and fabrication of Mobile Biodiesel unit is completed.
- Stakeholders and industry connections were also explored.
- Mobile Biodiesel Unit will be demonstrated in the coming parliamentary session (Nov-Dec 2024).

Key Findings

- The UCO analysis showed the FFA content in the UCO ranges from 0.5 to 3 mg KOH/ gm of oil.
- More than 1000 L of Biodiesel was produced and characterised as per BIS 15607:2022.
- Establishment of supply chain model initiated in Kumoun region mainly including Jim Corbett, Ramnagar.

Table: Physico-chemical properties of UCO-Biodiesel

No.	Properties	BIS 15607 : 2022	BS IV-HSD (High Speed Diesel)	Distilled Biodiesel (UCO)	Crude Biodiesel (UCO)	Comment
1	Density@ 15°C (g/cc)	0.860-0.900	0.820-0.845	0.8866	0.8956	
2	Kin. Viscosity @ 40°C (cSt)	3.50-5.00	2.0-4.5	4.130	5.341	
3	Flash Point (oC), Min	101	Min. 35	165.4	170.8	Higher is safer
4	Pour Point (oC)		3 (Winter) to 15 (Summer)	0.0	-3.0	Lower enables use in colder weather
5	Cloud Point (oC)	6-18	6 (Winter) to 18 (Summer)	-1.0	-1.0	Lower is better
6	Acid Value mgKOH/g Max	0.50 max.	Nil	0.38	0.36	Lower is better
7	Sulphur (ppm)	10 ppm	Max. 50	3.29	14.65	Lower is Better
8	Cetane No. Min	51	51	56.4	54.6	Higher is better for cold start

The college bus was flagged off jointly by VC, Kumoun University and Diector CSIR-IIP, Dehradun using a Diesel-Biodiesel (UCOME) blends at SCG-IMT Kashipur on 21st October 2023.

Audit and Certification of Biodiesel Plants based on Used Cooking Oil as Feedstock
Sponsor: Biodiesel Association of India (BDAI)

Objective

- Based on the recommendations of BDAI, CSIR-IIP will collect samples of feedstock (UCO) as well as UCO Methyl ester (UCOME) from different biodiesel plants and also audit for their plants for UCOME production.
- Testing of feed and Biodiesel sample provided by Biodiesel manufacturer through BDAI.
- CSIR-IIP will provide a test report and certificate of UCOME for use as Biodiesel and can be used by OMCs.

Work Done

- Audit and test report submitted to 2 clients/Biodiesel manufacturers only, so far 14 biodiesel manufactures have been audited and certified for production of UCO biodiesel .

Visit of IIP Scientist for Audit and Certification of Biodiesel Plant.

Project Title: Trial Run on Gen Sets and Construction Equipments of the Company using CSIR-IIP Room Temperature Biodiesel Process
Sponsor: Clean Energy and Sustainability, Tata Projects, Noida (U.P.)

Objective

- The trial run on Gen sets and construction equipments by UCO-Biodiesel (100 lit/week) for identified locations.
- Supply of UCO-Biodiesel by CSIR-IIP with test reports in monthly basis for each stock (200L/month).
- Maintenance and training of regular and temporary persons like Project Assistants and Trainees (4 No.) for regular operations at CSIR-IIP on the Biodiesel Plant.

Work Done

- CSIR-IIP synthesised UCOME for use as Biodiesel
- Testing of UCOME biodiesel
- Supplied 1000 lit of UCOME biodiesel to Tata Energy for evaluation at their site.

Development and Certification of New Generation Lubricant Formulations for Aerospace Surfaces and Components , HCP0036 (till March 2024)
Sponsor: CSIR Head Quarter, New Delhi, India

Objective

- Synthesis of bio lubes for precision instruments of aircrafts in bulk scale (5-10 kgs) for further testing & evaluation.
- To convert them into field deployable products at TRL-5 level for precision instruments of aircrafts and also for other components like delicate bearings, gauges, meters and clocks.
- To certify the developed products by CEMILAC

Work Done

- The revamping of the Buchi pilot plant reactor for bulk synthesis, Scaling up and Characterization of the products have been completed
- Products were synthesized in bulk using the similar conditions of the lab-scale reaction (5-10 Litres) and formulations were developed.
- Physicochemical characterization, Biodegradability and tribo-evaluation of synthesized products and formulations were completed
- The synthesized sustainable lubricant formulations were characterized as per the ISO/IEC17025 standard accreditation for BIS-1088 and MIL STD 6085E specifications for the certification process as well as comparison with Commercial oils for use as precision as well as aircraft instrument oils
- RCMA (F&F), suggested that, If the bio lubricant developed by IIP meets the MIL-PRF-6085E standard specifications, certification for bio lubricant can be sought as per standard specifications in consultation with key stakeholders and certifying authorities.

Key Findings

- Reaction parameters for the scaling up of two Bio-lubricants (Eco-I and Eco-II) in the Buchi reactor were optimized.
- Eco-1 and Eco-II products were synthesized in bulk using the similar conditions of the lab-scale reaction (10 Litres) and formulations were developed.
- Physicochemical characterization and tribo-evaluation of synthesized products and formulations were completed for 10 Litres.
- Bio-lubricant parameters Benchmarked to BIS-1088 specification and MIL STD 6085E specifications. The test results as per International accreditation ISO/IEC 17025:2017 and NABL for bio lubricants are presented in Table 1&4. Further detailed studies are required for the fine tuning of the products for the application as aircraft instrument oils.

1.11 व्यवसाय विकास /Business Development

1. Initiatives for Better Positioning of the Institute

Different scientist, technical officers, PhD Scholars 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. The program served as a platform to each individual who wants to communicate science.

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.

These initiative helped in better positioning of the institute

Sl. No.	Seminar / Conference/Workshop/ Jigyasa's Program
1.	One Week One Lab was celebrated by CSIR-IIP during 13th April to 19th April, 2023
2.	Stake Holders Meet, organized on 13th April 2023, at India Habitat Center, New Delhi
3.	Jigyasa -School Students visit & Interaction with Scientists & Research Scholars, organized on 15th April 2023, CSIR-IIP Dehradun
4.	Sustainable Aviation in India & Industry Meet, New Delhi on 17th April 2023
5.	National Conference on Advances of Polymer Materials" was held at GB Pant University of Agriculture and Technology during April 25-26, 2023
6.	Water Treatment Technologies for Water Challenged Sites in India: Opportunities for Research based Solutions" held at IIT Roorkee during May 15-16, 2023
7.	Waste to Best: Sustainable Environmental Remediation Strategies and Solution held on 19-20 May 2023 at Pt. Deendayal Petroleum University, Gandhinagar
8.	Seminar on "Flex Fuel Vehicle" on 24th June, 2023 at ARAI, Pune
9.	International Conference on Designing a Sustainable Future: Advances and Opportunities in Green Chemistry during 3-5 July, 2023 held at University of Ladakh, Leh Campus
10.	Summer School Materials Characterization, 11-15 July 2023 held at, IIT Madras
11.	International Oil & Gas Technology Conference (IOGTC 2023), at New Delhi from August 3-4, 2023
12.	3rd International Oil & Gas Technology Conference (IOGTC 2023), held at Hotel Crowne Plaza, New Delhi from August 3-4, 2023
13.	26th Energy Technology Meet (ETM 2023) at Delhi from 9-11 October, 2023
14.	CARBO XXXVII, International Conference on Basic, Analytical and Allied Sciences at the Interface of Carbohydrates and Biomass Valorisation from 30th November to 2nd December 2023 at DTU, New Delhi
16.	17th international conference on Polymer Science and Technology (SPSI-MACRO-2023 from 10-13 December 2023 at IIT Guwahati
17.	CSIR-IIP & Science and Engineering Research Board (SERB) Scientists organized a Two day Workshop on Scientific Social Responsibility (SSR) during 21-22 December, 2023.

Sl. No.	Seminar / Conference/Workshop/ Jigyasa's Program
18.	International Conference on Energy transition: Challenges and Opportunities and Chemical Engineering Congress (IIChE- CHEMCON) 2023, held at Heritage Institute of Technology, Kolkata from December 27-30, 2023
19.	ICECEES-2024 Conference from 15-17 February 2024 at IIT, Roorkee
20.	International Conference Chem EEE, at IIPE , Visakhapatnam from 19-21 Feb 2024
21.	26th Lubricating Grease Conference, Kolkata from 22-24 February 2024
22.	National Workshop on Biomass-based Clean Cooking Solutions during 29th February to 1st March 2024, at Sardar Swarn Singh National Institute of Bio-Energy, Kapurthala(Punjab)

2. Mega Business Proposals

CSIR-IIP has submitted business proposals to different sponsors addressing their problems, offering solutions, gives pricing estimates, and a working timeline.
Some of the major proposals that were submitted and accepted during the FY 2023-24 are:

Sl. No.	Title of the Project	Sponsor
1.	Analysis of HR-TEM with EDS	Sprint Testing Solutions, Nagpur
2.	Development of Efficient Catalysis for Hydrogenation of Co2 to Synthetic Natural Gas(E-Methane)	GAIL (India) Ltd., Noida
3.	Production of Propylene and Hydrogen via Propane Dehydrogenation : Catalyst and Process Development at Bench Scale	SERB, New Delhi
4.	Creation of Nodal Centres for Development and Production of Key Starting Materials, Intermediates and other Raw Materials that are required by the Health Care Sector	DST (MOST), New Delhi
5.	Thermo-Chemical Hydrogen Generation through Partially Open-Loop I-S Process Involving H2s Incineration : Coupling of Individual Sections for Laboratory Integrated Operation	ONGC Energy Centre Trust, Delhi
6.	Mapping, Monitoring and Management of Lantana Camara through Utilization for Improving Livelihood of People in Forest Fringe Villages of India	Ministry of Environment, Forest & Climate Change (MoEFCC), New Delhi
7.	Performance Evaluation of New Engine Lubricants Formulated for Motorcycles	Shell Technology Centre, Bangalore
8.	Innovation Strategies for Co2 Valorization Integrated With Organic Synthesis using Earth Abundant Metals and Cooperative Photoredox Catalysis	SERB, New Delhi

Sl. No.	Title of the Project	Sponsor
9.	Setting Up of a Demonstration Plant for the Production of D-Methanol 1 Kg/Day	Clearsynth Labs Ltd., Mumbai
10.	Oil Soluble Metal Catalyst for Upgradation of Crude/Heavy Crude to Value Added Petro-Products And Precursors	SERB, New Delhi
11.	One Step Conversion of Carbon Dioxide into Diphenyl Carbonate	BPCL, Noida
12.	Assessment and Preliminary Studies for Upgrading Type Pyrolysis Oil to LDO Grade	LMR Polymers Hyderabad (Telangana)

3. Indigenous Technology Commercialization

Sl. No.	Title of Technology	Date of License Grant	Name of the Company
1.	Improved Jaggery Making Plant (Gur Bhatti)	27.04.2023	Freyr Foods Pvt. Ltd., Muzaffarnagar, U.P

4. Clients Added to the Organizations:

- 6D Varsity, Hyderabad
- Anand Engineers Pvt. Ltd. Mumbai
- Arabian Petroleum Ltd, Mumbai
- Blue Horn Technologies Private Limited, Kolkata
- Camlin Fine Sciences Ltd, Mumbai
- Dai-Ichi Karkaria India Ltd, Dahej, Gujarat
- Donga Bio Fuels, Vadodara
- Freyr Foods Pvt. Ltd.,Muzaffarnagar, U.P
- Gaurav Bio Fuels, Pvt. Ltd. Derabassi
- Greenchem Enegies, Ludhiana Pvt. Ltd.
- Godavari Biorefineries Ltd., Navi Mumbai
- Haridwar Natural Gas Pvt. Ltd, Haridwar
- Himadri Speciality Chemical Ltd, Hyderabad
- Indian Council of Agricultural Research, Hyderabad
- Indian Institute of Technology, Gandhinagar
- Indian Council of Forestry Research and Education, Dehradun
- Kadamba, Bangalore
- KPMG India Services LLP, Mumbai
- Lubrikote Specialities Pvt. Ltd., Thane
- LMR Polymers, Pashamylaram, Dist, Telangana
- Manipal Academy of Higher Education, Manipal

- Manikaran Power Limited, New Delhi
- Molygraph Lubricants, Mumbai
- NMAM Institute of Technology, Nitte, Karkala, Udupi
- MP Enterprises, Pune
- Nirvana Scrappers, New Delhi
- Nandan Petro Chem Limited, Mumbai
- Organic Recycling Systems Limited, Navi Mumbai
- Oserve Private Limited, Noida
- Pacific Industrial Development Corporation, Kolkata
- Pashupathgi Group, Kashipur
- Prism Johnson Limited, Mumbai
- RCG Chemicals, Jaipur
- Raneka Industries Ltd, Dhar
- SHV Energy Private Limited, Hyderabad
- SABIC Research and Technology Pvt Ltd., Bangalore
- Siddharth Grease & Lubes Pvt. Ltd., Gurugram
- S R Paryavaran, Panchkula (HR)
- Shriram Institute for Industrial Research, New Delhi
- Sudha Solvents Pvt Ltd, Meerut
- Technithon International Pte Ltd. Singapore
- Thermax Limited, Pune
- Tecnimont NEXTCHEM, Gurugram
- Upcharge Energy Solution LLP, Delhi
- University of Birmingham, UK
- USM Uniccare Technologies Private Limited, Chennai
- Vansh Group of Industries, Noida
- Witmans Industries Pvt. Ltd., Mumbai

5. Institute's Positioning in the Strategic Sector

The Institute is catering towards the needs of Strategic sector and is presently working for Indian Air Force and Indian Navy towards Indigenisation and strengthening of our Defence Technology

1.12 वैश्लेषिक विज्ञान प्रभाग / Analytical Sciences Division

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

1. SSP-0123: Testing of GTL light paraffin liquid Samples from M/s ANSD Corporation LLP., Delhi.
2. SSP-0124: Testing of GTL light paraffin liquid Samples from M/s Swiss Singapore India Pvt Ltd., Gujarat.
3. SSP-0137: Assay Analysis of NGL, Naphtha, ATF, and HSD Samples from ONGC Ltd., Hazira Plant.
4. SSP-0140: Analysis of Biodiesel Samples from IOCL R&D, Faridabad.
5. SSP-0157: Analysis of OEC Gas Samples from ONGC Energy Centre, Ahmedabad.
6. SSP-0162: Analysis of Ethanol Blended Gasoline Samples from M/s Rhomu Technologies Private Limited, Chennai.
7. SSP-0165: Analysis of Biodiesel Samples from M/s Donga Bio Fuels Private Limited, Rajkot.
8. SSP-0166: Analysis of Ethylene Gas Samples from M/s India Glycols Private Limited, Kasipur
9. SSP-0169: Analysis of Biodiesel Samples from Office of SP, Khargon.

Objective

Testing of petroleum products such as naphtha, gasoline, aviation turbine fuels, high-speed diesel etc., and providing opinions to the client about the product and processes.

Work Done

The clients awarded all the projects mentioned above to test their petroleum products as per the requirements of the product specifications or to understand the production process. Testing activity in SSP-123 and SSP-124 involved determining n-paraffins, total saturates, and aromatics content in gas-to-liquid (GTL) products using GC and HPLC. SSP-0137 involved GC analysis of ONGC Hazira samples of NGLs, naphtha, ATF, and HSD with standard test methods. SSP-0140 involved GC characterization of biodiesel with ASTM D6584, SSP-0165 for complete biodiesel tests as per IS 15607, and SSP-0169 for GC and HPLC characterization of the biodiesels. SSP-0162 involved testing of E10-EBMS through GC.

Key Findings

All testing projects were intended to provide an opinion about the product being tested and considered valuable input in understanding and modifying the production processes for these products.

Design and Development of Biocarbon Supported Mn and Co-based Nanocatalysts for the. Transfer Hydrogenation/ Deuteration Reactions using CH3OH/CD3OD as Hydrogen/Deuterium Source and Synthesis of Pharmaceutical Intermediates (from 2023) SERB

Objective of the Project

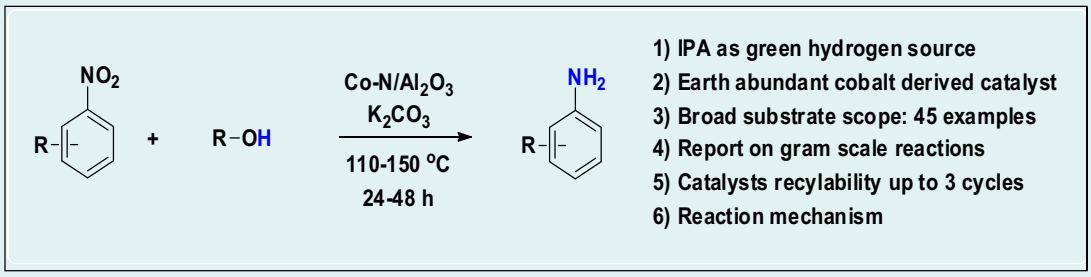
Recently, the "Government of India" has initiated "Atmanirbhar Bharat Abhiyaan" to develop and commercialize indigenous materials, methods, and technologies to make the country and its citizens independent and self-reliant in all senses. Considering this, we are proposing the development of sustainable base metal (Mn and Co) nanoparticles embedded in novel N-doped renewable carbon catalysts (Mn@N-C and Co@N-C) for the synthesis of a wide range of amines, N-methylated amines, and substituted alcohols including pharmaceutical intermediates via catalytic transfer hydrogenation methodology using methanol as a hydrogen and C1 source. The proposal offers the synthesis of 3-Fluoro-4-morpholinobenzenamine (API for linezolid), 2,2'-(ethane-1,2-diyl)dianiline (API for Oxcarbazepine), 1-(3,5-bis(trifluoromethyl)phenyl)ethanol (API for Aprepitant) and 3-amino-1-phenyl-1- propanol (API for Fluoxetine), in 50g scale using our new process (these drug intermediates are identified by the Government of India to develop an indigenous synthesis methods). We also include challenging substrates (whose selective reduction is difficult) such as Cinnamaldehyde, 3-Nitro-L-tyrosine, 3-Nitrostyrene, and 2-Chloro-4-nitrohenol, for the reductive transformations using proposed method. Hydrogenation of biomass-derived Furfuraldehyde (FA), 5-Methyl-2-furaldehyde (MF), and 5-hydroxymethylfurfural (5-HMF) possesses tremendous industrial applications for the production of resins, polymers, foams, drug intermediates, plasticizers, adhesives, artificial fibers, diols, fragrances, biodiesel, green solvents, fine chemicals; hence these will be considered for the process development. The proposal also offers the development of deuterium-labeled pharmaceutical intermediates using our newly developed catalyst and CD3OD as a deuterium source. The process will be optimized for the deuteration of nitro, nitrile, and carbonyl compounds followed by the synthesis of deuterium-labeled intermediates such as (4-Chlorphenyl)-phenylmethanol (API for Buclizine), 2-(3,4-dimethoxyphenyl)ethanamine) (API for Deutetrabenazine) and methyl 4-(R)-hydroxy-4-phenylbutyrate (API for Norfluoxetine) in 10g scale. The study of reaction mechanism, complete mass & energy balance, and preliminary cost-benefit evaluation are part of the project scope.

Work done in the Project

We developed an efficient catalytic transfer hydrogenation (CTH) method using inexpensive, environmentally friendly, and readily available methanol and isopropyl alcohol (IPA) as a hydrogen donor for selectively reducing nitroarenes. The process employs a cobalt-based nanocatalyst (Co-N/Al2O3), synthesized via a simple impregnation method using cobalt nitrate, 1,10-phenanthroline, and γ-Al2O3 as precursors. This method proves highly effective in producing a wide range of aryl amines (39 examples), pharmaceutical intermediates (4 examples), and late-stage functional group transformations (2 examples), with yields ranging from moderate to excellent (35-98%) across various scales as per the project goals. Comprehensive characterization of the catalyst was performed using HR TEM, Powder XRD, XPS, H2-TPR, N2 adsorption-desorption, Raman spectroscopy, and ICP-OES techniques. Mechanistic studies provided insights into the intermediates formed during different stages of the reaction and confirmed the indirect route (condensation mechanism). The recyclability studies of the catalyst were validated through experimental testing, demonstrating consistent efficiency over three consecutive cycles.

Key Findings

The project is ongoing. Hence details will be provided in the final report.



Caption: Graphical Abstract of the Developed Process

Title of the Project

Indigenous Design and Development of Hybrid Network Composite Solid Electrolyte for Batteries
Name of the Sponsor: SERB

Objective of the Project

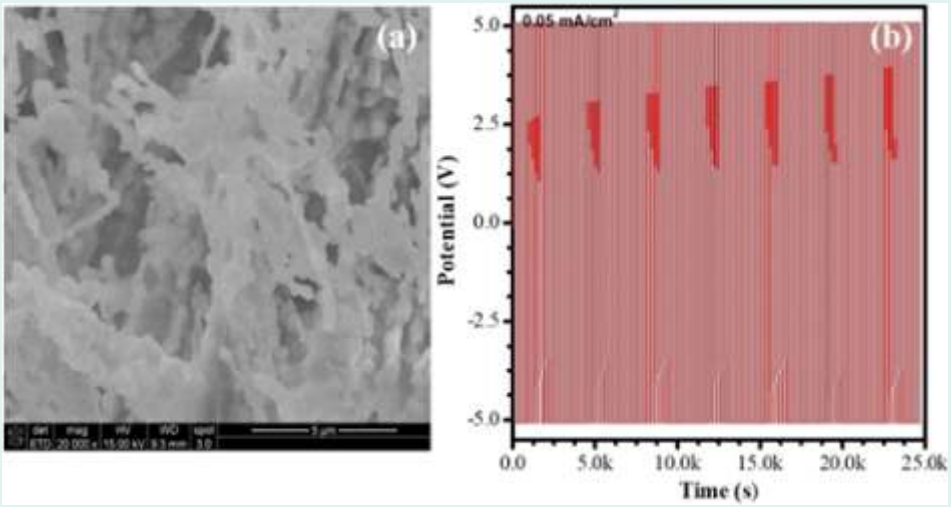
This project aims to address the poor cold-season performance of liquid electrolyte batteries (LEDs) by developing a hybrid network composite (HNC) that integrates lithium-(B/Al/Zr)-hydride as the active material within a hybrid network scaffold (HNS) matrix. The HNS matrix structurally supports the active material, optimizes ionic pathways, and prevents dendrite formation, which is a major safety risk in batteries with flammable organic solvents. Key objectives include achieving an HNS matrix surface area above 400 m^2/g, one-step HNC synthesis from affordable materials, and achieving ionic conductivity between 10^{-} and 10^{-2} $S \cdot cm^{-1}$. The project demonstrates a panicle morphology that transitions into a flexible substrate with ionic conductivity of 2.96 x 10^{-3} S/cm, outperforming conventional LLZO materials. This morphology reduces interfacial resistance, enables a shorter ion transport path, and enhances low-temperature and electrochemical stability. These advancements mark a significant step toward safer, longer-lasting solid-state batteries with higher energy density, fast-charging capability, and extended operational life spans.

Work done in the Project

The project has successfully developed a one-step synthesis process for hybrid network composite (HNC) solid electrolytes, using affordable raw materials and achieving gram-scale production. After extensive process optimization, efforts are now centered on infusing electrolyte-active materials into the hybrid network scaffold (HNS) to maximize ionic conductivity. Material characterization reveals that HNS materials, which are lightweight and porous, become flexible and semi-transparent upon electrolyte infiltration, forming a 60 µm-thick substrate at 5x5 cm^2. FESEM imaging shows the HNS's open, cage-like structure, which facilitates electrolyte infiltration and results in a semi-porous, pyramid-like morphology that improves lithium-ion transport by minimizing interfacial resistance. Electrochemical tests, including cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS), and galvanostatic charge-discharge (GCD), confirm stable oxidation at 4.1 V and a wide electrochemical stability window, outperforming traditional Al-LLZO solid electrolytes. EIS data indicate superior ionic transport for HNC substrates compared to conventional HNS and polymer substrates, with ionic conductivity values comparable to Al-LLZO materials. Long-term cycling over 25,000 seconds shows a stable voltage profile with no short-circuiting, underscoring the material's durability for solid-state applications. Solid-state batteries offer higher energy density, flexibility, and safety but often face challenges like interfacial resistance and low ionic conductivity. This study developed HNC solid electrolytes with panicle morphology, which convert into flexible substrates with 2.96 x 10^{-3} S/cm ionic conductivity, surpassing 3D LLZO materials. The unique morphology enhances ion transport, minimizes lattice mismatch, and lowers interfacial resistance, supporting faster charging, extended lifespan, and better energy density, making it a promising advancement for next-gen energy storage technologies.

Key Findings of the Study/Project

This study introduces a ground-breaking synthesis process for hybrid network composite (HNC) solid electrolytes, establishing a global first in materials design. The low-cost method produces HNC materials with unique morphology, reproducible at a 5000 mg scale, and yields an impressive ionic conductivity of 10^{-} S/cm. These achievements make HNCs immediately applicable in solid-state lithium-ion batteries and potentially transformative for next-generation solid-state batteries, known for their enhanced safety, energy density, and longevity. By developing a panicle morphology, later converted into a flexible substrate with ionic conductivity of 2.96 x 10^{-3} S/cm, the study surpasses traditional 3D LLZO materials. This distinctive structure shortens the ionic transport path, reduces lattice mismatch between the electrode and electrolyte, and minimizes interfacial resistance. The resulting soft-network design enables effective ion movement, a wider electrochemical stability window, and compatibility with low temperatures. This breakthrough enhances battery performance, lifespan, charge rates, and energy densities, positioning it as a critical advancement for future energy storage technologies.



(a) SEM image, (b) GCD curve of flexible solid electrolyte substrate

IN-HOUSE PROJECTS

Development of Cost-Effective Scale-up Process for the Production of High-Value Amines

Objective of the Project

The objective of this proposal is to develop inexpensive and sustainable heterogeneous catalysts consisting of Manganese, Iron, cobalt and bismuth for the effective production of anilines and active pharmaceutical intermediates of industrial importance up to 100g scale.

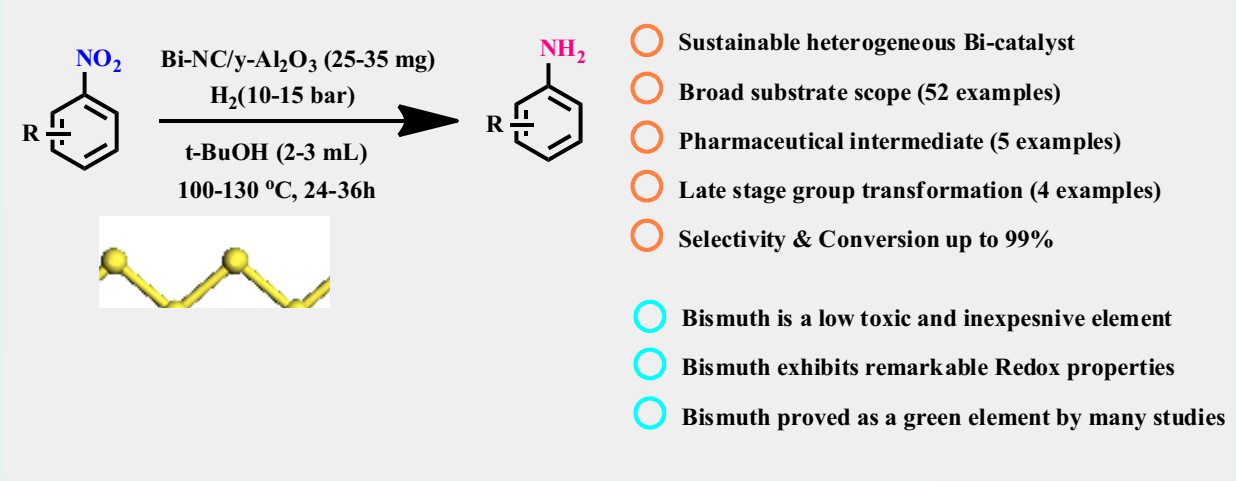
Work done in the Project

We have developed a novel, active, and reusable heterogeneous bismuth catalyst (Bi-NC/γ-Al2O3) for chemo selective hydrogenation of nitroarenes to aryl amines using molecular hydrogen. The Bi-NC/γ-Al2O3 catalyst was synthesized through a simple impregnation method followed by pyrolysis at 700 °C, for 2h under a nitrogen atmosphere. The physicochemical properties of fresh and spent Bi-NC/γ-Al2O3 catalysts were comprehensively characterized by powder X-ray diffraction (P-XRD), X-ray photoelectron spectroscopy (XPS), High-resolution transmission electron microscopy (HR-TEM), N2 adsorption-desorption, H2-temperature programmed reduction (H2-TPR), NH3-temperature programmed desorption (NH3-TPD), and thermo gravimetric analysis (TGA). The bismuth content in the Bi-NC/γ-Al2O3 catalyst was estimated by inductively coupled plasma optical emission spectroscopy (ICP-OES). The catalyst demonstrated exceptional performance and selectivity in reducing a wide variety of nitroarenes to

their corresponding aryl amines, achieving good to excellent yields (36 examples). Furthermore, the Bi-NC/γ-Al2O3 catalyst was applied to the selective hydrogenation of nitro groups in three commercially available drugs. Additionally, five pharmaceutical intermediates, including linezolid, Norfloxacin, Carbamazepine, paracetamol, and tizanidine, were synthesized up to a ~1g scale with a quantitative yield, showcasing the catalyst activity and selectivity. Further, the reaction mechanism was elucidated by tracking the intermediates (through GC-FID & GCMS) and employing Density Functional Theory (DFT). Notably, the Bi-NC/γ-Al2O3 catalyst is stable, recovered, and reused for four cycles without losing significant activity and selectivity. We have communicated this work to Applied Catalysis A: General for publication.

Key Findings of the Study/Project

We have developed a methodology for 5 pharmaceutical intermediate up to 1g scale. The development of new catalysts and scaleup process is in progress.



Caption: Graphical Abstract of the Developed Process

Feasibility Studies of Preparing Napkins from Cellulosic materials of IIP Forest Residues (In-House - OLP-1216)

Objective of the Project

- Preparation of absorbent materials from Forest/Agro residues
- Develop a process to make sanitary napkins from prepared absorbent materials

Work done in the Project

According to the World population data, females of India represent 48%, of which 68% are under the 15-45 age group. Women/girls use nonwoven sanitary napkins during menstruation, enabling them to be more active and productive and juggle different societal roles. The sanitary napkins used in this era are made of superabsorbent polymer (SAP) as an absorbent material that contains 30-100 % of non-degradability components due to synthetic polymers. Few sanitary napkins that are >95% biodegradable are marketed at a very high cost. Again, the disposal of non degradable sanitary pads generates tons of municipal waste. Most users burn sanitary napkins after use, which release harmful chemicals like dioxins and furan into the air. Thus, crucial attention is needed to manufacture organic pads from waste biomass, such as invasive forest species, weeds, or agro residues.

About the Project Work

We developed an open process for making sanitary napkins from forest-invasive biomass waste. Our process relates to an absorbent hygiene material of appropriate absorptivity for use in the three-layer sanitary napkin using the low-cost sanitary machine. The process leads to the development of clean societal technology and dual income sources by utilising the side products generated during the napkin process. Simple design, easy availability low capital input, and easy maintenance will make this process suitable for the rural sector. The process involves the extraction of cellulosic materials from the agricultural and forest residues of IIP and prepares the absorbent hygiene material for sanitary napkins using low-cost sanitary napkin equipment (100 Napkins per day).

CSIR-IIP Developed Process of Absorbent Hygiene Material from Forest Residues of IIP has the following features :

- Biodegradability >95%
- Sustainable Ecological Management and Improved Plant Biosphere
- Improvement in the Lifestyle of Rural and Urban Girls and Women
- Health Awareness /Sanitation
- Payback period of one Season (excluding machine cost)
- Waste to Health, Atma Nirbhar Bharat,
- Socioeconomic Empowerment of Women & Girl
- Outcome: Process for making Sanitary Napkin/Product : Sanitary Napkin qualifying IS 5405:2019
- Waste from process further utilised to make Laundry Soap qualifying IS 8180 regulation, clean technology with dual income opportunity for women and girls

Method for Adoption as a Standard Test Method for Diesel Fuel Characterization – Bureau of Indian Standards (BIS)

Development of Cost-Effective Scale-up Process for the Production of High-Value Amines

Introduction

In the compression-ignition engine, biodiesel or fatty acid methyl ester (FAME) is readily combustible or blends with diesel fuel. Biodiesel-blended automotive diesel significantly reduces greenhouse gas emissions, particulate matter, carbon monoxide, and polycyclic aromatic hydrocarbons. Infrared spectroscopy technology-based test methods, ASTM D 7371 and EN 14078 are referred to in the automotive diesel fuel — specification (IS 1460:2017) and biodiesel fuel blend B8 to B20 — specification for determination of FAME content (IS 16531:2022). Test methods ASTM D 7371 and EN 14078 are applicable for FAME concentrations from 1 percent by volume to 20 percent by volume as no precision data is available above 20 percent by volume to 50 percent by volume.

Significance

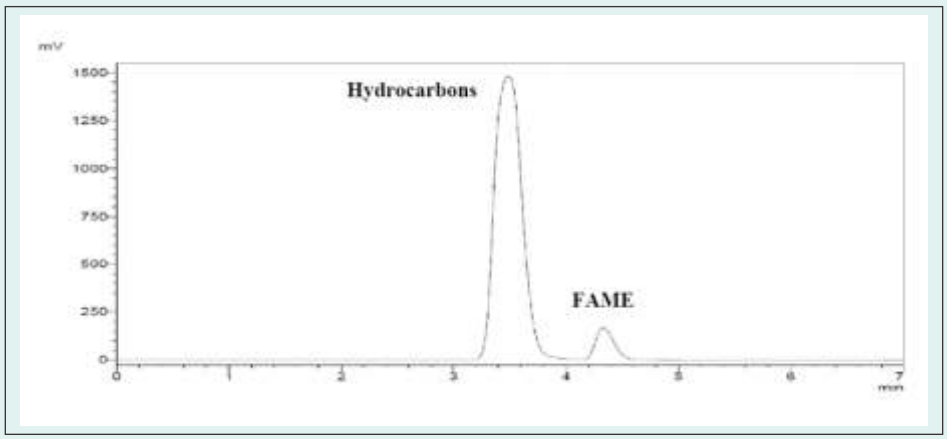
An indigenous test method for determining fatty acid methyl esters in biodiesel blended automotive diesel/paraffinic diesel fuels by high-performance liquid chromatography - refractive index detection has been developed by CSIR-Indian Institute of Petroleum, Dehradun, India. This method has established precision for diesel fuels and their blending components containing FAME content from percent to 50 percent by volume. This method is simple, fast (run time 7 min), and requires no sample pre-treatment or back flushing.

Scope of Test Method

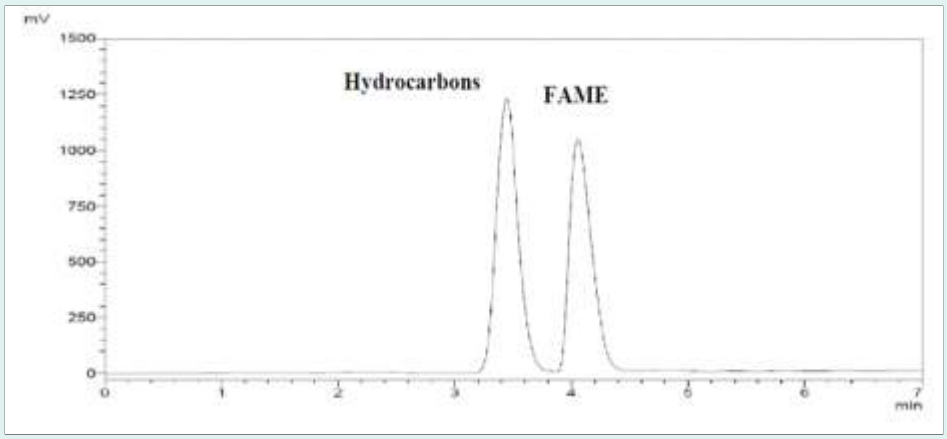
This standard prescribes the testing method for determining fatty acid methyl esters (FAME) content in biodiesel blended automotive diesel/paraffinic diesel fuels. The method applies to the FAME concentrations ranging from 0.1 percent to 50 percent by volume.

Summary of Test Method

The test sample (diesel-biodiesel blend) is diluted 1:9 with n-hexane, and a fixed volume of this solution is injected into a high-performance liquid chromatography (HPLC) fitted with a strong polar column (polar stationary phase). This stationary phase has no affinity for the hydrocarbons (nonpolar components) but exhibits a strong affinity for fatty acid methyl esters (polar components). As a result, the fatty acid methyl esters are separated from hydrocarbons. The method uses a silica stationary phase and an n-hexane mobile phase containing isopropanol as a modifier for optimum separation between hydrocarbons and FAME. The adsorption mechanism assists the separation. A Refractive index (RI) detector detects the components as they elute from the column. A data processor continuously monitors the electronic signal from the detector. The amplitudes of the signals (peak areas) of FAME in the sample are compared with external calibration standards to calculate the percent v/v FAME in the sample.



Chromatogram of Diesel-biodiesel Blend Fuel Sample
(Biodiesel: 7 Vol % Jatropha-derived Biodiesel)



Chromatogram of Diesel-Biodiesel Blend Fuel Sample
(Biodiesel: 47 Vol % Jatropha-derived Biodiesel)

Status

a) All technical activities completed.
b) Inter-laboratory comparison (ILS) with industry completed.
c) The preliminary draft was approved, comments addressed, and changes incorporated.
d) Wide Circulation (PCD 01 - 22415) of the final draft completed.
e) Adoption awaited.

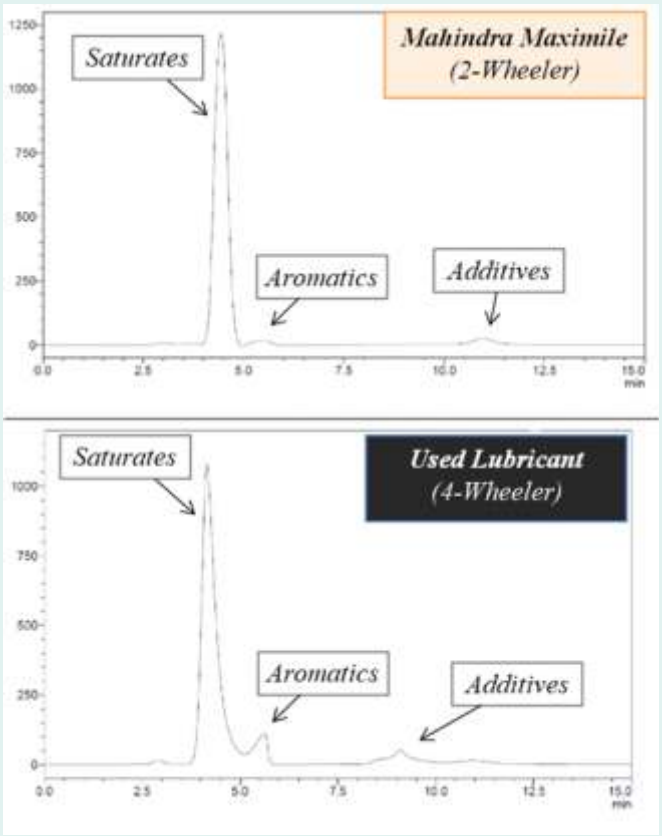
New Method for determining Saturates, Aromatics and Polars/Additives in finished Automotive Lubricants and used Lubricating Oils

Introduction

The mineral oil-based lube base stock is a high-value petroleum product comprising C20 to C40 hydrocarbon mixture boiling above 400°C. Its saturated and aromatic hydrocarbon contents are determined through elution chromatography (ASTM D2549 and ASTM D2007) and HPLC (ASTM D7419), but the applicability of all methods is restricted to lube base stocks only and do not cover finished lubricants. An identified research gap is the lack of validated methods in determining the aromatics and polar additives in either finished lubricating or used lubricating oils. Their determination is significant from the environmental perspective and in understanding the operational problems of automotive engines. We developed a new HPLC method to determine additives besides hydrocarbons in the finished lubricating oils and polars (lube degradation products; intact and degraded additives) in the used engine oils. The method is simple, fast (runtime of 13 minutes), does not require sample pre-treatment, and exhibits high precision and superior limits of detection and quantification.

Scope

The method scope is from 0.1 to 30% mass for total aromatics and 0.1 to 20% for additives. The method was validated by analyzing more than 40 brand-new commercial two- and four-wheeler lubricants and automotive lubricants.



HPLC Chromatograms of Commercial Two-wheeler Lubricant and 4-Wheeler used Lubricating Oil

Future Plan

The findings of this method have been published in a journal, however, in view of the utility and significance of this method in the testing of finished automotive lubricants and in Used lubricants, the method will be prepared as standard test method for regulatory purposes.

02

उपलब्धियां
ACHIEVEMENTS

2.1 प्रकाषित शोध / Published Research

2.1.1 जर्नलों में प्रकाषित 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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11. Banerjee, Ayan, Sangeeta Mohanty, Debashish Ghosh, and Thallada Bhaskar. "Hydrothermal Liquefaction and Carbonization for Sustainable Treatment of Sewage Sludge." In Sustainable Treatment and Management of Sewage Sludge, pp. 161-180. CRC Press, 2023.

2.2 शोध पत्रों की प्रस्तुतिया / Presented Research Papers

2.2.1 सम्मेलनों/संगोष्ठियों आदि मे प्रस्तुत शोध पत्र / Papers Presented in Conference / Seminars

2nd International Conference on Emerging Trends in Synthesis and Catalysis, 12-13 April, 2023, AMITY University Noida (UP)

- Hydrocracking of Heavy Crude Oil using NiMo Nano Catalyst in Slurry Phase Reactor, Bharat Singh Rana, Sweta Rani Chauhan, Ajad Chand, Mohit Verma, S K Maity.

International Conference on Molecules and Materials Technology (MMT-2023) 21-22 April, 2023

- Synthesis and Characterization of BioBased Surfactant from Used Cooking Oil: Application as Surface Active Agent, Neha Rawat, Aman K Bhonsle, Jayati Trivedi, Neeraj Atrey.

Waste to Best: Sustainable Environmental Remediation Strategies and Solution at Pt. Deendayal Petroleum University, Gandhinagar, 19-20 May, 2023

- Study on a Novel Triazole based Hindered Phenolic Antioxidant Additive in the Polyol Grease, Raj Kumar Singh, Ripudaman Singh Negi, Shailesh Kumar Singh.

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- H2 Free Reductive Catalytic Fractionation of Cotton Stalks for Production of Value Added Chemicals, Meenu Jindal, Priyanja Uniyal, Thallada Bhaskar.

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- Preparation of a Methyloleate based Novel Green Multifunctional Additive and its Performance Evaluation in Polyol Base Oil, Piyush Gupta, Soaib Akhtar, Ripudaman Singh Negi, Susheel Kumar Porwal, Raj Kumar Singh.

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- Copper Oxide Encapsulated ZSM-5 for catalytic cracking of LDPE: Maximizing the Gases Product with Light Olefins(C2-C4=) Rich Hydrocarbon. Himanshu Raghav, Bipul Sarkar.
- Greener Production of Styrene via Low-Temperature Dehydration of Phe over Co/P Modified ZrO2. Neha Dhiman, Sudhakar Reddy, Bipul Sarkar.
- Hydrotreating and Hydrodemetalation of Raw Jatropha Oil using Mesoporous Ni-Mo/Al2O3 Catalyst, Vikas Verma, Anil Kumar Sinha.
- Insight into Coke Formation Mechanism from Upgradation of Crude Oil in Slurry Phase Batch Reactor using MoS2 and its different Oil Soluble Forms Synthesised with various Organic Ligands, Ashutosh Rawat, Sonu Dhakla, S K Maity, Prem Lama.
- Waste Ilmenite Sludge derived Low Cost Mesoporous Fe-doped TiO2: A Versatile Photocatalyst for Enhanced Visible Light Photocatalysis without a Co-catalyst. Ankit Mishra, Anil K Sinha.
- Role of Dichloromethane's Anomeric Effect in reducing AlCl3 Amount in the Synthesis of Exo-tetrahydrodicyclopentadiene High Energy Density Fuel, Azeem Khan, Anil Kumar Sinha
- Selective Synthesis of Short Chain Olefins via CO2 Hydrogenation over Iron Based Catalysts, Ankur Bordoloi, Gaje Singh
- Earth Abundant Hetrogeneous Cobalt Catalyst for Selective Ring Hydrogenation of (Hetro) Arenes and Gram Scale Synthesis of Pharmaceuticals, Baint Singh, Ganesh Naik, Kishore Natte, Anand Narani.
- Lignin Residue derived Carbon Supported Nanoscale Iron Catalyst for the Selective Hydrogenation of Nitroarenes and Aldehydes, Naina Sarki, Suman Lata Jain, Kishore Natte

6th Internationl Oil and Gas Chemistry, Chemicals, and Additives Conference & Exhibition (IOGCA 2023)" on 12-13 September 2023, Gandhinagar

- Performance and Emission Characteristics of Gasoline Methanol Blend in a Stationary Genset Engine, M K Shukla, Vibhuti Bangwal, Anupam Chauhan.

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- Natural Gas Hydrates Formation and Dissociation Kinetics: Experiments and Modelling, Saksham Bhatt, Prahlad Gurjar, Avinash V. Palodkar, Gaurav Pandey and Asheesh Kumar.
- Synthesis of Zeolite-based Catalysts for the Pyrolysis of High-density Polyethylene into Petrochemical Products, Pratibha Negi, Akansha Gupta, Ranjith S, Pankaj K. Dubey, Sanat Kumar, Avinash Palodakar, Rajaram Bal, Ajay Kumar.
- Earth Abundant Biorenewable Carbon Supported Catalyst for Production of Renewable Fuel Additives, Vijendra Singh, Selvamani Armugan and Nagabhatla Vishwanadham.
- A Comprehensive Analytical Strategy to determine Automotive Gasoline Adulteration. Bhanu Prasad Vempatapu, Jagdish Kumar, Rajesh Kumar, Pankaj Kanujia.
- Gas Hydrate Mitigation/management for Deep Water Gas Fields: Applicable to Flow Assurance.

Sadhbhawana Dubey, Akash Verma, Sanat Kumar, Umesh Kumar and Asheesh Kumar.

- Methane Dehydroaromatization using Molybdenum Supported Zeolite Catalyst. Anil Chandra Kothari and Dr Rajaram Bal.
- Epoxidised Polyol Esters as a Potential Baasestock in the Formulation of Novel Lubricating Grease. Ripudaman Negi, Rajkumar Singh and Shailesh Kumar Singh.
- Hetero-structured Ti-MOF/g-C3N4 Driven Light-assisted Reductive Carboxylation of Aryl Aldehydes with CO2 under Ambient Conditions. Sakshi Bhatt and Suman L. Jain.
- Performance and Emission Characteristics Methanol/gasoline Fuel Blends in a Stationary Engine. Anupam Chauhan, Wittison Kamei, Devendra Singh, Vibhuti Bangwal and M.K. Shukhla.
- Design of Carbon-based Materials derived from Plastics and Evaluating its Potential Application in Electrocatalysis. Pankaj Kumar Dubey, Pratibha Negi, Prashant Bhardwaj, Sanat Kumar, Bipul Sarkar, Avinash V. Palodkar and Ajay Kumar.
- A Comprehensive Study on the Hydroprocessing of Crude Oil in Slurry Phase with Active Dispersal Catalyst to Obtain Refined Source of Energy and Fuel-Effect of Temperature and Time. Ashutosh Rawat, Sonu Dhakla, Samir K. Maity and Prem Lama.
- Structure-property Relationship and Catalytic Application of Versatile, Acido-basic Lanthanum Grafted Zeolites for the Production of Fuel Intermediates/Fuel Additives. Bhawna Saini, Anup Tathod, Jitendra Diwaker, Selwamani Arumugan and N. Vishwandham.
- Optimizing Pbex Rnew Membrane Concentrations for Enhanced Gas Separation Performance. Amit Jha, Swapnil Divekar, Soumen Dasgupta, R. Surya Murali.
- Shaping and Dynamic Study of CuETC MoF for Methane Separation from CH4/N2 Gas Mixture. Narendra Singh, Dr Aarti, Soumen Dasgupta. Swapnil Divekar.
- Magnetically Separable spent Coffee Grounds as a Potential Novel Ssupport for Covalent Immobilization of β-glucosidase for Cellobiose Hydrolysis. Shaifali Bharadwaj and Anil K. Sinha.
- Selective Single Step Co-hydroprocessing of Light Cycle Oil and Waste Cooking Oil Mixtures for Diesel Fuel Production. Vikas Verma and Anil K. Sinha.
- A Magnetically Separable Fe3O4@EDTA-gC3N4 Versatile Mesoporous Photocatalyst for CO2 Reduction and Water splitting into solar cells. Ankit Mishra and Anil K Sinha.
- A Red Mud based Heterogeneous Catalyst for the Selective Conversion of Toluene to Benzaldehyde. Shivani Singh and Rajaram Bal.
- Efficient Gas Separation using Polymer based Zeolite for CO2, CH4 and N2 gas. Anjali Sharma, Aarti and Umesh Kumar.
- Visible Light Driven Reaction of CO2 with Alcohols using Ag/CeO2 Nanocomposite: First Photochemical Synthesis of Linear Carbonates under Mild Conditions. Anil Malik and Suman Lata Jain
- Study of Pyrolysis of High Density Polyethylene with base Treated Zeolites in a Fixed Bed Reactor. Akansha Gupta, Pratibha Negi, Ranjith S, Anil Singh and Rajaram Bal.

Catalysis for Energy, Environment and Sustainability (CEES-2023) and CO2 India Network 2nd Annual Meet on 25-27 September 2023, IIT Mandi

- Glimpses of Carbon Dioxide Utilization Initiatives of CSIR-Indian Institute of Petroleum, Dehradun, Ankur Bordoloi.

ChemFerence-2023, BITS Goa Campus, 30 September to 2nd October 2023

- Value addition of Fluid Catalytic Cracking (FCC) Naptha, Vikram Singh, Kirtika Kohli, Prasenjit Ghosh, Pooja Yadav and Manoj Srivastava.

TriboIndia 2023-International Conference on Tribology for Sustainable Development, 5th to 7th October 2023, Srinagar, J&K

- Biomass derived Nano-structured Graphene like Carbon as Sustainable Material for Enhancement of Tribological Properties, Sweta Mehta Pratiksha Josh, Anchal Pandey, O.P. Sharma and O.P. Khatri.

- 2D/2D Heterostructure of Transition Metal Dichalocogenides (MoS2/WS2): Role of Interfacial Heterogeneity for Enhancement of Lubrication Properties. Anchal Pandey, Abhishek Negi, Nanoji Isalvath, O.P. Khatri

- Enhancement of Tribological Properties of Lube Base Oil by Nanostructured 2H-MoS2 Grown on Silica Nanoparticles Abhishek Negi, Anchal Pandey, O.P. Khatri.

Energy Technology Meet-2023. New Delhi, 9-11th October 2023

- On-pot H2-Free Reductive Catalytic Fractionation of Cotton Stalks over highly Dispersed Bi and Trimetallic Catalysts for Integrated Biorefineries. Meenu Jindal, Priyanka Uniyal and Dr T. Bhaskar.

International Workshop on Membrane Technologies for Desalination, Energy and Water (MemDEW). IIT Roorkee. 18th to 20th October 2023.

- Advances in Membrane Gas Separation for Environment, Energy and Healthcare Applications. Dr R. Surya Murali.

Global Congress on Renewable and Sustainable Energy, UAE, Dubai. 23 to 25th October 2023.

- Bioethanol Conversion to 1,3 Butandiene over Zn and La Grafted Defect-rich Beta Zeolite. Swati, Umesh Kumar and Dr N. Vishwanadham.

CORCON 2023, Mumbai 25-28 October, 2023

- Anticorrosion Performance of Novel Corrosion Inhibitors on Carbon Steel in Acidic media, R C Saxena, B G Prakashaiah, T Senthil Kumar, Sudip Kumar Gaguly.

- Synergistic Effect of Conducting Polymer and Corrosion Inhibitors for Carbon Steel Protection in an Acidic Medium, T Senthil Kumar, Sachin Dua, B G Prakashaiah, R C Saxena, Sudip K Ganguly.

- Anti Corrosion Performance of the Thiosemicarbazone am Mild Steel in Acidic Condition, Varsha Chaudhary, B G Prakashaiah, R C Saxena, T Senthil kumar, Sudip K Ganguly.

- Development of Novel Gemini Surfactant Molecules for Application of Oil and Gas Industries as a Corrosion Inhibitor, B G Prakashaiah, R C Saxena, T Senthilkumar, Sudip Kumar Ganguly.

- Synergistic effect of Schiff base product and inorganic molecules on the corrosion of mild steel in an acidic medium, Nishtha Arora, T Senthil kumar, BG Prakashaiah, R C Saxena, Sudip K Ganguly.

- MXene-Polyaniline nano-composites based coatings for enhancement of corrosion inhibition performance on mild steel substrate. Ramesh Goswami, Ravi Saini, O.P. Khatri and Anjan Ray.

- Electroconductive Graphene NiO-PANI based Nanocomposites for protection of mild steel in highly aggressive corrosion environment. Ravi Saini, Ramesh Goswami, and OP Khatri.

International Conference on Applications of Nanotechnology in Transformation of Environment, Agriculture and Healthcare (ICANTEAGH). 3-4th November 2023. Department of Zoology, University of Rajasthan, Jaipur

- Nanocomposite Comprising Hydrotalcite Nanocrystals on ZSM-5 Zeolite as an Efficient Biofuctional Catalyst. Anup Tathod, Bhavna Saini, Selvamani Arumugam and Nagabhatla Vishwanadham

New Horizons in Biotechnology 2023 (26-29 November 2023) Trivandrum Kerala

- Catalytic Flash Pyrolysis of Cashew De-oiled Shell: Effect of different Metal Oxides, Ramandeep Kaur, Bhavya B Krishna, Thallada Bhaskar.

- Slow Pyrolysis of Coffee Processing Industry Wastes, Valiveti Tarun Kumar, Ramandeep Kaur, Bhavya B Krishna, Thallada Bhaskar.

- Comparative Study of Reductive Catalytic Fractionation of different Biomass Feedstock: Insight into the Key Role of Lignin Monomer Units on Product Distribution, Priyanka Uniyal, Meenu Jindal, Thallada Bhaskar.

- Catalytic Pyrolysis of Pine Needles: Effect of structure and Si/Al Ratio of Catalyst on Bio-oil Yield and Product Distribution, Omvesh, Meenu Jindal, Richa Bhatt, Dr Thallada Bhaskar, Dr VCS Palla.

- Sustainable Thermo-chemical Synthesis of Pine Cone Biomass based Water Repellent Carbon Material, Shivam Rawat, Amritesh Kumar, Nidhi Arora, Amit Chauhan, Rakesh Kumar Mishra, Thallada Bhaskar.

- Reductive Catalytic Fractionation of Cotton Stalks over Ni-Based Catalysts, Meenu Jindal, Priyanka Uniyal, Thallada Bhaskar

8th International Conference on Advanced Nanomaterials and Nanotechnology (ICANN-2023), IIT Guwahati. 29th November to 1st December 2023

- Value Addition of Lignin to Zingerone using Recyclable AlPO4 and Ni/LRC Catalyst. Baint Singh, Ganesh Naik, Kishore Natte and Anand Narani.

Delhi Technological University, 30th November to 2nd December 2023, New Delhi

Indian Conference on Carbon Materials (ICCM-2023), 30th November to 2nd December 2023, Mumbai

- Nitrogen-rich Activated Carbon prepared from SiO2-Templated Polyaniline as a High Performance Anode Material for Lithium Ion Batteries. Kirti Chabbra, Ramesh N. Goswami, Nanoji Islavath and O.P. Khatri.

- Biomass-derived Nano-structured Graphitic Carbon for Tribological Applications. Sweta Mehta, Pratiksha Joshi, Anchal Pandey, O.P. Sharma and O.P. Khatri.

- Synthesis and Molecular Structure Elucidation of Dodceyl Succinylated Guar Gums. Piyush Gupta and Rajkumar Singh. Basic Analytical and Allied Sciences at the Interface of Carbohydrate & Biomass Valorization

International Conference on "Sustainable Energy and Environmental Challenges" (VIII-SEEC), 4 to 6th December 2023, MNIT Jaipur

- Sustainable Thermochemical Synthesis of Pine Cone Biomass based Water Repellent Carbon Material. Amritesh Jha, Shivam Rawat, Nidhi Arora, Amit Chauhan, R.K. Mishra and Thallada Bhaskar.

- Study on Solkatel based Novel Additive for Pour Point in Middle Distillate Fuel. Shoiab Akhtar, Sundaram Sharma, Mahendra Negi, Nisha Saini and Rajkumar Singh.

National Conference on Corrosion Control. 7-9th December 2023, Coimbatore

- Development of Carbon-dot based Inhibitor Formation to Mitigate the Interal Corrosion of Pipelines. R.C. Saxena, B.G. Prakashaiah, Sachin Dua, Sudip Ganguly and T. Senthil Kumar

- Safeguarding Mild Steel in Highly Aggressive Corrosive Environments by Grapheme-NiO-PANI Nanocomposite-based Epoxy Coatings. Ravi Saini, Ramesh Goswami and O.P. Khatri.

- Remarkable Enhancement in Corrosion Protection of Mild Steel by Reinforcing Expoxy Coatings with MXene-PANI Nanocomposites. Ramesh Goswami, Ravi Saini, O.P. Khatri and Anjan Ray.

Indo-French Seminar on Catalysis for sustainability. (IFSC-2023), December 10-13th 2023. IISER, Trivandrum

- Methane Transformation to C2 Hydrocarbons using Nano-crystalline Li/MgO Catalyst, Swati Rana, Anil Singh and Dr Rajaram Bal.

- Highly Efficient Production of 2,3 Pentanedione from Condensation of Bio-derived Lactic Acid over Polymorphic ZrO2. Neha Dhiman and Bipul Sarkar.

- Methane Dehydroaromatization using Molybdenum-supported Coal Waste Material Catalyst. Anil Kothari, Akashdeep Karmakar, Dr Rajaram Bal.

- Effect of Alkaline Treatment of Zeolite Catalyst in the Catalytic Cracking of a High-Density Polyethylene in a Lab-scale Reactor. Akansha Gupta, Pratibha Negi, Ranjith S, Anil Singh and Rajaram Bal.
- Catalytic Pyrolysis of High-density Polyethylene to Petrochemical Products with M-Zeolite based Catalyst. Pratibha Negi, Ranjith S, Anil Singh, Pankaj Kumar Dubey, Dr Sanat Kumar, Dr Avinash V. Palodkar, Dr Ajay Kumar and Dr Rajaram Bal.

17th International Conference on Polymer Science and Technology. SPSI-MACRO 2023, 10th to 13th December 2023, IIT Guwahati

- Mechanistic Insights on the Incorporation of Higher Alpha Olefins into Acrylate Co-Polymers via photo ARTP. Bhawana Sharma and Umesh Kumar

- Polymers as Corrosion Inhibitors for Mild Steel Corrosion Prevention. Sachin Dua, BG Prakashaiah, R C Saxena and T. Senthil Kumar.

- Performance and Characterization of PLA-biowaste based Composite for FDM-3D Printing, Nishtha Arora, Shailesh K. Singh and T. Senthil Kumar.

- Polymeric Additives for Bitumen Modification. Vedant Joshi, Kamal Kumar, Umesh Kumar and T. Senthil Kumar.

- Polymeric Additives Applied to Petroleum Refineries, T. Senthil Kumar, Bhawana Sharma and Vedant Joshi..

60th Annual Convention of Chemists, 20 and 21st December 2023, IIT Delhi

- Unlocking Biomass Valorization: Machine Learning Insights for Reductive Catalytic Fractionation of Cotton Stalks, Meenu Jindal, Aditya Gupta, Priyanka Uniyal and Thallada Bhaskar.

- Valorization of Spent Tulsi Biomass to Synthesize Functional Carbon Material for Hydrophobic Application, Amritesh Kumar, Nidhi Arora, Kritika Pandey, Anshika Agrawal, Shivam Rawat, Rakesh Kumar Mishra and Thallada Bhaskar.

International Conference on Energy Transition: Challenges and Opportunities and Chemical Engineering Congress (IIChE- CHEMCON) 2023 December 27-30, 2023

- Modified Biopolymeric Membrane for Water Treatment Applications, Vishwas Saini, Taslima Falaque, Racha Surya Murali, Vipin Kumar Saini, Rajkumar Singh

- Use of Chitosan as Bitumen Modifier and its Impact on Rheological Properties in Bitumen, Modification, Kamal Kumar, Aman Chand, Harish Chandra, Rajkumar Singh Manoj Kumar.

- Oxidative Desulfurizing of Fuels using Alcohol-Based DESs, Nisha, Mansi Negi, Pooja Yadav, Rajkumar Singh.

- A Feasible Study on the Screening of Solvents for for CO2 Absorption, Pradeep Kumar, Ankush Bindwal, Subham Paul, S K Maity.

- Development of Polymeric Multifunctional Additive to Improve Constitutional Properties of Bitumen, Aruna Kukreti, Kamal Kumar,

- Synthesis and Evaluation of Nanoparticles based Emulsifiers and their Application in Oil Industry, Aarif Chaudhary, Akash Verma, Navneet Sahoo, Manisha Sahai, Umesh kumar, Bipul Sarkar, Sanat Kumar.

- Two Stage Thermal Catalytic Conversion of Polyethylene into Gas Fuel. Himanshu Raghav, V Sudhagar, Sanat Kumar, Bipul Sarkar,

- Selective Separation of CO2 CH4, and N2 Gases over Polyols-modified Zeolite, Anjali Sharma, Akash Verma, Umesh Kumar, Aarti.

- Vapour Phase Dehydration of Sorbitol to Isosorbide over a Vanadium Phosphate Catalyst. Neha Dhiman, Bipul Sarkar and Sudhakar Reddy.

- Ni and Sr Modified ZSM-5 Catalyst for the Selective Dehydration of Bioethanol to Ethylene. Swati Saini and Umesh Kumar.

- Catalytic Upgradation of Used Cooking Oil (UCO) into Aromatic Hydrocarbons on Imidazole-

supported Zeolite Catalyst. Bhanu Joshi and Bipul Sarkar.

- Magnetically Separable Spend Coffee Grounds as a Potential Novel Support for Covalent Immobilization of Beta-glucosidase for Cellbiose Hydrolysis. Shaifali Bhardwaj and Anil Kumar Sinha.

- Unveiling the potential of antimicrobial polymers: Tackling bacterial resistance. Pratima Patel, Swati Saini, Aruna Kukrety, Umesh Kumar, T. Senthil Kumar, Anjan Ray and Diptarka Dasgupta.

- Visible Light Driven Reaction of CO2 with Alcohols using Ag/CeO2 Nanocomposite: First Photochemical Synthesis of Linear Carbonates under Mild Conditions. Anil Malik and Suman Lata Jain.

- Light Assisted Coupling of Phenols with CO2 to 2-Hydroxybenzaldehydes Catalyzed by g-C3N4/NH2-MIL-101(Fe) Composite. Sakshi Bhatt and Suman Lata Jain.

109th ISC, LPU, Punjab, 3-5 January, 2024

- Copper Catalysed Photochemical Coupling of Alcohols and CO2 to Organic Carbonates under Mild Conditions, Amod Kumar and Suman Lata Jain.

National Conference on Green Technology and Sustainable Development, NIT, Patna, 11-12 January, 2024

- Robust Nano-sized Co3O4 Supported on Biomass derived Carbon for the Carboxylation of Aromatics with CO2 under Mild Conditions. Amod Kumar and Suman Lata Jain

Special Symposium on Clinical Applications on NMR/MRI and 29th Annual meeting of NMR Society of India, SGPGI, Lucknow 2-5 February, 2024

- Solid State NMR of Cellulose/grafted Cellulose/Synthetic Super Absorbent in Non-Woven Biomaterial Matrix. Babita Behera, Kirtika Kohli, Piyush Gupta and Rajesh Kumar.

18th Uttarakhand State Science and Technology Congress-2024. UOU, Haldwani, 8-9th February, 2024

- Comparative Performance Evaluation of Trimethylolpropanetrioleate and Pentaerythritol Tetraoleate Ester based Sustainable Lubricating Greases. Ripudaman Negi, Shaliesh Kumar Singh and Rajkumar Singh.

- Lubrication Performance of Novel Solketal Based Additive in Middle Distillate Fuel, Shoiab Akhtar, Sundaram Sharma, Nisha and Rajkumar Singh.

ICECEES 2024, IIT, Roorkee, 15-17 February 2024

- Assessment of New Additives for the Kinetics of Natural Gas Hydrate Formation, Sadhbhawana Dubey, Abhishekh Sutradhar, Aniket Singh, Prakashaiah BG, Sanat Kumar and Asheesh Kumar.

- Carbon Dioxide Storage in Subsea Sediments as Solid Gas Hydrate Deposits., Shweta Negi, Suhas Suresh Ahetya, Sanant Kumar and Asheesh Kumar.

International Conference on Oil and Gas for Energy Security (ICOGES-2024), 16-17 February 2024, Pandit Deendayal Energy University, Gandhinagar.

- Value Addition of Light Cycle Oil and Naptha Cracker Bottom Feedstocks. Kirtika Kohli, Prasenjit Ghosh and Manoj Srivastava.

1st International Conference on trends in Chemical, Energy and Environmental Engineering, 19-22 February 2024, IIPE, Vishakhapatnam

- Kinetic Evaluation of Methane Trireforming over Ru-promoted Co/MgO-Al2O3 Supported Catalyst, Phani L. Kumar Kasina, Mohd. Belal Haider, Neelam Naidu Botcha, VVDN Prasad and Prasenjit Mondal.
- Shaping of Cu-OTC MOF for CO/CH4 : CO2/N2 Gas Mixture Separation, Narendra Singh and Aarti.
- Metal Cation Exchange of NaY Zeolite for Methane and N2 Gas Separation. Anjali Sharma, Umesh Kumar and Aarti.

International Conference on Crossroads of Chemistry and Biology-A Modern Prospective, 26-28 February 2024, University of Delhi

- Tribological Properties of the Diesel Blended with the Solketal Fatty Ester, Shoiab Malik and Rakjumar Singh.

Frontiers in Analytical and Applied Pyrolysis for Energy and Environment (FAAPEE-2024), 26-27 February 2024. IIT Madras

- Slow Pyrolysis of Geranium for the Production of Biooil and Biochar. Kritika Paney, Tarun Kumar Valiveti, Bhavya B. Krishna and Thallada Bhaskar.

RAFM-2024, 14-16th March, Delhi University

- Role of Material Science in Drilling Fluids: Applications in Oil and Gas Production Aniket Singh, Sanat Kumar and Asheesh Kumar
- Elucidating the Performance of New Materials to Enhance the Natural Gas Storage in the Form of Gas Hydrates: Applications in Energy Storage, Abhishek Sutradhar, Sadhbhawna Dubey, Shweta Negi, Sanat Kumar and Asheesh Kumar.

2.3 मुद्रांकित एकस्व/Patent Sealed

2.3.1 विदेशों में मुद्रांकित एकस्व/Patents Sealed Abroad

- An improved process and catalyst for low temperature non-oxidative dehydrogenation of propane to propylene, Bipul Sarkar, Ankit Agrawal, OmVir Singh, Indrajit Kumar Ghosh,Shailendra Tripathi, Sanat Kumar, Anjan Ray, US, Patent No. 11654 dt. 23.05.2023
- An improved process for the selective production of n-Methyl-2-Pyrrolidone (NMP), Ghosh Indraji Kumar, Jainsuman Lata, Khatri Praveen Kumar, Ray Siddharth Sankar, Garg Madhukar Onkarnath, KR, Patent No. 2563884 dt. 07.08. 2023
- A method for reactive desulfurization of crude oil and sulfur rich petroleum refinery fractions via simultaneous copolymerization of thiophene and its derivatives, Anjan Ray, T. Senthil Kumar, Umesh Kumar, Vedanta Joshi and Sudip K. Ganguly, US, Patent No. 11802249 dt. 31.10.2023
- Process for crude petroleum oil processing in the crude distillation unit (CDU), Sunil Kumar, Avinash Mhetre, Ojasvi Sharma, Manoj Srivastava and Anjan Ray, US, Patent No. 11859139, dt. 02.01.2024

- Process for the photocatalytic allylic oxidation of olefins using carbon dioxide, Suman Lata Jain, Sandhya Saini, Shafuir Rehman Khan, Praveen Kumar Khatri and Anjan Ray, US, Patent No. 11872547 dt. 16.01. 2024

- Double metal cyanide calatisy for the production of polyether polyols and a process thereof, Umesh Kumar, Akash Verma, Bhawana Sharma, Thangraj Senthil Kumar, Sudip Kumar Ganguly and Anjan Ray, US, Patent No. 11898007 dt. 13.01. 2024

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- Catalyst coating formulation for process intensification in hydroprocessing of biomass derived liquids, Anil Kumar Sinha, Botcha Neelam Naidu, Malayil Gopalan Sibi, Saleem Akhtar Farooqui, Mohit Anand, Rohit Kumar, Rakesh Kumar, Rakesh Kumar Joshi, Parvez Alam and Tasleem Khan, Patent No. 433939, dt. 07.06.2023

- A biodegradable lubricant formulation and process for preparation thereof, Ponnekanti Nagendramma, Anjan Ray, Gananath Doulat Thakre and Neeraj Atray, Patent No. 455439 dt. 27.09.2023

- A domestic cooking burner for piped natural gas, Pankaj Kumar Arya, Satishkumar, Gananath Doulatthakre, Amar Kumar Jain,Surendra Pratap, Patent No. 461166 dt. 20.10.2023

- A new catalyst useful for the production of synthesis gas and a process for the preparation there of, and a process trireforming of methane for the production of synthesis gas, Vemulapalli Venkata Durga Nagendra Prasad, Botcha Neelam Naidu, Kasinadivyua Phanindra Lakshmee Kumar, Bordoloi Ankur, Bal Rajaram, Nanotishrikant Madhusudan, Garg Madhukar Onkarnath, Sinha Renu, Chugh Parivesh,Kashyap Raj Kumar, Patent No. 470392 dt. 20.11.2023

- Dual Fumigation Homogeneous Charge Compression Ignition (DF-HCCI) Engine, Wittison Kamei, Patent No. 481255 dt. 12.12, 2023

- Integrated process for removal and value addition to sulfur and aromatics compounds of gas oil, Sunil Kumar, Shrikant Madhusudan Nanoti, Madhukar Onkarnath Garg, Bhagat Ram Nautiyal, Prasenjit Ghosh, Pooja Yadav, Nisha, Patent No. 497543 dt. 11.01.2024

- A process for the free radical polymerisation of vinyl monomers using chicken feather keratin as catalyst, Patnam Padma Latha, Bansal Ankushi, Indu Shekhar, Umesh Kumar, Jain Suman Lata, Ray Siddharth Sankar, Chatterjee Alok Kumar, Patent No. 504208 dt. 29.01.2024

- Consolidated bio processing of lignocellulosic biomass for L-lactic acid production, Dilip Kumar Adhikari, Jayati Trivedi and Deepti Agrawal, Patent No. 504857 dt. 30.01.2024

- An improved process for photocatalytic hydrocarboxylation of methanol with CO2 to produce acetic acid, Suman Lata Jain, Sandhya Saini, Praveen Khatri, Indrajit Ghosh and Anjan Ray, Patent No. 524099 dt. 12.03.2024

2.4 आवेदित एकस्व /Patents Filed

2.4.1 विदेशों में आवेदित एकस्व /Patents Filed Abroad

- Schiff base incorporated double metal cyanide catalyst for the production of polyether polyols, Umesh Kumar, Akash Verma, Bhawna Sharma, Amod Kumar, Swati, Thangaraj Senthilkumar, Sudip K. Ganguly, Anjan Ray, US, Patent No.18/305077 dt. 21/04/2023.

- Cryogenic process for crude helium recovery from natural gas Jointly with ONGC Energy Center Trust, Sunil Kumar, Avinash Mhetre, Ojasvi Sharma, Swapnil Divekar, Soumen Dasgupta, Manoj Srivastava, Anjan Ray, Aarti Arya, Presenjit Ghosh, Bharat S Mendhe, Nammi Ramya, US, Patent No. 18/329151 dt.05.06.2023.
- An improved catalytic process to produce aromatic hydrocarbon from used cooking oil, Bipul Sarkar, Om Vir Singh, Ankit Agrawal, Anjan Ray, Sanat Kumar, Bhanu Prasad Vempatapu, Jagdish Kumar, US Patent No. 18/355160 dt. 19.07.2023.

- A process for the preparation of higher-grade VG bitumens using sulfur-based polymeric additives, Thangaraj Senthilkumar, Kamal Kumar, Amod Kumar, Vedant Joshi, Umesh Kumar, Sudip Kumar Ganguly, Manoj Thapliyal, Manoj Srivastava, Anjan Ray, US, Patent No. 18/612469, 21.03.2024.

- A single-step catalytic process for the production of alkylated aromatics using CO2, Anup Prakash Tathod, Anjan Ray, NagabhatlaViswanadham, Selvamani Arumugam, US, Patent No. 18/613733 dt. 22.03.2024.

2.4.2 भारत में आवेदित एकस्व / Patents Filed in India

- Synthesis of polyether polyols based low dosage gas hydrate inhibitors using double metal cyanide catalyst, Umesh Kumar, Asheesh Kumar, Akash Verma, Sadbhawana Dubey, Sanat Kumar and Sudip K. Ganguly, Patent No. 202311044274, dt. 30.06.2023

- Polymeric wax deposition inhibitor additive to assure flow of waxy crude oil in pipeline (Jointly with OIL India Ltd), Umesh Kumar, Manisha Sahay, Aruna Kukrety, T Senthilkumar, Bijan Mahanta, Rajarshi Panigrahi, Sanat Kumar, S K Ganguly, Anjan Ray, Neeraj Mathur, Patent No. 20231105024 dt.25.07.2023

- Nanostructured Mo modified Ni-Al2O3 catalyst for syngas production through dry and bi reforming of methane and its preparation thereof, Ankur Bordoloi, Satyajit Panda, Jyotishman Kaishyop, Gaje Singh, MD Jahiruddin Gazi and Rajaram Bal, Patent No. 202311052529 dt. 04.08.2023

- Method for producing renewable hydrocarbon fuel from crude by-product of animal wastes fat oil biodiesel process, Arumugam Selvamani, N. Vishwanafham, Anjan Ray, Anup P. Tathod, Sivasamy Arumugam and Sreeram Katarical Janardhan, Patent No.202311686231, 15.11.2023

- High softening point coal tar – petroleum hybrid pitch, Ajay Kumar Gupta, Subhadra Sen, Manoj Srivastava, Manoj Kumar Thapliyal, Indu Shekhar, Mudavath Ravi, Nitya Nand Bahuguna, Rajesh Sharma, Patent No. 202443100817, dt. 04.01.2024.

- Process for the preparation of zeolite, Rajaram Bal, Anil Chandra Kothari, Akashdeep Karmakar, Sonu Bhandari, Ankur Bordoloi, Tuhin Suvra Khan, Mukesh K Poddar, Patent No. 202411004791 dt. 23.01.2024

- Improved Crude Petroleum oil processing methods for crude distillation unit, Sunil Kumar, Patent No. 202411005918 dt 29.01.2024

2.5 उपाधियाँ/अध्येतावृत्तियाँ /Degrees/Fellowships

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

- Ms. Himani Negi was awarded PhD degree for her thesis entitled "Combating the Problems Associated with Heavy and Waxy Crude Oils" under the supervision of Dr. Rajkumar Singh by the Academy of Scientific & Innovative Research (AcSIR), April 24, 2023.

- Ms. Pratiksha Joshi was awarded PhD degree for her thesis entitled "Aerogel and Aerogel Templated Materials for Environmental and Energy Applications" under the supervision of Dr. O. P. Khatri and Dr. Manoj Srivastava by the Academy of Scientific & Innovative Research (AcSIR), June 19, 2023.

- Mr. Aman Kumar Bhonsle was awarded PhD degree for his thesis entitled "Biodiesel production, Life Cycle Assessment and Synthesis of Multifunctional Additives for Biodiesel" under the supervision of Dr. Neeraj Atray and Dr. Jasvinder Singh by the Academy of Scientific & Innovative Research (AcSIR), August 16, 2023.

- Ms. Arfin Imam was awarded PhD degree for her thesis entitled "Multifunctional Microbial Consortium for Removal of Polycyclic Aromatic Hydrocarbons from Petroleum Contaminated Soil" under the supervision of Dr. Pankaj Kanaujia and Dr. Sunil Kumar Suman by the Academy of Scientific & Innovative Research (AcSIR), October 04, 2023.

- Mr. Shivam Rawat was awarded PhD degree for his thesis entitled "Lignocellulosic Biomass and Saccharide-derived Functional Carbons for Supercapacitor Applications" under the supervision of Dr. Thallada Bhaskar and Dr. Srinivas Hotha by the Academy of Scientific & Innovative Research (AcSIR), October 14, 2023.

- Ms. Rubina Khatun was awarded PhD degree for her thesis entitled "Synthesis of Nanostructured Catalysts for Methane Transformation to Syngas" under the supervision of Dr. Rajaram Bal and Dr. Chanchal Samanta by the Academy of Scientific & Innovative Research (AcSIR), November 21, 2023.

- Ms. Komal Saini was awarded PhD degree for her thesis entitled "Biomass Based Carbon Materials for Waste Water Treatment" under the supervision of Dr. Thallada Bhaskar, by the Academy of Scientific & Innovative Research (AcSIR), December 06, 2023.

- Mr. Sudip Ganguly was awarded PhD degree for his thesis entitled "Studies on Optimization of Foaming and Kinetics of Catalytic Thiol Oxidation in LPG Sweetening" under the supervision of Dr. Anjan Ray and Dr. C. B. Majumder, by the Academy of Scientific & Innovative Research (AcSIR), December 18, 2023.
- Mr. Vikas Verma was awarded PhD degree for his thesis entitled "Production of Sustainable and Renewable Fuels using Catalytic Hydroprocessing Pathways" under the supervision of Dr. Anil Kumar Sinha, by the Academy of Scientific & Innovative Research (AcSIR), December 18, 2023.

- Mr. Ankit Mishra was awarded PhD degree for his thesis entitled "Renewable Fuels Preparation using Transition Metal-based Nano-catalysts" under the supervision of Dr. Anil Kumar Sinha, by the Academy of Scientific & Innovative Research (AcSIR), December 29, 2023.

- Mr. Saurabh Kumar was awarded PhD degree for his thesis entitled "Synthesis of Novel Porous Nanomaterials as Catalysts for the Production of Fuel and Chemicals" under the supervision of Dr. N. Viswanadham, by the Academy of Scientific & Innovative Research (AcSIR), December 29, 2023.

- Mr. Akash Verma was awarded PhD degree for his thesis entitled "Development of Double Metal Cyanide Catalysts for the Synthesis of Industrially Viable Polyether Polyols" under the supervision of Dr. N. Viswanadham and Dr. Umesh Kumar by the Academy of Scientific & Innovative Research (AcSIR), December 29, 2023.

- Mr. Jitendra Diwakar was awarded PhD degree for his thesis entitled "Functionalized Nanomaterials: Functionalized Nanomaterials: Novel Synthesis Routes and Catalytic Applications" under the supervision of Dr. N. Viswanadham by the Academy of Scientific & Innovative Research (AcSIR), January 18, 2024.

- Mr. Vijendra Singh was awarded PhD degree for his thesis entitled "Catalyst development studies for the value addition of Industrial feedstocks" under the supervision of Dr. N. Viswanadham by the Academy of Scientific & Innovative Research (AcSIR), February 21, 2024.

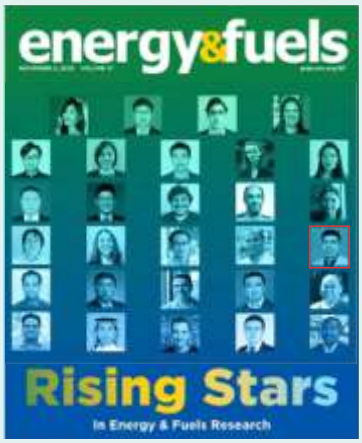
2.6 सम्मान एवं पुरस्कार /Honours & Awards

- Best Student Scientist Award to Dr. Ramesh N Goswami for his Research Work Presentation at CORCON 2023 (Asia's Biggest Conference in the area of Corrosion) at Mumbai on 28th Oct 2023

- Prof. Baldev Raj Memorial Award for the Best PhD Thesis to Dr. Sangita Kumar for her PhD work under the supervision of Dr. Om P Khatri (CSIR-IIP) and Prof. Sumeet Walia (RMIT, Australia). The joint award of AcSIR, India and RMIT, Australia was given during the 7th Convocation of AcSIR at New Delhi on 7th Nov 2023.

- Best PhD Thesis Award-2023 to Dr. Pratiksha Joshi by the Indian Carbon Society for her PhD work under the supervision of Dr. Om P Khatri and Dr. Manoj Srivastava. The award was given during the Indian Conference on Carbon Materials (ICCM 2023) at Mumbai on 2nd December 2023

- Best PhD Thesis Award-2024 to Dr. Pratiksha Joshi by the International Society for Energy, Environment, and Sustainability (ISEES) for her PhD work under the supervision of Dr. Om P Khatri and Dr. Manoj Srivastava.



- Recognition of Energy and Fuels Rising Stars 2023 by Americans Chemical Society(ACS) to Dr Asheesh Kumar

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

2.7.1 भारतीय संस्थाओं के साथ / With Indian Concerns

- MoU with Research Triangle Instiute Global India Private Limited, New Delhi to Jointly Collaborate for Development of Business Model for Plastic Waste to Transportation Fuel (PWTF) Technology, April, 06, 2023.

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- Non-disclosure Agreement with Nayara Energy Limited, Jamnagar on Drop-inLiquid Sustaniable Aviation and Atutomotive Fuel (DISAAF), Room Temperature Biodiesel Process, April 26, 2023.

- MoU with Freyr Foods Pvt. Ltd.,Muzaffarnagar, U.P on Improved Jaggery Making Plant, April 27, 2023.

- Non-disclosure Agreement with Upcharge Energy Solution LLP, Delhi on Conversion of Diesel to a Dual Fuel Mode and Study of the Converted Gensets, April 28, 2023.

- MoU with NMAM Institute of Technology, Nitte, Karkala, Udupi on Academic and Joint Research Programs, May 19, 2023.

- Non-disclosure Agreement with Prism Johnson Limited, Mumbai on Manufacture of Reformer Catalyst used in Petrochemical Industries, May 24, 2023.

- Memorandum of Understanding with ONGC Energy Centre Trust, New Delhi on Thermo-chemical Hydrogen Generation through Partially Open-Loop I–S Process Involving H2S Incineration, May 25, 2023.

- Non-disclosure Agreement with Hindustan Petroleum Corporation Limited, Mumbai on Hydrogen-free Desulfurization of Petroleum Crude Oil and Refinery Streams, June 23, 2023.

- MoU with Central Pulp & Paper Research Institute (CPPRI) Saharanpur for Joint Research Project, July 03, 2023.

- Memorandum of Understanding with Manipal Academy of Higher Education, Manipal for Academics, July 17, 2023.
- Non-disclosure Agreement with Shell India Markets Private Limited, Gurugram, for Testing on Field Trial, July 19, 2023.
- Non-disclosure Agreement with UPL Limited, Mumbai Texol Engineering Pvt. LtD. Pune on Demostration Unit of CSIR-IIP DILSAAF Technology, July 19, 2023.
- Memorandum of Understanding with Upcharge Energy Solution LLP, Delhi on Conversion of Diesel to a Dual Fuel Mode and Study of the Converted Gensets, August 10, 2023.
- Memorandum of Understanding with Indian Institute of Technology, Madras for Academics, August 24, 2023.
- Memorandum of Understanding with Bharat Petroleum Corporation Ltd. Mumbai on One Step Conversion of CO2 into Diphenyl Carbonate, October 23, 2023.
- Non-disclosure Agreement with Evonik Catalysts India Pvt Ltd, Thane on Joint Development for New Adsorbents & Catalysts as well Testing January 24, 2024.
- Non-disclosure Agreement with Greenchem Engineeers Pvt Ltd. Ludhiana on Production of Biofuel, February 02, 2024.
- MoU with Indian Council of Agricultural Research, Hyderabad on Research and Development in the Sustainable Biofuel and Value Addition for Residul Biomass during Millets Production, Biobased Products/Chemicals Functional Carbons etc., February 23, 2024.
- MoU with 6D Varsity (promoted by 6D Research Foundation) Hyderabad on Collaboration and Responsibilities and Skill Development Training Programs, February 24, 2024.
- Memorandum of Understanding with Indian Institute of Technology, Roorkee on Academics, March 01, 2024.
- Memorandum of Understanding with Uttarakhand State Council for Science and Technology (UCOST) Dehradun To undertake Science & Technology based Women Empowerment Project in the Champawat District of Uttarakhand, March 05, 2024.
- Non-disclosure Agreement with Sud Chemie India Pvt Ltd.Vadodara on Evaluation of Improved ZSM-5 Zeolite (for FCC Additive) for better Propylene Yield, March 27, 2024.

2.7.2 वेदेशी संस्थाओं के साथ / With Foreign Concerns

- Non-disclosure Agreement with Technithon International Pvt. Ltd. Singapore on Sulphonation of Alpha-Olefin Rich Stream derived from Waste Plastics/Polyolefins, July 24, 2023.
- Memorandum of Understanding with Pacific Industrial Development Corporation, USA on Utilization of Material for DME Synthesis, November 17, 2023.
- Memorandum of Understanding with University of Birmingham, UK regarding Joint Collaborative Research Projects, December 22, 2023.

03

प्रशिक्षण

TRAINING

3.1 तेल एवं संबद्ध क्षेत्र 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 the Chemical Engineers of IOCL New Delhi from March 27, 2023 to May 05, 2023.
- Training Programme on "Petroleum Refining Technology" for 40 Chemical Engineers of IOCL, New Delhi from May 15, 2023 to June 23, 2023.
- Training Programme on "Petroleum Refining Technology" for the Chemical Engineers of IOCL New Delhi from July 10, 2023 to August 18, 2023
- Training Programme on "Petroleum Refining Technology" for the Chemical Engineers of IOCL New Delhi from September 04, 2023 to October 13 2023
- Training Programme on "Petroleum Refining Technology" for the Chemical Engineers of NRL Numaligarh from November 15-18, 2023
- Training Programme on "Petroleum Refining Technology" for the Chemical Engineers of IOCL New Delhi from November 20, 2023 to December 29, 2023.
- Six Weeks Training Programme on "Petroleum Refining Technology" for the Chemical Engineers of IOCL New Delhi from January 15 to February 23 2024

3.1.2 अन्य कार्यक्रम / Other Programmes

- Training Programme on "Automotive Lubricants and Deposit Ratings" for different Companies during August 02-04, 2023.
- Five days Training Program on "Advanced Automotive Technology and Indian Road Traffic Patterns" for Officers of Ministry of Road Transport and Highway (MoRTH), New Delhi, 4 to 8 December, 2023.
- Three Days Training Programme on "Present and Future Automotive Fuels Quality and Emission Norms" for Officers of MEA, New Delhi from January 3-5, 2024.
- Five days Training Program on "Real World Driving Emissions" for Officers of Ministry of Road Transport and Highway (MoRTH), New Delhi, from 15 to 19 January, 2024.
- Five days Training Program on "Present and Future Automotive Fuels Quality and Emission Norms" for Officers of MEA, New Delhi from 15 to 19 January, 2024.
- Three Weeks Training Programme on "Analysis of Petroleum and Allied Products" for Officers of MEA, New Delhi from February 05 to February 23, 2024.
- Training Programme on Efficiency and Alternative Fuels for Advanced Engine Technology for the Officers of Ministry of Road Transport and Highway (MoRTH), New Delhi, from February 12-16, 2024

3.2 विदेश में प्रतिनियुक्ति/ Deputations Abroad

- Dr. Sunil Kumar Pathak, Senior Principal Scientist, to attend the 20th Workshop of GHG Inventories in Asia (WGIA 20), Japan, June 25, 2023 to June 30, 2023.
- Dr. Thallada Bhaskar, Chief Scientist, China & Hong Kong, to attend and deliver a lecture at the International Conference on Sustainable Solid Waste Treatment and Management (SWTM-2023) organized by the Northwest A&F University, Yangling. China followed by visit to Hong Kong to visit the solid waste (biomass and plastics) treatment labs, July 28, 2023 to August 2, 2023
- Dr. Sunil Kumar Pathak, Senior Principal Scientist, visited as an Expert and participated as a reviewer for the 2023 Greenhouse Gas (GHG) to serve as second Energy Technical Expert for the in-country review of Ireland, September 11, 2023 to September 16, 2023
- Dr. T Senthil Kumar, Scientist visited Canada to attend 24 World Petroleum Congress 2023 during 17th September to 21st September, 2023 (DST 50% and CSIR-IIP)
- Dr. Atul Ranjan Principal Scientist, visited UAE to attend International Petrol Exhibition and Conference (ADIPEC) during 2nd October to 5th October, 2023 CSIR-IIP/Lab Reserve Fund (LRF)
- Dr. Suman Lata Jain, Senior Principal Scientist visited France to attend CEFIPRA Visiting/Mobility Fellowship (PROWIS-II) under the Indo-French Programme for Women in Science at Molecular Electrochemistry and Redox Photochemistry EMPRe group, the Molecular Chemistry Department (DCM) and Grenoble Alpes University, February 5, 2024 to February 16, 2024
- Dr. Thallada Bhaskar, Chief Scientist, visited Department of Resource Recovery and Building Technology, University of Borås, Sweden to Strengthen Research Collaboration between the two Institutes March 4, 2024 to March 29, 2024
- Dr. Sunil Kumar Pathak, Senior Principal Scientist visited Singapore to participate in "Hands on Training Workshop on Transitioning to the ETF and Tracking of Progress in Implementing and Achieving NDCs" from March 12-15, 2024 in Singapore. The workshop is being organized by Singapore Government, the United States Environmental Protection Agency (USEPA), United Nations Framework Convention on Climate Change (UNFCCC) Secretariat and the Nationally Determined Contributions (NDC) Partnership

04

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 परियोजनाए / Sponsored Projects

1. Assay Analysis of NGL, Naphtha, ATF and HSD Samples
2. Development of Efficient Catalysis for Hydrogenation of CO2 to Synthetic Natural Gas(E-Methane)
3. To Study the Deposit & Distresses Characteristics of a Four - Cylinder Diesel Engine
4. Analysis of Biodiesel Samples
5. Production of Propylene and Hydrogen via Propane Dehydrogenation : Catalyst and Process Development at Bench Scale
6. Study of Deposit and Distresses Characteristics of Three Passenger Car Engine Components
7. Study the Physicochemical Characteristics of Ethanol Blended Diesel (HSD) Samples as per IS-1460
8. Creation of Nodal Centers for Development NAD Production of Key Starting Materials, Intermediates and other Raw Materials that are required by the Health Care Sector
9. Thermo-Chemical Hydrogen Generation through Partially Open-Loop I-S Process Involving H2S Incineration : Coupling of Individual Sections for Laboratory Integrated Operation
10. Detailed Feasibility Report and Basic Engineering Design Package on DILSAAF Technology
11. To Study the Deposit and Gear Distress Characteristics of Selected Components of Two Wheeler Engines
12. 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
13. Metal Sharp Sterilization And Infraction Apparatus Messia
14. Conversion of a Diesel Genset to a Dual-Fuel Mode and Performance and Emissions Study of the Converted Genset
15. Mapping Monitoring and Management of Lantana Camara through Utilization for Improving Livelihood of People in Forest Fringe Villages of India
16. HR-TEM Analysis with EDS for Sprint Testing Solutions
17. To Study the Deposits & Distresses Characteristics of the Components of One Diesel and Two Gasoline Passenger Car Engines
18. Corrosion Inhibitor Performance Evaluation Studies
19. Testing of HC HFDU 68 Synthetic Ester Based Fire Resistant Hydraulic Oil As Per IS 7895 & IS 10532
20. To Utilize Organic Fraction of Waste Available at Dumsite of Kondungiyur, Chennai and Strategic Planning / Approval of Technology for New Processing Units
21. One Step Conversion of Carbon Dioxide into Diphenyl Carbonate
22. Performance Evaluation of the Pour Point Depressant Test on Crude Oil

23. Machine Learning Enable Design and Synthesis of Nanoscale Layered Pervoskite Materials for High-Performance Fuel Cell and Battery

24. Performance Evaluation of New Engine Lubricants Formulated for Motorcycles

25. Analysis of Ethanol Blended Gasoline Samples

26. Compatibility Studies of Lubricating Greases

27. Innovative Strategies for CO2 Valorization Integrated with Organic Synthesis using Earth Abundant Metals and Cooperative Photoredox Catalysis

28. Analysis of Biodiesel Samples

29. Analysis of Ehtylene Gas Samples

30. Assessment and Preliminary Studies for Upgrading Type Pyrolysis Oil to LDO Grade

31. National Greenhouse Gases Inventory for Road Transport Sector- BTR1, BUR4 and Fourth National Communication

32. Analysis of Bio Diesel

33. Engine Components Rating as per ASTM Manual for Component Distress

34. Setting Up of a Demonstration Plant for the Production of D-Methanol 1 Kg/Day

35. Design and Development of Biocarbon Supported Mn and CO based Nano Catalysts for the Transfer Hydrogenation / Deuteration Reactions using Ch3OH/Cd3OD as Hydrogen/Deuterium Source and Synthesis of Pharmaceutical Intermediates

36. Oil Soluble Metal Catalyst for Upgradation of Crude/Heavy Crude to Value Added Petro-Products and Precursors

37. Characteristic Property Evaluation of HOUGH TO SAFE 620 EP

38. Integrated Fermentation and Chemical Catalysis for Jet Range Bio-Renewable Fuels and Blends

39. Friction and Wear Behaviour of Friction Wedge Material

4.1.2 संस्थागत / In-house

1. Feasibility Studies of Preparing Napkin from Cellulosic Material of IIP Forest Residues

2. Kinetic Evaluation and Reactor Design Aspects using Multi-Physics Methodology for Catalytic Stream Naphtha Cracking and Crude Bio-Glycerol Bi-Reforming Processes

3. Development of Porous Adsorbents for their Use in Gas Separation Application

4. Development of Catalyst for the Synthesis of Polyether Carbonate Polyois via Chemical Fixation of Co2

5. Desulfurization of Tire Pyrolsis Oil (TPO) from Waste Tires (WT) of Airplane and Vehicle Tires

6. Catalyzing Rural Empowerment and Entrepreneurship Development through Cultivation, Processing, Value Addition and Marketing of Aromatic Plants

7. Carbon, Capture, Utilization & Storage (CCUS)
8. Waste to Wealth: Comprehensive Solutions Towards Circular Economy and Sustainability
9. SAF Plant Facility Operation to Produce Sustainable Aviation Fuel (SAF) and Green Diesel
10. Development of Cost Effective Scale-Up Process for the Production of High Value Amines
11. Maintaining ISO-9001-2015 Certification for the Institute and to Obtain Future Certification

4.2 चालू परियोजनाएँ / On-going Projects

4.2.1 प्रायोजित / Sponsored

1. Demonstration of Mobile Pyrolyser for Conversion of Agriculture Residues for Production of Bio-Oil and Biochar
2. Demonstration of 1000 Lit/Day Syngas Generation via Dry Reforming
3. Development of an Indigenous Catalyst for Hydrogenation of CO2 to Methanol and Design of a Pilot Scale Unit for 10kg/Day Methanol Production
4. Clathrate Hydrates: Opportunities for Innovative Technologies
5. Audit and Certification of Biodiesel Plants based on used Cooking Oil (UCO) as Feedstock
6. Fabrication, Supply and Installation of Medical Grade Oxygen Concentrator System to Government Establishments under PM Cares Fund
7. Development of New Variants of the Re-Formulated Thoxcat ES Catalyst with Effective Foam Control Feature for Supply Security in the Middle East Market
8. A Bench Scale High Pressure Visual Autoclave: Assessment of Green Hydrate Inhibitors for Deepwater Energy Production
9. Feasibility Assessment of SWEE Sorghum (SS) Stalk and Syrup for 2G Ethanol Production
10. Technology Information Document (TID) for Demonstration Unit of 1mt/Day Feedstock Processing on CSIR-IIP DILSAAF Technology
11. Feasibility Study for Implementation of Pinch Analysis in Crude Distillation Unit-II at CPCL Manali Chennai
12. Production of Xylene-Rich Alkylated Aromatics using CO2 as an Alkylation Reagent
13. Energy and Process Optimization of Pulping and Chemical Recovery Sections
14. Indigenously Design and Development of Hybrid Network Composite Solid Electrolyte for Batteries
15. Catalytic Valorization of Bio-Ethanol through Production of Future Fuel
16. Exhaust Gas Analysis for NOx Reduction in Industrial Furnace through a Novel Exhaust Gas Recirculation Technology
17. Evaluation of Turbine And Compressors Oils
18. Analysis of HR-TEM with EDS

19. Supply of Bio Diesel to Garh Mukteshwar-Meerut Road Project

20. Development of Efficient Catalysis for Hydrogenation of CO2 to Synthetic Natural Gas (E-Methane)

21. Production of Propylene and Hydrogen via Propane Dehydrogenation : Catalyst and Process Development at Bench Scale

22. 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

23. Thermo-Chemical Hydrogen Generation through Partially Open-Loop I-S Process Involving H2s Incineration : Coupling of Individual Sections for Laboratory Integrated Operation

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29. HR-TEM Analysis with EDS for Sprint Testing Solutions

30. To Study the Deposits & Distresses Characteristics of the Components of One Diesel and Two Gasoline Passenger Car Engines

31. Corrosion Inhibitor Performance Evaluation Studies

32. Testing of HC HFDU 68 Synthetic Ester based Fire Resistant Hydraulic Oil as per IS 7895 & IS 10532

33. To Utilize Organic Fraction of Waste Available at Dumsite of Kondungiyur, Chennai and Strategic Planning / Approval of Technology for New Processing Units

34. Determination of Helium, Hydrogen, Carbon Monooxide, Carbon Dioxide, Oxygen, Nitrogen, C1-C15 in Gas Samples

35. One Step Conversion of Carbon Dioxide into Diphenyl Carbonate

36. Machine Learning Enable Design and Synthesis of Nanoscale Layered Pervoskite Materials for High-Performance Fuel Cell and Battery

37. Performance Evaluation of New Engine Lubricants Formulated for Motorcycles

38. Analysis of Ethanol Blended Gasoline Samples

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47. Setting up of a Demonstration Plant for the Production of D-Methanol 1 Kg/Day

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49. Oil Soluble Metal Catalyst for Upgradation of Crude/Heavy Crude to Value Added Petro-Products and Precursors

50. Characteristic Property Evaluation of Houghtosafe 620 EP

51. Integrated Fermentation and Chemical Catalysis for Jet Range Bio-Renewable Fuels and Blends

52. Friction and Wear Behaviour of Friction Wedge Material

53. Development and Testing of Bio-Jet Fuel for IAF

54. Thermo-Chemical Hydrogen Generation Through Partially Open-Loop S-I Process Involving H2S Incineration : Part I. Experimental Study Of Bunsen Reaction And Hi Decomposition

55. Setting up of 1 TDP Demo Pilot Plant for Conversion of Waste Plastic to Value Added Hydrocarbons (Phase II)

56. Thermo-Chemical Hydrogen Generation through partially Open-Loop S-I Process Involving H2S

57. Development of Lubricating Oil (HALRC-35m) For Helicopter Transmission Gearboxes

58. Performance Evaluation of New Engine Lubricant Formulation Synthesized for Two-Wheelers through Field Trials

59. 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. Hydroprocessing of Palm Stearin and Comparison with Jatropha Oil

4. Development of High Photo-Conversion Efficiency Electron Donors for Organic Photovoltaic Applications

5. Crude Oil to Chemicals : Olefins Maximization

6. Separation and Recovery of Bicyclic Aromatic Chemicals (BAC) from Carbon Black Feedstock (CBFS), Coke Liquid and Light Cycle Oil (LCO)

7. Development of Conducting Polymer based Coatings for Metal Corrosion Protection

8. Development of a Catalyst for the Production of Lower Olefins by Catalytic Cracking of Naphtha Co-Processes with Co2

9. New Multipurpose Green Lubricating Grease Formulations base on Indigenous Non-Edible Oils

10. Eco-Campus Initiative to Convert Biomass to Pellets Using In-House Facility

11. Development of Novel Lubricant Additive through Chemical Modification / Derivatization of Biomaterial

12. Energy and Process Optimization of Pulp and Paper Mill's Processes using Simulation and Pinch Analysis Tools

13. Techno-Economic Evaluation of Chemical Looping based Separation Process for Closed Boiling Mixture Separation of Mixed Xylene Isomers over UOP's Parex Process

14. Feasibility Study for the Recovery of Fats, Oils, and Grease (FOG) from Indian Drains / Nallahs and its Conversion into Bio-Fuel

15. A Method for Immobilizing B-Glucosidases on a Magnetically Separable Recycleable Support based on Graphene for Multiple Cycle Conversion of Cellobiose into Glucose

16. Development of Emulsifiers for Indian Heavy Crude Oil (API 10-30) using a Novel Surfactant for Pipeline Transportation

17. Development of Low-Cost Metal-Organic Frameworks and their High Capacity Formulation Routes (LCM-HCF) for Gas Separation Applications

18. Development of Corrosion Inhibitor Formulation for Up and Mid Stream Applications

19. Utilization of Coal Gangue TP Synthesize Zeolites and their Application in Adsorption and Catalysis

20. Synthesis of Lube Base Oil from used Cooking Oil (UCO)

21. Development of High Performance Mixed Matrix Membranes (MMMS) for CO2 Capture from Industrial Flue Gases

22. Electric Retrofitment 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

23. Feasibility Studies of Preparing Napkin from Cellulosic Material of IIP Forest Residues

24. Kinetic Evaluation and Reactor Design Aspects using Multi-Physics Methodology for Catalytic Stream Naphtha Cracking and Crude Bio-Glycerol Bi-Reforming Processes

25. Development of Porous Adsorbents for their use in Gas Separation Application

26. Development of Catalyst for the Synthesis of Polyether Carbonate Polysis via Chemical Fixation of Co2

27. Desulfurization of Tire Pyrolysis Oil (TPO) from Waste Tires (WT) of Airplane and Vehicle Tires

28. SAF Plant Facility Operation to Produce Sustainable Aviation Fuel (SAF) and Green Diesel

29. Development of Cost Effective Scale-Up Process for the Production of High Value Amines

30. Maintaining ISO-9001-2015 Certification for the Institute and to Obtain Future Certification

31. Rational Design of Industrially Viable Ammonia Oxidation Catalysts using High Throughput Computational and Experimental Techniques

32. Development of Bio-Binder for Construction of Flexible Pavements

33. Design of Modular Biogas Dry Reforming Pilot Plant with Optional Downstream Syngas Conversion Processes

34. 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

35. Catalyzing Rural Empowerment and Entrepreneurship Development Through Cultivation, Processing, Value Addition and Marketing of Aromatic Plants

36. Development and Certification of New Generation Lubricant Formulations for Aerospace Surfaces and Components / Wp-5

37. Design and Development of High-Entropy Alloys using Artificial Intelligence for Gas Turbine Applications (WP- 4.2)

38. Hydrogen Technology (H2T) Mission Program

39. Plastic Depolymerization and Upcycling (DEPOLUP)

40. Phenome India-CSIR Health Cohort Knowledgebase (HTC)

41. Carbon, Capture, Utilization & Storage (CCUS)

42. Waste to Wealth: Comprehensive Solutions towards Circular Economy and Sustainability

43. Jigyasa 2.0 Programme with the Concept of Virtual Lab Integrated (CJVL)

44. CSIR-Integrated Skill Initiative (Phase-II) 2020 to 2025

4.3 पूर्ण हो चुकी परियोजनाएं / Projects Completed

4.3.1 प्रायोजित / Sponsored

1. Farm based S&T Interventions for Socio-Economic Development in the Aspirational District of Nabarangpur, Odisha

2. Testing of Samples for TEM, EDS, TPO, TPR/TPN, Raman Spectroscopy and TGA

3. Crystallographic Evidence to understand Interactions between Gaseous Guest Molecules and the Crystalline Host Materials using In-Situ X-Ray Crystallographic Analysis

4. Testing of UCO, Acid Oil and Biodiesel

5. Development of Coal-Tar-Petroleum Hybrid Pitch

6. Compatibility / Miscibility Tests for HPCL Grade HP ENKLO FRDU 46

7. Enhanced CO2 Adsorption and its Photo-Electrochemical Conversion using Semiconductor-Metal Complex Hybrids
8. Greenhouse Gas Inventory for TNC Biennial Update Report II & III
9. To Study the Deposit Characteristics of Passenger Car Engine Components
10. Study the Physicochemical Characteristics of E2O Blend Gasoline (MS) Samples as per IS:17934:2022 and Diesel (HSD) Samples as Per IS:1460
11. Development of Catalyst and Process for Slurry Phase Residue Hydrocracking
12. To Study the Deposit & Distresses Characteristics of a Four - Cylinder Diesel Engine
13. Pre-Feasibility Study of 20 KL/Day Sustainable Aviation Fuel (SAF) Production using CSIR-IIP DILSAAF Technology for Bio-Jet Plant at MRPL
14. Study the Physicochemical Characteristics of Ethanol Blended Diesel (HSD) Samples as Per IS-1460
15. Testing of GTL Light Paraffin Liquid Samples
16. Testing of GTL Paraffin Liquid Samples
17. Tachers Associateship for Research Excellence to Dr. Saurabh Kumar Yadav, IITRAM, Ahmedabad, Gujarat
18. Study the Deposit and Distress Characteristics of Wheel Bearings
19. Production of Gasoline-Range Aromatics and Hydrogen-Enriched Fuel Gas from Non-Edible/Waste Cooking Oils over Engineered Hierarchical Nano Zeolites
20. Characterization of Crude Oil for Short and Detailed Evaluation from Oil India Ltd, Jodhpur
21. Solar Assisted Hydroformylation / Carboxylation of Olefins Containing Natural Products with Co2
22. High-Temperature Workability and Tribological Characterization of High Entropy Alloy
23. Development of Industrial Catalyst for Selective Production of Xylene From Bio-Derived Glycerol
24. Measurement of Dynamic and Static COF and Wear Loss as per RDSO Specification CONTR 02 Misc 07
25. Performance Investigation of Hydraulic Fluid and Gear Oil
26. To study the Deposit and Gear Distress Characteristics of Selected Components of Two Wheeler Engines
27. Assay Analysis of NGL, Naphtha, ATF and HSD Samples
28. Analysis of Biodiesel Samples
29. Study of Deposit and Distresses Characteristics of Three Passenger Car Engine Components
30. Testing of FRHF (HFDU 68) Oil as per IS -10532 Part V
31. Scale up of CSIR-IIP Developed Flow Improver to 1kg Scale (Phase-II)
32. Performance Evaluation of the Pour Point Depressant Test on Crude Oil

4.3.2 संस्थागत / In-house

1. Corona Sample Testing Project
2. Valorisation of Fishery Waste for Development of Biofertilizer, Biorefinery & Recovery of Biopolymers (VALBBBB) (FBR)
3. Photochemical Carboxylation of Naphtha Feed with Carbon Dioxide (FBR)
4. Development of Adsorption based Process for the Up-Gradation of Coal Bed Methane
5. Development of a Process for Catalytic Cracking of Phenolics Tar to Phenols (NCP)
6. Recovery of Aromatics from Cracked Naphtha (FBR)
7. Digital Twinning based Flooding Predictor Alogrithm for Distillation Columns
8. Development of Graphene-based Materials as Booster Dose Additives to Fully Formulated Engine Oil for Enhancement of Lubrication Properties
9. Development Of Pani-Graphene Based Composites As Functional Fillers To Conventional Coatings For Enhancement Of Corrosion Inhibition Properties (Fbr)
10. The Engineering/ Omics Potential of Rhodotorula Mucilagenosa IIPl32 (MTCC 25056) as a Workhorse for Biotechnological Applications (FBR)
11. Techno-Economic Evaluation, Nutritional Mapping, and Toxicity Profiling of MUFA Rich Yeast Lipid Production from Biodiesel Plant Derived Glycerin Targeted to be used as Edible Oil Blend (FBR)
12. ISO 17025:2017 Accreditation of CSIR-IIP through National Accreditation Board for Testing and Calibration Laboratories (NABL)
13. Exploratory Studies of Biofuel Crop Plantation at Identified Districts in Uttar Pradesh to Enable Distribution Biodiesel Production, Petroleum Import Reduction, Farm Income Enhancement, and Job Creation
14. Development of a Catalytic Process for the Production of Light Olefins from Stream Cracking of Naphtha
15. Studies and Compilation of Experimental Data of Adsorbents Synthesized and Characterized for CH4 Separation from Coal Bed Mehtane
16. Study of On-Board Exhaust Emission Measurement & Fuel Consumption of Light Vehicle in City, Highway and Hilly Area (Gradient) Driving Conditions
17. Monitoring Catalyst(S) Health using IOT with Machine Learning for Tri-Reforming of Methane

05

अनुसंधान एवं विकास बुनियादी ढांचे को बढ़ाना

ENHANCING R&D INFRASTRUCTURE

5.1 सृजित की गयी नई सुविधाएँ / New Facilities Created

- **QMS based Quantitative Gas Analyzer (QGA) (Make Hiden Analytical, UK)**

- **Tensile Strength Tester (Tensile strength tester was purchased to estimate the mechanical strength of the polymers)**

- **Flexural Tester: Flexural tester was purchased to estimate the material's ability to resist bending under an external force.**

- **Chemisorption Analyzer**

An automated flow chemisorption analyzer for pulse chemisorptions and temperature programmed reduction/ desorption (TPR/TPD) to study the chemisorptions, reduction profiles and desorption behaviour of gases pre-absorbed on catalyst surface.

- **Transformer Oil Gas Analyzer (ASTM D3612)**

The facility supports analysis of electrical insulating oil (transformer oil) for its quality monitoring upon prolonged usage. It provides valuable input on the quality of oil by determining the dissolved gases that are produced upon degradation of the transformer oil. The facility intends to support the electric utility companies in monitoring and maintaining their transformer assets.

- **Gas Chromatograph - Wax Analyzer (ASTM D5442)**

The wax analyzer determines carbon number distribution of petroleum waxes and normal and non-normal hydrocarbons available in it for control of production processes and guide to performance in many end uses including use in rubber formulations.

- **Gas Chromatograph – Flame Ionization Detection/Mass Spectrometer (GC-FID/MS)**

The facility supports analysis of electrical insulating oil (transformer oil) for its quality monitoring upon prolonged usage. It provides valuable input on the quality of oil by determining the dissolved gases that are produced upon degradation of the transformer oil. The facility intends to support the electric utility companies in monitoring and maintaining their transformer assets.

- **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.

Vacuum-Arc Melting Furnace

- **A Bench-Scale Hydrate-based CO2 Sequestration Prototype**

A new high-pressure reservoir mimicking setup that can represent the realistic subsea CO2 injection process has been commissioned at upstream lab of CSIR-IIP. For the first time, actual oceanic sediments/cores and seawater collected from various sites/depths of the Arabian Sea will be utilized in this reactor for hydrate formation studies. Through this setup, we would deliver the evidence of CO2 sequestration in the reservoir representing the environment. The major components of this setup include: 1. Test Section (Reservoir holder), 2. High-Pressure Syringe Pump, 3. HPLC Pump, and 4. Gas Chromatography.

A Bench-Scale Hydrate-based CO2 Sequestration Prototype

- **Custom Designed New Fume Hood Commissioned at Upstream Lab**

06

महत्वपूर्ण आयोजन

IMPORTANT EVENTS

6.1 स्थापना दिवस / Foundation Day

6.1.1 सीएसआईआर–भापेसं स्थापना दिवस, 14 अप्रैल, 2023 / CSIR-IIP Foundation Day, April 14, 2023

CSIR-Indian Institute of Petroleum celebrated its 64th Foundation Day and Dr BR Ambedkar Jayanti on 14th April 2023. The event was marked as a part of CSIR-IIP's "One Week One Lab" campaign. Shri Arun K Singh, Chairman, ONGC Group, graced the occasion as Chief Guest, while Shri Khajan Das, MLA (Rajpur), was the Guest of Honour. Subsequently, Dr Anjan Ray, Director CSIR-IIP, welcomed the guests and provided the details concerning the planned events as part of the "One Week One Lab" campaign. He also explained the importance and significance of the new facilities like India's first D-methanol plant, FTL and Up-stream lab that will be inaugurated on this auspicious day.

In his address, Shri Arun Kumar Singh, Chairman ONGC group, said that Science and Technology in the recent era has played a vital role in our society. He cited the example of Google search that can provide instantaneous information to everyone irrespective of their status. He also mentioned that the next 30 years would grow for the Nation by following the 4D's like Demographic, Digitalization, Decarbonization and Deglobalization (partial). He said that India has tremendous opportunities to convert Crude to Chemicals and unconventional & Renewable energy resources for the self-reliance of the Nation. He noted that IIP could work on the Crude to Petchem (Petrochemical) and develop energy-efficient processes to reduce the energy intensity that will also help decrease the carbon footprints.

6.1.2 वैऔअप स्थापना दिवस समारोह, 4 अक्तूबर 2023/ CSIR Foundation Day Celebrations 4th October 2023

The Council of Scientific and Industrial Research, established in 1942, has emerged as India's largest research and development organization. Having a pan-India presence, CSIR covers a broad spectrum of science and technology and is the pioneer of India's intellectual property movement and noteworthy S&T human resource development.

CSIR-Indian Institute of Petroleum, one of the premier institutes of CSIR, situated at Dehradun, celebrated 82st CSIR Foundation Day on 4th October 2023. We use this opportunity to take pride in the glorious past and exciting future of our parent organization and rededicate ourselves in service of the Nation.

Prof. Durgesh Pant, DG, UCOST graced the occasion as Chief Guest and delivered the Foundation Day lecture. A Cultural Evening was also arranged by the students /wards of IIP employees & employees.

6.1.3 Open Day at CSIR-IIP on the Occasion of CSIR Foundation Day Celebration 26th September 2023

The Council of Scientific & Industrial Research (CSIR), established by the Government of India in 1942, celebrates its 81st Foundation Day today. The organization has a vast nationwide network of R&D laboratories working in disciplines ranging from radio and space physics, oceanography, geophysics,

chemicals, drugs, genomics, biotechnology and nano-technology to mining, aeronautics, instrumentation, environmental engineering and information technology.

CSIR-IIP, a constituent laboratory of CSIR, observed an Open Day on 26th September 2023 as a part of the Foundation Day celebrations. A group of 180 Students from all the KVs of Dehradun along with 20 Faculty Members.

The students also 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 2023 / Dr. Ambedkar Jayanti, April 14, 2023

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.

Shri Khajan Das remembered the struggle and efforts made by Dr B. R. Ambedkar to uplift women and social freedom for the Dalits. He also praised the Former Prime minister of India, the Late Shri Atal Bihari Bajpai, for announcing the Bharat Ratna to Babasaheb posthumously. He also praised the Institute not only for its scientific achievements but also for its contributions to society and ordinary people. He extended his best wishes for the future growth and achievements of the Institute.

6.2.2 राष्ट्रीय प्रौद्योगिकी दिवस, 11 मई , 2023 / National Technology Day Celebration 11 May, 2023

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 'Technology Day' today on 11th May 2023. Dr R K Sharma, Head Sustainability and Vice President India Glycols along with Young Entreprenure Sh. Rajat Jain, Founder Sunfox Technologies have agreed to be the Chief guest and Guest of Honour

6.2.3 विश्व पर्यावरण दिवस, 5 जून 2023 /World Environment Day, June 5, 2023

CSIR-Indian Institute of Petroleum, Dehradun, celebrated World Environment Day on 5th June 2023. The theme of the function was "Preventing Plastic Pollution".
The Chief Guest of the event was Sh. Anoop Nautiyal, Founder of the Social Development for Communities (SDC) Foundation, Uttarakhand. In his welcome address, Prof. R Pradeep Kumar Director, CSIR-IIP, emphasized the importance of climate change and the significance of Energy demand and supply in the Nation. He also informed the gathering that we need to utilize our resources judiciously, as they won't be available to us again once replenished.

Sh. Anoop Nautiyal, the Chief Guest of the function, delivered the World Environment Day Lecture on "The Perils of Plastic Waste". Shri Nautiyal informed the audience that nobody is 100 per cent perfect, but we can try to change our habits and minimize the use of single-use plastic in our homes. He also stated that it

is our collective social responsibility to encourage and educate youngsters, family and friends to restrict and minimize the use of plastics in our day-to-day life.

6.2.4 International Yoga Day-2023, 21 June, 2023

International Day of Yoga-2023 having the of "Yoga for Humanity", Y-break (Yoga break) was organized on 21st June, 2023.

6.2.5 स्वतंत्रता दिवस 15 अगस्त 2023 / Independence Day, August 15, 2023

भारतीय स्वतंत्रता की 77वीं वर्षगांठ के अवसर पर भारतीय पेट्रोलियम संस्थान, देहरादून में 15 अगस्त 2023 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 2024/ Republic Day Celebrations, January 26, 2024

सीएसआईआर–भारतीय पेट्रोलियम संस्थान, देहरादून में 26 जनवरी, 2024 को 75 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 2024 / National Science Day, February 28, 2024

AAGAZ-2" a Science Fest for Ph.D. students, project assistants, and trainees was organized on the occasion of National Science Day on 28.02.204.

6.3 राज्य व्यापी मिशन / State-wide Missions

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

सक्षम (सरंक्षण क्षमता महोत्व)–2023) has been continually organized by the Oil Industries namely IOCL, HPCL, BPCL, jointly with the Petroleum Conservation Research Association (PCRA). Likewise this year also we inaugurated the 'Oil & Gas Conservation Month 2023 Celebration' in our premises on 24th April, 2023. Shri Dhan Singh Rawat, Hon'ble Minister, Government of Uttarakhand, graced the occasion as Chief Guest.

6.3.2 Nature Walk, 16th April, 2023

The Nature Walk celebrating the biodiversity of the CSIR-IIP campus and learning the flora and fauna of the area and it ecological significance from expert environment enthusiasts was organized on 16th April, 2023 during the One Week One Lab (OWOL) event.

6.3.3 A SPIC MACAY Sarangi Concert, 24th April, 2023

CSIR-IIP, in association with SPICMACY Dehradun Chapter a musical evening was organized A SPIC MACAY Sarangi Concert with Sitar Maestro Vid. Sahana Banerjee and Sh. Mithilesh Kr Jha (on Tabla) on 24th April, 2023 at CSIR-IIP Lovraj Kumar Auditorium.

6.3.4 Himalayan Diwas, 15th September, 2024

CSIR-IIP Celebrated Himalayan Day on the 15th of September, 2023. Shri Sujit Kumar Mukherjee, IFS, Former Director Wildlife Institute of India, Dehradun was Special Guest and Dr.M.P.S. Bisht, Professor (Geology), HNB Garhwal University, Uttrakhand and Former Director, Uttarakhand Space Application Centre (USAC) graced the occasion as Chief Guest. Smt. Radha Chatterjee, Member Friends of Doon Society also attended the function.

6.4 ज्ञान और कौशल का प्रसार / Dissemination of Knowledge and Skill

6.4.1 Skill Development Training Programme

In its contribution towards skilling our work force for better productivity leading to better economic growth and a resilient economy as per the CSIR-Integrated Skill Initiative mandate , CSIR-IIP contributed through organizing various Skill Development Training programs for students, research scholars and corporate executives.

Sl No.	Name of the Skill Development Training	Duration /Dates	Qualification criteria	Overall Feedback Rating %
1	'Testing of Petroleum Products'	03/04/2023-21/04/2023	Msc Chemistry,BE / BTech Chemical	99.4
2	'Spectroscopic Analytical Techniques IR-NMR'	12/06/2023-23/06/2023	Msc Chemistry, M Pharm	88.9
3	'Analysis with Elemental, Microscopic and Thermo-gravimetric tools'	10/07/2023-21/07/2023	Msc Chemistry, M Pharm	87.6
4	'Analysis using Chromatography and Mass Spectrometry'	31/07/2023-11/08/2023	Msc Chemistry, M Pharm	88.5
5	'Testing of Petroleum Products'	03/10/2023-20/10/2023	Msc Chemistry,BE / BTech Chemical	85.1
6	'Spectroscopic Analytical Techniques IR-NMR'	15/01/2024-25/01/2024	Msc Chemistry, M Pharm	92.9
7	'Analysis using Chromatography and Mass Spectrometry'	15/01/2024-25/01/2024	Msc Chemistry, M Pharm	97.1

Whereas exposure to modern day infrastructure and activities in a typical R&D set-up enhanced interest and employability in scientific field for newly passed out students, for those already employed helped catering modern day work place challenges. Skill development training programs for students were mainly focused in the analytical sciences and Petroleum Testing area.

Key Achievements

Good participation observed from remote areas, specifically girl candidates. Skill Development Training program for student generated scientific temperament and enhanced interest towards Q/C, R&D and academia linked professions. Participants benefitted from earlier programs are serving in different institutions, including CSIR-IIP. We also contributed towards Qualification Packs (QPs) creation by Hydrocarbon Sector Skill Council (HSSC).

Recent Testimony :

Mr Ankit Pandey our first Skill Trainee received Young Scientist Award in Chemistry at the 18th Uttarakhand State Science Congress , Haldwani held on 28.02.2024.

Received award from Governor Uttarakhand

6.4.2 Major Jigyasa Activities

One-day "Artificial Intelligence (AI) & Analytical Techniques Awareness" Program, 26th July, 2023

A One-day "Artificial Intelligence (AI) & Analytical Techniques Awareness" program under Jigyasa 2.0 program was successfully organized for the students from Xth-XIIth class of Nancy International School, Doiwala, Dehradun on 26 July 2023 at CSIR-Indian Institute of Petroleum, Dehradun. The main objective of the program is to give exposure to students about Artificial Intelligence, and different analytical techniques used for the characterization of crude oil and related products, technologies developed for the utilization of non-edible vegetable oils, and used cooking oil.




Five-day Residential Programme under 'Jigyasa' programme organized for the students of Class XIth of Scindia Kanya Vidyalaya, Gwalior from 18th-22nd Sept 2023

The main objective of this Residential program is to give an opportunity to observe, and participate in the actual scientific work going on in the different research laboratories. This was one of a series of such programmes to be organized at various times of the year in the Institute.


Dr. Harender Singh Bish, Director IIP encouraged the girl students and reminded them as they are the pillar of the society and can contribute scientifically in the social, scientific and economical growth of India. Dr. Aarti, Jigyasa Coordinator, CSIR-IIP, Dehradun, brief the students about the Jigyasa program and different activities organized throughout the year under Jigyasa program. She also educated the students for Climate change due to the global warming and to control it by avoiding the over consumption of energy.

Under this Residential Summer Vacation Programme, students were grouped in batches of 3 each, and were attached to specific laboratories for experimental activities wherein the students participated in routine chores of the laboratory while learning about science. Students got an opportunity to interact with the Scientists and technical officers of CSIR-Indian Institute of Petroleum. Scientific lectures were delivered on Petrochemicals and Polymers, and on Nano catalysis to enhance the scientific temperament of students.

During this program students also visited various laboratories such as Adsorption & Membrane Separation lab, Advanced Crude Oil Research Centre and Waste Plastic to Fuels & Chemicals pilot plants. During the Valedictory function students have also given presentations on the research work they performed during the 5-Day Residential program.

One-day "IISF's 2023 Science Outreach" program under "Jigyasa 2.0 program" on 12th December, 2023

One-day "IISF's 2023 Science Outreach" program under "Jigyasa 2.0 program was successfully organized for the students from IXth-XIIth class of different government schools viz. GIC Baronwala, SPIC Karbari, GIC Khadri, SVMJ Dhalwala, Krishak Inter College, Shreeshambara of Dehradun region on 12th December 2023 at CSIR-Indian Institute of Petroleum, Dehradun. The main objective of the program is to give exposure to students about different analytical techniques used for the characterization of crude oil and related products, technologies developed for the utilization of non-edible vegetable oils, and used cooking oil.

On the occasion of National Science Day, "Lab Visit & Interaction with Scientist" was organized for students of Welhom Boys School, Dehradun on 28th February, 2024 under the Jigyasa program.

6.5 प्रचार आयोजन /Exposure Events

6.5.1 Students' Visits

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

- 60 Students of B.Tech from Deenbandhu Chhotu Ram University of Science & Technology, DCRUST, Murthal, Sonipat Haryana, along with their Faculty Members, visited CSIR-IIP on 6th October 2023
- 22 B.Sc. (Research) Biotechnology students from Shiv Nadar University (SNU) Delhi NCR and their faculty members visited CSIR-IIP on 13th October 2023.
- 30 Students of B.Sc./M.Sc./Ph.D Chemistry from Shri Guru Ram Rai University, Dehradun, along with their Faculty Members, visited CSIR-IIP on 17th October, 2023
- Shri Alok A. Dimri, High Commissioner of India to Brunei Darussalam – on State Attachment to Uttarakhand, visited CSIR-IIP on 20th December 2023 as a part of his Mid-Career Training Programme-III (MCTP-III) for Indian Foreign Service Officers
- A team of 28 Students of B.Tech Petroleum Engineering from DIT University Dehradun along with their Faculty Members visited CSIR-IIP on 17th January, 2024.
- 40 Diaspora youths of Indian origin from different countries visited CSIR-IIP under Know India Programme (KIP) of the Government of India, on 19th Feb. 2024
- A team of 30 Students of B.Sc. from JBIT College, Dehradun along with 2 Faculty Members visited CSIR-IIP on 22nd February, 2024
- A team of 20 Students of B.Pharm Final Year along with 2 Faculty Members from DIT, Dehradun visited our Institute on 5th March, 2024.
- 40 Scientist G rank officials from DRDO visited CSIR-IIP on the 6th of March, 2024
- Fulbright Outreach program for the Students, Project Staff, Research Fellows, and Permanent Staff on 14th March 2024.

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 participated in Energy Summit 2023 organized at UPES, Dehradun during 20-22 September, 2023
- CSIR-IIP participated in the CSIR-Expo 2023 on the occasion of CSIR Foundation Day, 26-27 September, 2023
- CSIR-IIP showcased its technologies at the Uttarakhand Vikas Pradarshini (Swadeshi Pradarshni) organized by Smruti Vikas Sansthan under the guidance of Swadeshi Jagran Manch at the Doon University from 16th-20th October 2023
- CSIR-IIP showcased its technologies of rural importance at the Field Technology Showcase in Champawat District, organized by the UCOST in collaboration with the Office of the Principal Scientific Adviser's AGNI Mission from 18th-19th October 2023
- CSIR-IIP participated in The Vibrant Uttarakhand exhibition at Exhibition Hall Prem Nagar Aashram, Haridwar Uttrakhand from 20th-22nd October 2023
- CSIR-IIP, participated in the 18th Uttarakhand State Science & Technology Congress (18th USSTC) during 8-9 February 2024 at Uttrakhand Open University (UoU) Haldwani in collaboration with Kumaun University and Uttarakhand Open University
- CSIR-IIP participated in the Vikasit Bharat Sankalp 2024 organised at Haridwar, during 21-23 February, 2024 and showcased it technologies and products at the expo

6.6 अनुसंधान प्रबंधन गतिविधियाँ /Research Management Events

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

The 53rd Research Council Meeting on 25th January, 2024. The Head of Divisions and the Institute's Technical and Administrative personnel attended the RC Meeting.

6..6.2 Dr Harender Singh Bisht takes over the Charge of the Director, CSIR-IIP, Dehradun on 4th August, 2023

Dr. Harender Singh Bisht assumed the charge of Director, CSIR-Indian Institute of Petroleum, Dehradun, today on 4th August, 2023. He took over the charge from Prof. Ramancharla Pradeep Kumar, who had been holding the additional charge of the Director, CSIR-Indian Institute of Petroleum since May 01, 2023.

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

6.7.1 CSIR-IIP: One Week One Lab Campaign

The CSIR-Indian Institute of Petroleum launched the One Week One Lab (OWOL) campaign to showcase its legacy and achievements to society. The campaign was initiated on 13th April 2023 and concluded on 19th April 2023. During the week-long campaign, ten different interactive events were organized to showcase and market the capabilities, expertise, and technological breakthroughs of CSIR-IIP. The programs included Stakeholders Meet, Industry and MSME Meet, Alumni Meet, PAN-CSIR collaboration showcase, Gram Chaupal, Student and Academia Connect, Nature Walk, and Interaction with the District and State Govt. functionaries of Uttarakhand.

Hon'ble Minister of State (I/C) S&T, Dr Jitendra Singh, Dr N. Kalaiselvi, DG CSIR, Sh. Arun Kr. Singh, Chairman ONGC Group, Dr S Chandrashekhar, Secretary DST, Dr. Durgesh Pant, DG UCOST, Air Marshal Alok Singh, AVSM, VSM, Air Officer-in-charge Maintenance (AoM), Sh. Sumit Sarkar, CEO CBDA Raipur, Ms Mercy Epao, Jt Sec. MSME, Sh. Khajan Das, MLA Raipur (Dehradun), Dr Ashish Lele, Director CSIR-NCL, Dr M. Parida, Director CSIR-CRRI, Dr Pradeep Kr. Ramancharla, Director CSIR-CBRI, and the Heads from the CSIR HQ graced the programs as the Chief Guest, Guest of Honour and Special Guests.

The events were attended by a large number of participants from Industry, Students and Teachers from Schools and Colleges, Gram pradhans, local entrepreneurs, farmers, District Administration and state government functionaries etc. The events were organized at India Habitat Centre, New Delhi, Bajrikot village Champavat, and CSIR-IIP campus at Dehradun to have widespread publicity and provide accessibility to the participants and attendees.

The major highlights of the campaign were;

- The Stakeholders meet to showcase the developmental journey of CSIR-IIP technologies from idea nucleation to its implementation in the industry,
- Sustainable Aviation in India & Industry Meet, focusing on the launch of the DILSAAF™ brand of sustainable fuel, along with the deliberations on collaborative developments between CSIR-IIP and various industry partners in overcoming specific technical challenges,
- The MSME Meet & PAN CSIR – Collaboration showcase presenting CSIR-IIP's outreach to its esteemed MSME partners and exhibiting its intra-CSIR collaborative research,
- The Gram Chaupal showcasing the scientific capabilities of CSIR based on rural technologies and proposing them for developing the 'Adarsh Champawat' model,
- The Institute Academia connect, building the bridges between the Institutes and universities with CSIR-IIP scientists to understand the challenges and opportunities in science and engineering,
- The JIGYASA student-scientist connect program connecting school students with scientists and extending the student's classroom learning with a very well-planned research laboratory-based learning,
- The Alumni meet cum workshop providing the platform for brainstorming the challenges and opportunities in the Oil and Gas industry and futuristic research approaches for clean and sustainable energy with the Industry persons trained and associated with CSIR-IIP,
- The 64th Foundation Day of CSIR-IIP along with the Ambedkar Jayanti, marking the inaugurations of the Upstream Research Laboratory and Fuel Testing Laboratory along with the foundation stone laying of the D-4 Methanol Demonstration Plant,
- The Nature Walk celebrating the biodiversity of the CSIR-IIP campus and learning the flora and fauna of the area and its ecological significance from expert environment enthusiasts, and
- The interaction with the district authorities and state government functionaries to showcase and propose the offerings of CSIR-IIP towards the development of Uttarakhand State

Hon'ble Minister Dr Jitendra Singh appreciated the initiatives taken by CSIR-IIP and complimented it for being the only laboratory in the country that celebrates not wealth but waste. He congratulated the team for working on the next-generation challenge of converting waste to wealth. The minister, in his address, highlighted that "Waste is the wealth of the coming times", and it is in line with Prime Minister Narendra Modi's vision of India being central to global environmental action.

These events were well captured and posted on print and social media platforms. The initiatives undertaken through these programs were appreciated by the general audience, industrialists, technocrats, stakeholders, students and the scientific community. The campaign provided a takeaway for every category of the audience who attended the program physically and those who joined through live streams. The OWOL campaign concluded on 19th April 2023.


Sustainable Aviation in India
& Industry Meet
17th April 2023
One Week One Lab
@ CSIR IIP Dehradun
One Lab
IRSME Meet &
PAN CSIR – Collaborations
18th April 2023


Supported by
Presentations


R IIP Dehradun
Centre, New Delhi
Press Conference

6.7.2 A Two Day Workshop on Scientific Social Responsibility (SSR), 21-22 December, 2023

CSIR-IIP & Science and Engineering Research Board (SERB) Scientists organized a two day Workshop on Scientific Social Responsibility (SSR) during 21-22 December, 2023. The main objective of the Workshop was to develop scientific social responsibility (SSR) policy to benefit S&T stakeholders, especially under-resourced researchers.

6.8 कर्मचारी जागरूकता अभियान/Employee Awareness Drives

6.8.1 स्वच्छता पखवाड़ा 2023

Swachata Pakhwada was celebrated during 01.05.2023 to 15.05.2023. A variety of events were organized during the fortnight.

6.8.2 सतर्कता जागरूकता सप्ताह, 30 अक्टूबर – 5 नवंबर, 2023 / Vigilance Awareness Week, 30 Ocotber – 5 November, 2023

In compliance to CVO, CSIR vide letters No. 15-6(88)/2023-O&M-(Vig.) dated 14th Aug., 2023 and dated 12.09.2023 enclosing therewith CVC Circular No. 06/08/2023 dated 02.08.2023 and Circular no. 08/09/23 (S.No. 023/VGL/035) dated 11.09.2023 respectively, wherein instruction have been issued regarding Preventive Vigilance Activities during three months campaign from (16th August 2023 to 15th November 2023) as a precursor to Vigilance Awareness Week, 2023 and for activities during Vigilance Awareness Week, 2023 from 30.10.2023 to 05.11.2023, precursor activities were started from 24.08.2023 by displaying / distributing A3 size posters on the topics integrity and eradication of corruption etc. in all Sections in Administration and Divisions and on different important locations of the Institute. Thereafter, Public Interest Disclosure and Protection of Informers (PIDPI) posters (3x2 ft size) were also displayed in bilingual language on important locations viz. Main Gate, Reception, all Sections of Administration, Notice Boards, ESD Building, ETL Lab., Training Centre, Canteen Hall, Guest House. One video/Jingle on PIDPI Resolution was uploaded on Institute website and also played during Vigilance Awareness Pledge ceremony in Auditorium of the Institute. A lecture was also arranged on the topic "Fairness, Integrity and Transparency in Public Procurement" delivered by Sh Tariq Badar, Ex-CoSP, CSIR-NPL on 13.09.2023 at 11.00 A.M. onwards.

In this context 03 more lectures were arranged during the above three months duration. All the lectures were conducted in Hybrid Mode. The purpose of the lecture are Capacity Building and to train the officials to impart necessary competency and develop skill for smooth and effective functioning of the organization. The week began with the Pledge taking ceremony at 11.00 am on 30.11.2023. The pledge was administrated by the Director, CSIR-IIP in Hindi and English. The following were present during pledge ceremony viz. regular employees/ Scientists/ Officers/Research Scholars, Project Assistants and Casual Workers (Security Staff, Wild Growth Cutting Staff and Sweeping/Cleaning Staff etc.) of this Institute (approx. 150 in number). In this occasion the PIDPI Resolution video was also displayed for dissemination of PIDPI provision. Staff members 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 this year the theme was **"भ्रष्टाचार का विरोध करेंय राष्ट्र के प्रति समर्पित रहें"** "Say no to corruption; commit to the Nation". Few photographs of the events are given below:

Banners Displayed

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

Integrity Pledge administered by Director, CSIR-IIP

6.8.3 Swachchta Abhiyaan Celebrated, 2nd October, 2023

154th Birth Anniversary of Mahatma Gandhi is being celebrated on 2nd October, 2023. It was been decided to carry out a Swachhata Abhiyaan at CSIR-IIP under which single use plastic will be picked up from the colony and will be handed over to the waste plastic team.

6.8.4 Rashtriya Ekta Diwas Celebrated, October 31, 2023

As per GOI instructions, Rashtriya Ekta pledge was taken by the employees of the Institute on October 31, 2023, on the occasion of the birthday of Sardar Vallabhbhai Patel.

6.8.5 The Constitution Day Celebrated, November 26, 2023

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, 2023.

07

अनुसंधान एवं प्रबंधन निकाय

RESEARCH & MANAGEMENT BODIES

7.1 सीएसआईआर–भापेसं के अनुसंधान परिषद के सदस्य / Research Council Members of CSIR&IIP

सीएसआईआर–भापेसं के 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
M804 Jaipuria Sunrise Greens,
Ahinsa Khand,
Indirapuram, Ghaziabad 201 014.

Ms Sukla Mistry
Director (Refineries), Indian Oil, New Delhi
Indian Oil Corporation Ltd. Scope Complex, Core, 2
7 Lodhi Institutional Area, Lodhi Road
New Delhi -110 049

Prof Jayesh Bellare
Department of Chemical Engineering
IIT Bombay, Powai
Mumbai - 400 076, India

एजंसी प्रतिनिधि/Agency Representative

Dr Alka Sharma,
Scientist H,
Department of Biotechnology
6th-8th Floor, Block 2 and 4th-5th Floor,
Block 3, CGO Complex, Lodhi Road
New Delhi – 110 003, India

डीजी–नॉमिनी/DG's Nominee

Shri Anoj Kumar Chadar
Senior Principal Scientist
Technology Management Directorate (TMD)
Vigyan Suchan Bhawan (CSIR-NIScPR Building)
14 Satsang Vihar Marg
New Delhi – 110067

सहोदरी प्रयोगशाला/Sister Laboratory

Dr.Ashish Lele
Director
CSIR-National Chemical Laboratory
Dr. Homi Bhabha Road,
Pune - 411 008

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. 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

डॉ. हरेंद्र सिंह बिष्ट,
निदेशक

आंतरिक सदस्य

डॉ. एस के गांगुली
मुख्य वैज्ञानिक

डॉ सुमन लता जैन
वरिष्ठ प्रधान वैज्ञानिक

डॉ. ए. हरीश
वैज्ञानिक

डॉ. सत्यम कुमार प्रजापति
वैज्ञानिक

श्री राकेश कुमार, एसटीओ
वरिष्ठ तकनीकी अधिकारी

डॉ. सनत कुमार, प्रमुख, आरपीबीडी
मुख्य वैज्ञानिक

नियंत्रक वित्त एव लेखा
वित्त एव लेखा अधिकारी

प्रशासन नियंत्रक
सन्योजक सदस्य

बाहरी सदस्य

प्रो. प्रदीप कुमार रमनचारला
निदेशक
सीएसआईआर– केंद्रीय भवन अनुसंधान संस्थान
रूड़की

08

राजभाषा

OFFICIAL LANGUAGE

8.0 राजभाषा / Official Language

8.1 हिंदी माह समारोह

8.1.1 माननीय संसदीय राजभाषा समिति की दूसरी उपसमिति द्वारा दिनांक 26/05/2023 को संस्थान का निरीक्षण किया गया।

इस अवसर पर निदेशक, सीएसआईआर – आईआईपी ने संस्थान की पत्रिका 'विकल्प' की प्रति माननीय सदस्यों को भेंट की। माननीय सदस्यों ने विकल्प की सराहना की। इस अवसर पर संस्थान में राजभाषा हिंदी के कार्यान्वयन और प्रचार – प्रसार के लिए किए जा रहे कार्यों संबंधी एक प्रदर्शनी भी लगाई गई थी।

8.1.2 सीएसआईआर – भारतीय पेट्रोलियम संस्थान, देहरादून में हिंदी माह – 2023 का आयोजन

सीएसआईआर–भारतीय पेट्रोलियम संस्थान में दिनांक 01 से 30 सितंबर 2023 तक हिंदीमाह 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। हिंदी माह 2023 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 ई–मेल, व्हाट्स एप द्वारा एक प्रश्न पूछा जाता था जिसका उत्तर उन्हें ऑनलाइन गूगल प्रपत्र पर ही देना होता था। मुख्यतरू इसमें पूछे जाने वाले प्रश्न हिंदी 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 हिंदी भाषा का ही प्रयोग करना होता है। इस प्रतियोगिता में संस्थान के अधिकतम कर्मचारियों ने भाग लिया। इसमे कुल 19 प्रश्न पूछे गए थे। यह प्रतियोगिता संस्थान की हिंदी की सर्वाधिक लोकप्रिय प्रतियोगिता है। संस्थान दैनिक कार्यों में हिंदी के प्रयोग में उत्तरोत्तर वृद्धि तथा प्रभावी राजभाषा कार्यान्वयन के लिए प्रतिबद्ध है और इसी दिशा में संस्थान में दिनांक 14 सितंबर 2023 को हिंदी दिवस के अवसर पर भारत के माननीय गृह मंत्री श्री अमित शाह जी का संदेश सभी अधिकारियों, कर्मचारियों में परिचालित किया गया। इसके अतिरिक्त संस्थान के कर्मचारियोंने अखिल भारतीय राजभाषा सम्मेलन, पुणे का ऑनलाइन प्रसारण भी देखा। निदेशक, आईआईपी द्वारा सभी वैज्ञानिकों, अधिकारियों तथा कर्मचारियों को हिंदी में अधिक से अधिक कार्य करने की अपील की गई । दिनांक 21 सितंबर, 2023 को संस्थान में कार्यरत ग्रुप सी–एमटीएस तथा तकनीशियन । और II के लिए चित्र वर्णन प्रतियोगिताकाआयोजनकिया गया। दिनांक 25 सितंबर ,2023 को संस्थान के सभी कर्मचारियों के लिए एक मोबाइल श्रुत टंकण प्रतियोगिता का आयोजन किया गया। इस वर्ष लिप्यंतरण एवं वर्तनी शुद्धता के कौशल की भी परीक्षा के मद्देनजर श्रुत टंकण का प्रारूप अन्य वर्षों से थोड़ा भिन्न रखते हुए टंकण सामग्री की लिपि को अंग्रेजी में रखा गया। कर्मचारियों ने भी इस की सराहना करते हुए पूरे उत्साह के साथ इस में भाग लिया और यथा निर्देश दी गई सामग्री का लिप्यंतरण एवं श्रुत टंकण कर व्हाट्स II ग्रुप पर भेजा। इसके अतिरिक्त दिनांक 19 सितंबर, 2023 को एक निबंध प्रतियोगिता का भी आयोजन किया गया। इस प्रतियोगिता हेतु इस वर्ष चंद्रयान–3, जी–20 शिखर सम्मेलन, भारत की नई शिक्षा नीति जैसे समकालीन विषयों के साथ साथ तकनीकी एवं वैज्ञानिक विषयों जैसे 'वैकल्पिक ईंधन: एक उज्ज्वल भविष्य' आदि विषय भी रखे गए थे। इस निबंध प्रतियोगिता का माध्यम ऑनलाइन तथा ऑफलाइन दोनों ही रखा गया था। हिन्दी माह का समापन संस्थान के वैज्ञानिक, तकनीकी कर्मचारियों के लिए एक 'वैज्ञानिक, तकनीकी पावर पॉइंट प्रस्तुतीकरण प्रतियोगिता के आयोजन के साथ हुआ। इसमें संस्थान वैज्ञानिको तथा तकनीकी कर्मचारियों के साथ–साथ शोध छात्रों ने भी बहुत ही उत्साह से भाग लिया।।

अन्य :

- संस्थान की हिंदी पत्रिका विकल्प कापुनरू प्रकाशन प्रारंभ।
- संस्थान में राजभाषा हिंदी के प्रचार – प्रसार और अधिकाधिक प्रयोग के उद्देश्य से तिमाही बैठको और हिंदी कार्यशालाओं का नियमित आयोजन।
- मुख्यालय और संस्थान के आई टी प्रमुख के सहयोग से परिचय –ई– ऑफिस प्रचालन प्रशिक्षण हिंदी माध्यम से आयोजित किया गया।
- नगर राजभाषा कार्यान्वयन समिति की बैठकों एवं कार्यक्रमों में संस्थान की सक्रिय भागीदारी रहती है। दिनांक 22 नवंबर, 2023 को आयोजित बैठक में निदेशक ने भाग लिया तथा इस बैठक में संस्थान की पत्रिका 'विकल्प' को श्रेष्ठ पत्रिकाओं की श्रेणी में तृतीय पुरस्कार प्रदान किया गया।

- दिनांक 22 नवंबर, 2023 को आयोजित बैठक में संस्थान द्वारा प्रकाशित नगर राजभाषा कार्यान्वयन समिति की पत्रिका देवश्लोक का भी विमोचन किया गया और पिछले तीन वर्षों से देवश्लोक के प्रकाशन और सम्पादन के सतत सहयोग के लिए संस्थान और देवश्लोक के संपादक श्री सोमेश्वर पांडेय, वरिष्ठ हिंदी अधिकारी की सराहना की गई।

- संस्थान में प्रत्येक माह सभी र्भाग प्रमुख के लिए एक कार्यशाला की जाती है जिसमें राजभाषा कार्यान्वयन की स्थिति और बेहतर कार्यान्वयन और हिंदी के सहज और अधिकाधिक प्रयोग संबंधी उन्हें प्रशिक्षण दिया जाता है तथा ऑनलाइन टूल्स की जानकारी दी जाती है तथा उन्हें हिंदी के प्रयोग में आ रही कठिनाइयों का समाधान किया जाता है।

- इसके अतिरिक्त देहरादून में आयोजित शब्दावली (वैली ऑफ वर्डस) साहित्य सम्मेलन 2023 में भी संस्थान की सक्रिय सहभागिता रही है।।

8.1.3 विश्व हिन्दी दिवस तथा नगर राजभाषा कार्यान्वयन समिति देहरादून के तत्वावधान में 'काव्यपाठ' प्रतियोगिता का आयोजन

सीएसआईआर– भारतीय पेट्रोलियम संस्थान में विश्व हिन्दी दिवस के उपलक्ष में दिनांक 30 जनवरी, 2024 को संस्थान के डॉ. लवराज कुमार प्रेक्षागृह में एक कार्यक्रम आयोजित किया गया। संस्थान के समस्त अधिकारियों, कर्मचारियों एवं कनिष्ठ, वरिष्ठ अनुसंधान अध्येताओं के साथ–साथ अनुबंध कर्मियों ने भी इस कार्यक्रम में भाग लिया। समादृत वरिष्ठ साहित्यकार प्रो. जयवंती डिमरी तथा श्री 'अंबर' खरबन्दा इस कार्यक्रम के मुख्य अतिथि थे। संस्थान के निदेशक डॉ. हरेन्द्र सिंह बिष्ट ने इस कार्यक्रम की अध्यक्षता की।
दीप–प्रज्वलन एवं सरस्वती वंदना के साथ कार्यक्रम का शुभारंभ हुआ। तत्पश्चात संस्थान के निदेशक डॉ. हरेन्द्र सिंह बिष्ट ने अतिथियों को पौधों एवं शॉल भेंट कर उनका स्वागत किया।

श्री सोमेश्वर पाण्डेय, वरिष्ठ हिन्दी अधिकारी द्वारा दोनों अतिथियों के विस्तृत परिचय के साथ उपस्थित सभी कर्मचारियों ने तालियों के साथ उनकाअभिनंदन किया। इस कार्यक्रम में दो सत्र आयोजित किए गए। प्रथम सत्र में नगर राजभाषा कार्यान्वयन समिति (का.2) के तत्वावधान में एक काव्यपाठ प्रतियोगिता का आयोजन किया तथा दूसरे सत्र में हिन्दी माह 2023 के दौरान आयोजित की गई प्रतियोगिताओं के विजेताओं को पुरस्कार वितरण कर सम्मानित किया गया। संस्थान के निदेशक डॉ. हरेन्द्र सिंह बिष्ट ने संस्थान के सभी कर्मचारियों को विश्व हिन्दी दिवस की शुभकामनाएं एवं बधाई दी। उन्होंने कहा की हिन्दी भारत के जनमानस की भाषा है। अगर यह विज्ञान एवं तकनीक की भाषा बनती है तो प्रत्येक व्यक्ति तक ज्ञान का प्रसार संभव हो सकेगा। अतः हिन्दी का विकास हम सब की सामूहिक जिम्मेदारी है। उन्होंने इस समारोह के आयोजन में शामिल संस्थान के प्रत्येक कर्मचारी एवं राजभाषा अनुभाग की सराहना की।इस अवसर पर संस्थान की हिन्दी पत्रिका 'विकल्प' का विमोचन भी किया गया।
त्पश्चात कार्यक्रम को आगे बढ़ाते हुए काव्यपाठ प्रतियोगिता की शुरुआत की गई। नराकास के तत्वावधान में आयोजित इस प्रतियोगिता में संस्थान के कर्मचारियों के साथ – साथ नराकास देहरादून के अन्य सदस्य कार्यालयों के प्रतिनिधियों ने भी भाग लिया।

इस अवसर पर मुख्य अतिथि प्रो. जयवंती डिमरी तथा श्री 'अंबर' खरबन्दा ने भी क्रमशः दर्शकों को संबोधित किया। प्रो. जयवंती डिमरी ने अपने विश्वविद्यालय के अध्यापन काल के अनुभवों के साथ – साथ अपनी साहित्यिक यात्रा की अनुभूतियों और उपलब्धियों को सबके साथ साझा किया। उन्होंने बताया कि अंग्रेजी भाषा की प्रोफेसर होते हुए उनका हिन्दी से विशेष लगाव रहा है। उन्होंने उपस्थित सभी दर्शकों को हिन्दी को अपने जीवन में लाने की प्रेरणा दी। तदुपरांत विख्यात गजलकार श्री 'अंबर' खरबन्दा जी ने अपनी गजलों से पूरे सभागार में उत्साह का संचार कर दिया। श्री खरबन्दा जी हिन्दी– उर्दू साहित्य में एक बड़ा नाम हैं। उनके कई गजल संग्रह प्रकाशित हो चुके हैं। साथ ही उन्हें हिन्दी साहित्य जगत के कई उत्कृष्ट सम्मानों से नवाजा जा चुका है। उन्होंने इस आयोजन के लिए निदेशक, भारतीय पेट्रोलियम संस्थान तथा सभी सम्बद्ध को बधाई दी।

दूसरे सत्र में हिन्दी माह 2023 के प्रतिभागियों हेतु पुरस्कार वितरण का आयोजन किया गया। हिन्दी माह में ऑनलाइन दैनिक प्रश्नोत्तरी के साथ निबंध, चित्र वर्णन, मोबाइल हिन्दी श्रुतटंकण, वैज्ञानिक, तकनीकी प्रस्तुतीकरण आदि कई प्रतियोगिता का आयोजन किया गया था। इन प्रतियोगिताओं में स्थाई कर्मचारियों से लेकर अनुसंधान अध्येताओं तक ने बढ़– चढ़ कर भाग लिया। सभी विजेताओं को मुख्य अतिथि के कर कमलों द्वारा पुरस्कार वितरण किए गए। इस अवसर पर इन प्रतियोगिताओं के निर्णायकों को भी सम्मानित किया गया। कार्यक्रम के अंत में आई आई पी के मुख्य वैज्ञानिक श्री एन. विश्वनाधम द्वारा वरिष्ठ साहित्यकार प्रो. जयवंती डिमरी तथा श्री 'अंबर' खरबन्दा को उनकी साहित्य सेवा के लिए संस्थान की ओर से स्मृति चिन्ह प्रदान कर सम्मानित किया गया। संस्थान के प्रशासनिक अधिकारी श्री सी. ए. बोध द्वारा धन्यवाद ज्ञापन के साथ यह कार्यक्रम सम्पन्न हुआ।।

09

सीएसआईआर–भापेसं परिवार

THE CSIR-IIP FAMILY

9.0 सीएसआईआर–भापेसं परिवार / The CSIR-IIP Family

31 मार्च 2024 को संस्थान के कर्मचारीगण की स्थिति / Staff as on March 31, 2024

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	डॉ. सनत कुमार	मुख्य वैज्ञानिक
7	डॉ. थल्लड़ा भास्कर	मुख्य वैज्ञानिक
8	डॉ. समीर कुमार मैती	मुख्य वैज्ञानिक
9	श्री सुनील कुमार पाठक	मुख्य वैज्ञानिक
10	श्री राजेश कुमार	वरिष्ठ प्रधान वैज्ञानिक
11	डॉ. सुमन लता जैन	वरिष्ठ प्रधान वैज्ञानिक
12	डॉ. ओ.पी. खात्री	वरिष्ठ प्रधान वैज्ञानिक
13	डॉ. जी डी ठाकरे	वरिष्ठ प्रधान वैज्ञानिक
14	डॉ. देवेंद्र सिंह	वरिष्ठ प्रधान वैज्ञानिक
15	डॉ. राजराम बल	वरिष्ठ प्रधान वैज्ञानिक
16	डॉ. नीरज आत्रे	वरिष्ठ प्रधान वैज्ञानिक
17	श्री सूर्यदेव कुमार	वरिष्ठ प्रधान वैज्ञानिक
18	डॉ. सौमेन दासगुप्ता	वरिष्ठ प्रधान वैज्ञानिक
19	डॉ. सुनिल कुमार	वरिष्ठ प्रधान वैज्ञानिक
20	श्री एल रोबीन्द्रो	वरिष्ठ प्रधान वैज्ञानिक
21	डॉ. अजय कुमार	वरिष्ठ प्रधान वैज्ञानिक
22	डॉ. अतुल रंजन	प्रधान वैज्ञानिक
23	श्री विटीसन कामई	प्रधान वैज्ञानिक
24	डॉ. डी वी नायक	प्रधान वैज्ञानिक
25	डॉ. बबीता बेहरा	प्रधान वैज्ञानिक
26	डॉ. राजकुमार सिंह	प्रधान वैज्ञानिक
27	श्री मृत्युंजय शुक्ला	प्रधान वैज्ञानिक
28	डॉ. अंकुर बोर्डोलोई	प्रधान वैज्ञानिक
29	श्री स्वप्निल दिवेकर	प्रधान वैज्ञानिक
30	श्री पंकज कुमार आर्य	प्रधान वैज्ञानिक
31	डॉ. देबाशीश घोष	प्रधान वैज्ञानिक
32	श्री प्रसेंजित घोष	प्रधान वैज्ञानिक
33	श्री सलीम अख्तर फारूकी	प्रधान वैज्ञानिक
34	डॉ. पंकज कुमार कन्नौजिया	प्रधान वैज्ञानिक

क्रम सं	कर्मचारी का नाम	पदनाम
35	डॉ. दीपतारका दासगुप्ता	प्रधान वैज्ञानिक
36	डॉ. आरती	प्रधान वैज्ञानिक
37	डॉ. दीप्ति अग्रवाल	प्रधान वैज्ञानिक
38	डॉ. सुनील कुमार सुमन	प्रधान वैज्ञानिक
39	डॉ. इंद्रजीत कुमार घोष	प्रधान वैज्ञानिक
40	डॉ. शुभम पाल	प्रधान वैज्ञानिक
41	डॉ. भव्या बी	प्रधान वैज्ञानिक
42	डॉ. उमेश कुमार	प्रधान वैज्ञानिक
43	डॉ. गौरव गुप्ता	प्रधान वैज्ञानिक
44	श्री बी नीलम नायडू	प्रधान वैज्ञानिक
45	डॉ. श्रीणीवास पडाला	प्रधान वैज्ञानिक
46	डॉ. रचा सूर्य मुराली	प्रधान वैज्ञानिक
47	डॉ. शैलेश कुमार सिंह	वरिष्ठ वैज्ञानिक
48	डॉ. गणेश नारायण नाईक	वरिष्ठ वैज्ञानिक
49	डॉ. बीपुल सरकार	वरिष्ठ वैज्ञानिक
50	डॉ. प्रणब दास	वरिष्ठ वैज्ञानिक
51	डॉ. अविनाश पालोडकर	वरिष्ठ वैज्ञानिक
52	डॉ. इन्दु शेखर	वरिष्ठ वैज्ञानिक
53	श्री अंकुश बिंदवाल	वरिष्ठ वैज्ञानिक
54	डॉ. सुधाकर रेड्डी	वरिष्ठ वैज्ञानिक
55	श्री अविनाश म्हेत्रे	वरिष्ठ वैज्ञानिक
56	डॉ. ए. सेल्वामणि	वैज्ञानिक
57	डॉ. ओजस्वी	वैज्ञानिक
58	डॉ. अनूप ताथोड	वैज्ञानिक
59	डॉ. टी सेंथिलकुमार	वैज्ञानिक
60	डॉ. प्रेम लामा	वैज्ञानिक
61	डॉ. वी चंद्रशेखर पाल्ला	वैज्ञानिक
62	डॉ. तुहिन खान	वैज्ञानिक
63	डॉ. नानोजी इसलावथ	वैज्ञानिक
64	डॉ. कीर्तिका कोहली	वैज्ञानिक
65	डॉ. भरत सिंह राना	वैज्ञानिक
66	डॉ. प्रकाशईयाह 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	डॉ. आर.सी. सक्सेना	प्रधान तकनीकी अधिकारी
3	श्री हरिचन्द सिंह	प्रधान तकनीकी अधिकारी
4	श्री डी.के. पांडे	प्रधान तकनीकी अधिकारी
5	डॉ. सूचिस्मिता बेंजवाल	प्रधान तकनीकी अधिकारी
6	डॉ. घनश्याम ठक्कर	वरिष्ठ तकनीकी अधिकारी (3)
7	श्री सी.डी. शर्मा	वरिष्ठ तकनीकी अधिकारी (3)
8	श्री सेठपाल सिंह	वरिष्ठ तकनीकी अधिकारी (3)
9	श्री सुनिल कुमार	वरिष्ठ तकनीकी अधिकारी (3)
10	श्री राकेश कुमार	वरिष्ठ तकनीकी अधिकारी (3)
11	श्री संदीप सरन	वरिष्ठ तकनीकी अधिकारी (3)
12	श्री सतीश कुमार	वरिष्ठ तकनीकी अधिकारी (3)
13	श्री जगदीश कुमार	वरिष्ठ तकनीकी अधिकारी (3)
14	श्री मनोज कुमार	वरिष्ठ तकनीकी अधिकारी (3)
15	श्री विनीत सूद	वरिष्ठ तकनीकी अधिकारी (3)
16	श्री राकेश कुमार जोशी	वरिष्ठ तकनीकी अधिकारी (3)
17	श्री सरवानन्द तिवारी	वरिष्ठ तकनीकी अधिकारी (2)
18	श्री एस.एन. यादव	वरिष्ठ तकनीकी अधिकारी (2)
19	श्री राजिन्दर बडोला	वरिष्ठ तकनीकी अधिकारी (2)
20	डॉ. कमल कुमार	वरिष्ठ तकनीकी अधिकारी (2)
21	श्री अमित शर्मा	वरिष्ठ तकनीकी अधिकारी (1)
22	श्री ओ.पी. शर्मा	वरिष्ठ तकनीकी अधिकारी (1)
23	डॉ. निशा	वरिष्ठ तकनीकी अधिकारी (1)
24	श्रीमति रेखा चौहान	वरिष्ठ तकनीकी अधिकारी (1)
25	श्री सुंदराम शर्मा	वरिष्ठ तकनीकी अधिकारी (1)
46	डॉ. ज्योति पोरवाल	वरिष्ठ तकनीकी अधिकारी (1)
27	डॉ. प्रवीण कुमार खत्री	वरिष्ठ तकनीकी अधिकारी (1)
28	डॉ. मनीषा सहाय	वरिष्ठ तकनीकी अधिकारी (1)
29	डॉ. रोहित कुमार	वरिष्ठ तकनीकी अधिकारी (1)
30	डॉ. प्रदीप कुमार	वरिष्ठ तकनीकी अधिकारी (1)
31	श्री विशवास सैनी	वरिष्ठ तकनीकी अधिकारी (1)
32	श्रीमति पूजा यादव	वरिष्ठ तकनीकी अधिकारी (1)
33	श्रीमति संध्या जैन	वरिष्ठ तकनीकी अधिकारी (1)
34	श्री यशवीर सिंह मीणा	वरिष्ठ तकनीकी अधिकारी (1)

क्रम सं	कर्मचारी का नाम	पदनाम
35	श्रीमति कमला यादव	वरिष्ठ तकनीकी अधिकारी (1)
36	श्री मनोज कुमार	वरिष्ठ तकनीकी अधिकारी (1)
37	श्री एल. एन. शिवकुमार कोंथाला	वरिष्ठ तकनीकी अधिकारी (1)
38	श्री पियूष गुप्ता	वरिष्ठ तकनीकी अधिकारी (1)
39	श्रीमति रश्मी	वरिष्ठ तकनीकी अधिकारी (1)
40	डॉ. रघुवीर सिंह	वरिष्ठ तकनीकी अधिकारी (1)
41	डॉ. दीपेंद्र त्रिपाठी	वरिष्ठ तकनीकी अधिकारी (1)
42	डॉ. वी. भानु प्रसाद	वरिष्ठ तकनीकी अधिकारी (1)
43	श्री गोरधन जैन	वरिष्ठ तकनीकी अधिकारी (1)
44	श्री कसीना डी.पी. लक्ष्मी कुमार	तकनीकी अधिकारी
45	श्री जितेंद्र कुमार	तकनीकी अधिकारी
46	श्री अमित कुमार	तकनीकी अधिकारी
47	श्री वैभव	तकनीकी अधिकारी
48	श्री मुदावत रवि	तकनीकी सहायक
49	श्री रोहित	तकनीकी सहायक
50	श्री हेमन्त कुमार साहू	तकनीकी सहायक
51	श्री राहुल कुमार	तकनीकी सहायक

9.1.3 तकनीकी कर्मचारीगण समूह–II / Technical Staff Group-II

क्रम सं	कर्मचारी का नाम	पदनाम
1	श्री टी.सी. शर्मा	वरिष्ठ तकनीशियन (2)
2	श्री दीप चंद	वरिष्ठ तकनीशियन (2)
3	श्री एन.एन. बहुगुणा	वरिष्ठ तकनीशियन (2)
4	श्री परमजीत सिंह	वरिष्ठ तकनीशियन (2)
5	श्री राजीव शर्मा	वरिष्ठ तकनीशियन (2)
6	श्री रजनीश भटनागर	वरिष्ठ तकनीशियन (2)
7	श्रीमति अंजलि भटनागर	वरिष्ठ तकनीशियन (2)
8	श्री अनिल कुमार	वरिष्ठ तकनीशियन (2)
9	श्री राजपाल सिंह	वरिष्ठ तकनीशियन (2)
10	श्री एन.के. रावत	वरिष्ठ तकनीशियन (2)
11	श्री संजीव कुमार	वरिष्ठ तकनीशियन (1)
12	श्री मयंक मिश्रा	वरिष्ठ तकनीशियन (1)
13	श्री प्रदीप सिंह नेगी	वरिष्ठ तकनीशियन (1)
14	श्री देवेंद्र सिंह बटोला	वरिष्ठ तकनीशियन (1)
15	श्री बिनोद कुमार	वरिष्ठ तकनीशियन (1)

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

9.1.4 प्रयोगशाला कर्मचारीगण समूह–I / Laboratory Staff Group- I

क्रम सं	कर्मचारी का नाम	पदनाम
1	मोहम्मद परवेज	प्रयोगशाला सहायक
2	श्री सूरत राम	प्रयोगशाला सहायक
3	श्री रनबीर सिंह	प्रयोगशाला सहायक
4	श्री संजय कुमार	प्रयोगशाला सहायक
5	श्री जय प्रकाश	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)
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)

क्रम सं	कर्मचारी का नाम	पदनाम
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	श्रीमति भारती पयाल	प्रयोगशाला परिचर (2)

9.1.5 प्रशासनिक कर्मचारीगण / Administrative Staff

9.1.5.1 सामान्य संवर्ग के अधिकारीगण / Common Cadre Officers

क्रम सं	कर्मचारी का नाम	पदनाम
1	श्री अंजुम शर्मा	वरिष्ठ प्रशासन नियंत्रक
2	श्री जे.के.चौरससिया	वित्त एवं लेखा नियंत्रक
3	श्री सी. ए. बोध	प्रशासनिक अधिकारी
4	श्री दिनेश कुमार	भंडार एवं क्रय अधिकारी (भंडार एवं क्रय)
5	श्री भारत भूषण	भंडार एवं क्रय अधिकारी (भंडार एवं क्रय)
6	श्री रमेश कुमार जोशी	अनुभाग अधिकारी (सामान्य)
7	श्री विश्वेन्द्र डोगरा	अनुभाग अधिकारी (सामान्य)
8	श्री बी. बी. डिमरी	अनुभाग अधिकारी (सामान्य)
9	श्री राकेश पंत	अनुभाग अधिकारी (सामान्य)
10	श्रीमति विनीता वालिया	अनुभाग अधिकारी (सामान्य)
11	श्री सतीश चन्द्र	अनुभाग अधिकारी (वित्त एवं लेखा)
12	श्री पंकज कुमार	अनुभाग अधिकारी (वित्त एवं लेखा)
13	श्रीमति मीना कुमारी	अनुभाग अधिकारी (भंडार एवं क्रय)

9.1.5.2 निजी सचिव संवर्ग के अधिकारीगण / Private Sectretary

क्रम सं	कर्मचारी का नाम	पदनाम
1	श्री देवेंद्र राय	निजी सचिव
2	श्रीमति पद्मा कुमारी	निजी सचिव
3	श्रीमति सरोज कुशवाहा	निजी सचिव
4	सुश्री रीना शर्मा	निजी सचिव
5	सुश्री कुसुम भट्ट	निजी सचिव

9.1.5.3 सहायक ग्रेड–I/ Assistant Grade-I

क्रम सं	कर्मचारी का नाम	पदनाम
1	श्री विक्रम सिंह	सहायक अनुभाग अधिकारी (सामान्य)
2	श्रीमति किरण लता	सहायक अनुभाग अधिकारी (सामान्य)
3	श्रीमति प्रतिमा राणा	सहायक अनुभाग अधिकारी (सामान्य)
4	श्रीमति आशा जोशी	सहायक अनुभाग अधिकारी (सामान्य)
5	श्री हिम्मत सिंह	सहायक अनुभाग अधिकारी (सामान्य)
6	श्री आदेश सेठ	सहायक अनुभाग अधिकारी (सामान्य)
7	श्रीमति प्रतिमा बग्गा	सहायक अनुभाग अधिकारी (सामान्य)
8	श्रीमति अनीता देवी	सहायक अनुभाग अधिकारी (सामान्य)
9	श्री जस्सू कुमार	सहायक अनुभाग अधिकारी (सामान्य)
10	श्री संजय पोखरियाल	सहायक अनुभाग अधिकारी (सामान्य)
11	श्री आर.के. भट्टाचार्य	सहायक अनुभाग अधिकारी (भ.व.क्र.)
12	श्री प्रमोद जोशी	सहायक अनुभाग अधिकारी (भ.व.क्र.)
13	श्री मुनिन्दर पाल सिंह आरोडा	सहायक अनुभाग अधिकारी (भ.व.क्र.)
14	श्री विक्रम सिंह रावत	सहायक अनुभाग अधिकारी (भ.व.क्र.)
15	श्री शिव प्रसाद सकलनी	सहायक अनुभाग अधिकारी (वि.व.ले.)
16	श्री जितेंद्र सिंह नेगी	सहायक अनुभाग अधिकारी (वि.व.ले.)
17	श्री महेश कुमार जाटव	सहायक अनुभाग अधिकारी (वि.व.ले.)
18	श्री आशीश रतुड़ी	सहायक अनुभाग अधिकारी (वि.व.ले.)

9.1.5.4 सहायक ग्रेड–II/ Assistant Grade-II

क्रम सं	कर्मचारी का नाम	पदनाम
1	श्री हरजीत सिंह	वरिष्ठ सचिवालयीन सहायक (सा.)
2	श्री कुलवंत सिंह	वरिष्ठ सचिवालयीन सहायक (सा.)
3	श्रीमति हर्विंदर कौर	वरिष्ठ सचिवालयीन सहायक (सा.)
4	श्री जितेंद्र सिंह रावत	वरिष्ठ सचिवालयीन सहायक (सा.)
5	श्री तनवीर अहमद कुरेशी	वरिष्ठ सचिवालयीन सहायक (सा.)
6	सुश्री स्तुति शर्मा	वरिष्ठ सचिवालयीन सहायक (सा.)
7	श्री सुनील रावत	वरिष्ठ सचिवालयीन सहायक (भ.व.क्र.)
8	श्री बीजेन्द्र दत्त बहुगुणा	वरिष्ठ सचिवालयीन सहायक (भ.व.क्र.)
9	श्रीमति साइमा नाज	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 स्टेनोग्राफिक संवर्ग के कर्मचारीगण / Stenographic Cadre Staff

क्रम सं	कर्मचारी का नाम	पदनाम
1	सुश्री भावना रावत	वरिष्ठ आशुलिपिक
2	श्री राजेंद्र कुमार	वरिष्ठ आशुलिपिक
3	श्रीमति 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 धीरज झा	वरिष्ठ हिन्दी अनुवादक
3	श्री गोविंद सिंह मेहता	वरिष्ठ तकनिसियन (वाहन चालक)
4	श्री राजेंद्र प्रसाद	वरिष्ठ तकनिसियन (वाहन चालक)
5	श्री मुकेश कुमार	वरिष्ठ तकनिसियन (वाहन चालक)
6	श्री भूपेंद्र सिंह रावत	वाहन चालक (नॉन टेक)
7	श्री पंकज कुमार	वाहन चालक (नॉन टेक)
8	श्री अनूप	वाहन चालक (नॉन टेक)

9.1.5.8 जलपान गृह कर्मचारीगण / Canteen Staff

क्रम सं	कर्मचारी का नाम	पदनाम
1	श्री भारत सिंह बिष्ट	सहायक हलवाई–सह कुक
2	श्री मातबर सिंह	बेयरर (एम.ए.सी.पी.)
3	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	श्रीमति 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	श्रीमति 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./एम.ए.सी.पी.)
31	श्रीमति उमा देवी	समूह ग (एम.टी.एस.)
32	श्री राम गोपाल	समूह ग (एम.टी.एस.)
33	श्रीमति नीतू	समूह ग (एम.टी.एस.)
34	श्रीमति सविता देवी	समूह ग (एम.टी.एस.)
35	श्री प्रवीण कुमार	समूह ग (एम.टी.एस.)
36	श्रीमति निशा राणा	समूह ग (एम.टी.एस.)
37	श्री सौरभ रावत	समूह ग (एम.टी.एस.)

9.2 वर्ष के दौरान पदोन्नति/ Promotions During The Year

(इसमें वर्तमान में कार्यरत तथा सेवानिवृत्त हो चुके लोग दोनों शामिल हैं) /
(Includes both who are on the rolls at present & those who have retired)

क्रम सं	कर्मचारी का नाम	पदनाम	पदोन्नति की तिथि
1	डॉ. थल्लड़ा भास्कर	मुख्य वैज्ञानिक	23.06.2023
2	डॉ. समीर कुमार मैती	मुख्य वैज्ञानिक	23.06.2023
3	डॉ. सनत कुमार	मुख्य वैज्ञानिक	23.06.2023
4	श्री सुनील कुमार पाठक	मुख्य वैज्ञानिक	30.01.2024
5	डॉ. सुनिल कुमार	वरिष्ठ प्रधान वैज्ञानिक	18.04.2023
6	डॉ. अजय कुमार	वरिष्ठ प्रधान वैज्ञानिक	18.04.2023
7	श्री एल रोबीन्द्रो	वरिष्ठ प्रधान वैज्ञानिक	20.04.2023
8	डॉ. सौमेन दासगुप्ता	वरिष्ठ प्रधान वैज्ञानिक	23.06.2023
9	डॉ. अतुल रंजन	वरिष्ठ प्रधान वैज्ञानिक	15.01.2024
10	श्री बी नीलम नायडू	प्रधान वैज्ञानिक	18.04.2023
11	डॉ. श्रीणीवास पडाला	प्रधान वैज्ञानिक	18.04.2023
12	डॉ. उमेश कुमार	प्रधान वैज्ञानिक	20.04.2023
13	डॉ. सुधाकर रेड्डी	वरिष्ठ वैज्ञानिक	20.04.2023
14	श्री अंकुश बिंदवाल	वरिष्ठ वैज्ञानिक	20.04.2023

9.3 नये पदाधिकारी / New Incumbents

9.3.1 हमारी सहयोगी प्रयोगशालाओं/संस्थानों से नवागत कर्मचारी / New Entrants From Our Sister Laboratories/Institutes

क्रम सं	कर्मचारी का नाम	पदनाम	दिनांक	कहां हस्तांतरित
1	डॉ. शुचिस्मिता बेंजवाल	महिला चिकित्सा अधिकारी	30.10.2023	सीएसआइआर–एनजीआरआई, हैदराबाद
2	श्री पंकज कुमार मौर्य	अनुभाग अधिकारी (वित्त एवं लेखा)	24.07.2023	सीएसआइआर मुख्यालय, नई दिल्ली
3	श्री राकेश पंत	अनुभाग अधिकारी (सामान्य)	08.01.2024	सीएसआइआर–सीबीआरआई, रुड़की

9.4 जो हमसे विदा हूए / 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	कर्मचारी का नाम	पदनाम	दिनांक	कहां हस्तांतरित
1	मोहम्मद शाजिद अहमद शरीफ	सीनियर टेक्निकल ऑफिसर	31.10.2023	सीएसआइआर–सीसीएमबी, हैदराबाद
2	फरीद मोहम्मद	अनुभाग अधिकारी	31.07.2023	सीएसआईआर–इमटैक चंडीगढ़
3	श्रीमति सीमा शर्मा	सहायक अनुभाग अधिकारी (वित्त एवं लेखा)	16.06.2023	सीएसआइआर मुख्यालय, नई दिल्ली
4	श्री अश्वनी कुमार	तकनीसियन (2)	5.07.2023	सीएसआइआर –सीएसआईओ, चंडीगढ़
5	श्री अजय पॉल	प्रोयोगशाला परिचर (2)	30.06.2023	सीएसआइआर मुख्यालय, नई दिल्ली

9.4.2 अधिवर्षिता / स्वैच्छिक सेवा निवृत्ति / त्याग–पत्र के कारण / On Superannuation /voluntary Retirement/ Resignation

क्रम सं	कर्मचारी का नाम	पदनाम	दिनांक	टिप्पणी
1	डॉ. आनंद नारनी	वरिष्ठ वैज्ञानिक	10.05.2023	त्यागपत्र
2	डॉ.जयति त्रिवेदी	प्रधान वैज्ञानिक	31.08.2023	त्यागपत्र
3	डॉ. अंजन रे	निदेशक	30.04.2023	सेवानिवृति
4	डॉ. ए. के. जैन	वरिष्ठ प्रधान वैज्ञानिक	30.04.2023	सेवानिवृति
5	श्री आर. एस. चौहान	अनुभाग अधिकारी	31.05.2023	सेवानिवृति
6	श्री मुनेश कुमार	सफाई कर्मचारी	31.05.2023	सेवानिवृति
7	श्री एल. आर. कौशिक	अनुभाग अधिकारी	30.06.2023	सेवानिवृति
8	डॉ. जसविंदर सिंह	प्रधान तकनीकी अधिकारी	31.07.2023	सेवानिवृति
9	श्री हरभजन सिंह	सीनियर तकनिसियन , 2	30.06.2023	सेवानिवृति
10	श्रीमति आभा ध्यानी	सहायक अनुभाग अधिकारी	31.07.2023	सेवानिवृति
11	श्री एस सी भट्ट	प्रिन्सिपल प्राइवेट सेक्रेटरी	31.08.2023	सेवानिवृति
12	श्री पी एस चौहान	प्रिन्सिपल प्राइवेट सेक्रेटरी	31.10.2023	सेवानिवृति
13	श्री मदन गोपाल	सीनियर तकनिसियन , 2	31.01.2024	सेवानिवृति
14	श्री राज कुमार	प्रोयोगशाला सहायक	29.02.2024	सेवानिवृति
15	श्री मातबर सिंह	बेयरर	31.03.2024	सेवानिवृति

9.5 नई नियुक्तियाँ / New Appointment

क्रम सं	कर्मचारी का नाम	पदनाम	दिनांक
1	डॉ. हरेन्द्र सिंह बिष्ट	निदेशक	04.08.2023
2	श्री मुकेश कुमार पोद्दार	वैज्ञानिक	09.10.2023
3	डॉ. महक धीमान	वैज्ञानिक	26.02.2024

CSIR- Indian Institute of Petroleum, Dehradun
Allocation & Expenditure from 2023-24

		(Rs in Lakhs)
Allocation and Expenditure from 2023-24	**Allocation**	**Expenditure**
NAME OF LAB. CSIR-IIP Dehradun	**Project & No-Project**	**Project & No-Project**
Financial year	**2023-24**	**2023-24**
A.Salary		
1. Salary & Sal. Linked Allowances	4476.460	4476.460
2. Other Allowances	216.486	216.486
Total Salary	**4692.946**	**4692.946**
B. General		
3. P07 Chemical/Consum.& Other Res.Exp.	1159.095	1159.095
4. P-804 Pension & Other retirement benefits	4690.000	4690.000
5. P04 & P06, P701 - Other Revenue	646.170	646.170
Total General	**6495.265**	**6495.265**
C. Capital		
6. P-50 Works & Services/Elec. Installations	179.066	179.066
7. P-50 App. & Equip./Computer Equipment	1014.385	1014.385
8. P-50 Other Capital		
Total Salary	**1193.451**	**1193.451**
Total A+B+C	**12381.662**	**12381.662**

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

directro@iip.res.in

www.iip.res.in

+91-135-2660205
Fax : 0135-2660202/2660098

P.O.- IIP Mohkampur,
Dehradun- 248005
Uttarakhand, India.