



उच्च प्रौद्योगिकी केन्द्र

(पेट्रोलियम एवं प्राकृतिक गैस मंत्रालय), भारत सरकार

Centre for High Technology

(Ministry of Petroleum & Natural Gas), Govt. of India

Dated: 4th June, 2020

No. ED-CHT/2386

Shri Rajesh Saini,
Deputy Chief Finance and Accounts Officer,
Oil Industry Development Board,
Plot No. 2, Sector-73,
Noida (UP) - 201 301

Sub: Material for OIBD's Annual Report for the year 2019-20

Dear Sir,

Please refer to your letter no. 5/1/2020-OIBD dated 26th May 2020 for the subject matter. As desired, material for inclusion in the OIBD's Annual Report for the year 2019-20 pertaining to Centre for High Technology (CHT) is enclosed.

As desired, Soft Copy of this report has been sent through email at dcfao.admn.oibd@nic.in. Soft copies of few photographs relating to the project undertaken with the financial assistance provided by the Oil Industry Development Board are also forwarded for your needful please.

Thanking You,

Yours faithfully,

(K.K. Jain)

Executive Director

Encl.: As above

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Material for inclusion in the OI DB's Annual Report for the year 2019-20**1.0 Introduction**

Centre for High Technology (CHT) was established in 1987, to act as the Technical Wing of MOP&NG for implementation of scientific and technological programmes of Govt. of India. Major functions of CHT include:

- Performance Benchmarking of Refineries and Pipelines
- Performance Improvement in Refineries through Best Practices, Special Studies, Operational Improvement and Process Technology
- Energy Efficiency Improvement in Downstream Hydrocarbon Sector
- Petroleum Product Quality Improvement
- Sharing of Best Practices and Information & Knowledge Dissemination
- Integration with Alternative Energies and New Initiatives in Downstream Sector for Future Sustainability
- Promoting Innovations and R&D in Downstream Hydrocarbon Sector. Co-ordination of activities of Scientific Advisory Committee (SAC) on Hydrocarbons of MoP&NG

During the year 2019-20, an amount of Rs 18.10 crore was received by CHT as grant-in-aid from OI DB. Out of this fund, Rs 2.37 and Rs 6.81 crore were released by CHT for R&D projects and special studies respectively during the year.

2.0 Major activities undertaken during 2019-20 are as under:**1. Performance Benchmarking of PSU refineries and pipelines****(a) Performance Benchmarking of PSU refineries**

Performance Benchmarking 2018 cycle of PSU refineries is carried out by CHT regularly since 2012 cycle through M/s Solomon Associates (SA), U.S.A. The study for 2018 cycle was for 16 PSU refineries and 4 lube refineries was completed and final benchmarking study report was submitted in mid of Oct 2019. A workshop on "How to use data" was conducted by M/s Solomon Associates on 19th/20th November 2019. The participants comprised of a multidisciplinary team from all the participating PSU refineries. In the workshop, Solomon Associates deliberated on various KPI's used in benchmarking along with its significance and methodology of calculation. Solomon Associates made a final consolidated presentation on the performance of PSU refineries at MoP&NG on 18th November 2019.

(b) Performance Benchmarking of PSU Pipelines

Performance Benchmarking Study for Pipelines (Liquid, Gas, LPG and SPMs) for 2018 cycle was initiated for the first time and completed through M/S Solomon Associates (SA), USA in January, 2019. The Data Coordinators' Seminar was conducted by SA with participants from Pipelines (IOCL, BPCL, HPCL, OIL, GAIL) on 22nd/23rd February, 2019 at CHT. The Study results were shared in October, 2019. Executive presentation of Study results was done by M/s Solomon Associates on 21.10.2019. Two Workshops at Delhi & Mumbai were also carried out on 22.10.2019 & 25.10.2019 as per contractual agreement. Study results have been shared with all the participating companies. Presentation of study results was held at MoP&NG on 10th February 2020. Secretary, P&NG chaired the meeting. ASFA, MoP&NG, representatives of M/s Solomon Associates along with CMD/Directors of Oil PSUs and ED CHT were the major participants in the meeting.

2. Energy Efficiency improvement

Refineries are included in PAT (Performance Achieve and Trade), under which each refineries is mandated to meet the Specific Energy Consumption Targets. CHT was actively associated with BEE for baseline Audit of Refineries, target setting, for development of calculation formats and has been monitoring the progress. CHT has also checked the final M&V reports submitted by Accredited Energy Auditors and assisted BEE in finalising the achievements of Energy Reduction Targets for Refineries.

Under PAT cycle-II, which ended in 2018-19, the refinery sector achieved savings of 1.482 MTOE against target of 1.08 MTOE over the base line year of 2014-15. The refinery wise energy savings targets for 2023-24 under new PAT cycle have also been mandated based on specific energy reduction of 4.49% the refining sector.

A Roadmap for Energy Reduction in PSU refineries till 2030, aligning with India's NDC of 33-35 % reduction in Specific Energy Consumption over base year of 2005, has been prepared. The roadmap has also assigned a midterm (2023-24) and long term target (2030) for each PSU refineries.

3. Refinery Performance Improvement Programme (RPIP)

CHT coordinated finalisation of refinery-wise global consultants for carrying out comprehensive Refinery Performance Improvement Programme of 7 PSU refineries (HPCL - Mumbai and Visakh, BPCL - Mumbai and Kochi, IOCL - Panipat, Paradip and Mathura) in the first phase based on baseline year 2017-18. Refineries have received their assessment report and implementation phase is under progress.

Based on experience of Phase-1 refinery post assessment, the Study for balance refineries (IOCL-Barauni, Gujarat, Haldia, Bongaigaon, Guwahati, Digboi, CPCL-Manali and NRL shall be taken up in 2nd Phase and the activities of EOI finalization has begun.

4. Special studies for the PSU refineries

Development of Water Consumption Norms and Reduction of Water Footprint for Refineries

CHT initiated Development of Water Consumption Norms and Reduction of Water Footprint for Refineries through EIL as approved during 25th meeting of EC of CHT. The final report was discussed among PSU refineries at CHT on 26/27th February, 2020 and an execution roadmap with a short term (<2 years) and a long term (>2 years) target, was developed for submission to MoP&NG. While the short term measures had a target date of completion by March 2022, the long term measures involved ideas / projects which shall be completed beyond March 2022.

Approach Paper on demand side steam management

M/s KBC, Singapore was awarded to prepare an approach Paper on demand side steam management based on the best practices and Indian realities. The final report along with a detailed matrix of identified best practices as well as RPIP findings have been circulated to refineries.

Feasibility study for production of ethanol using waste gases through M/S LanzaTech, USA: The study for 1st phase of refineries is in progress.

CHT in coordination with M/s LanzaTech carried out Techno-economic Assessment for 13 PSU refineries covering Refinery-wise Ethanol potential, Capex and estimated Cash Cost of Production (CCOP). CCOP was projected below Rs 40 per litre for all refineries except IOC-GR & DR, indicating feasibility of adopting LanzaTech technology. Joint site visit by M/s LanzaTech and respective refinery were done to access site limitations, if any. Out of 6 refineries identified for carrying out feasibility studies initially, two refineries (IOC-Haldia & IOC-Gujarat) were dropped out due to space constraints. BPCL-Mumbai refinery and MRPL awarded the job, BPCL-Kochi and Bina refinery are interacting with M/s LanzaTech to resolve technical issues. In view of lower potential of Ethanol at MRPL, the feasibility study will be independently done by MRPL without CHT funding.

Feasibility & Business Model for Reference Fuel by EIL & IOC R&D:

Reference Fuels are used by OEMs for testing their vehicles. These fuels are imported mainly from Germany. A study, comprising of three phases has been planned to assess the feasibility for production in India. Work Order was awarded to M/s Engineers India Ltd., along with IOC-R&D for "Development of Process Scheme for Reference Fuel". Identification of Refinery streams for manufacture of Reference fuel was carried out. Kick off meeting was held on 27th January 2020 at CHT with EIL & IOCL-R&D for the First phase of "Development of Process Scheme for production of Reference Fuel". EIL submitted updated Final report for Stage-1 study on 26th May 2020.

5. Furnace efficiency and Steam leak surveys

In order to improve energy efficiency and reduce energy consumption, CHT, in association with refineries, organizes Surveys every year in the areas of i) Furnace/ Boiler Efficiency and ii) Steam leak. These two areas are taken-up every alternate year. Survey in the area of Steam Leak was conducted during January, 2019 and survey for Furnace/ Boiler Efficiency was conducted during January-February, 2020.

6. Refining & Petrochemicals Technology Meet (RPTM)

With a view to keep abreast with the technological developments and disseminate information, CHT organises RPTM every year in association with one of the PSU oil company on different theme of relevance. The event is attended by large number of process licensors, catalyst suppliers and delegates from India and abroad. The last 24th RPTM, was organised by CHT in association with MRPL, during 19th to 21st January, 2020 in Bengaluru. The Theme of the Meet was "Driving Refineries and Petrochemicals towards Sustenance". Around 1500 delegates / invitees from India and abroad participated in the Meet. The event had presentation of 82 oral papers spread over 15 Technical Sessions, 77 papers in Poster Sessions and 17 Exhibition Stalls. The meet was attended by 1500 delegates/invitees from India and abroad.

7. Implementation of PM JI VAN Yojna

Pradhan Mantri JI-VAN Yojna was announced in March, 2019 for promotion of 2G ethanol by providing financial assistance for setting up of 12 commercial units (combined capacity of ~40 crore litre per annum) and 10 demonstration units at semi commercial level. Government has targeted blending of 10 % Ethanol in Petrol by 2022 and 20% by 2030 & Blending of Biodiesel in Diesel of 5% by 2030

The scheme will be implemented in 2 phases as under:

Phase-I (2018-19 to 2022-23): 6 Commercial & 5 demonstration projects

Phase-II (2020-21 to 2023-24): 6 Commercial & 5 demonstration projects

For commercial projects, the maximum financial support per project has been capped at Rs 150 crore, which is linked to ethanol capacity and the project cost. For demonstration projects, the financial assistance will be limited to Rs. 15 crore per Technology.

CHT has been nominated as nodal agency for implementation PM JI VAN Yojna. Scientific Advisory Committee on Hydrocarbons of MoP&NG (SAC) has been nominated to appraise the project proposals. The projects recommended by SAC shall be considered and approved by Steering Committee of CHT.

3 sub committees were constituted by SAC for quick & effective implementation of the scheme. Draft RFS, separately for Commercial & Demonstration Projects, were prepared after taking inputs from 3 sub committees & subsequent discussion in SAC meeting. RFS documents were issued on 26th Aug'19 on CPP Portal as well as CHT Website for selection of

Project Developers (PDs) for demonstration scale & commercial scale 2G Bioethanol Projects.

Against the RFS, 6 commercial project proposals and one proposal (IOCL R&D) for demonstration project have been received. The recommendation of the SAC shall be now put up for consideration and approval by Steering Committee of CHT.

8. Indigenous Technology Development

CHT co-ordinates the activities of Scientific Advisory Committee (SAC) on Hydrocarbons of MOP&NG in identifying and funding of research projects for downstream hydrocarbon sector. SAC approves and steers projects of national importance and refining operations. SAC is headed by Dr Anil Kakodkar, an eminent Scientist and DAE Chair Professor, BARC.

During the year, M/s EIL along with BPC Kochi has developed indigenous Desalter Technology under the project funded by CHT.

9. Hydrogen Research

Till the very recent past, the role of hydrogen was not seen so clearly. As a result there was not so much interest in Hydrogen research. Driven by concern of global warming, deteriorating emission levels and falling cost of renewable power, it is now being recognized that the different energy systems, including fossil fuels (coal, crude, gas), will co-exist in the foreseeable future. As energy systems are capital intensive and take time to develop, increasing role for renewables, with possible transition to electricity and hydrogen economy is foreseen in long term. While there appears to be renewed interest in hydrogen research, the energy transition still remains unclear and developments in the different energy forms shall determine the path forward. Considering the above, Scientific Advisory Committee on Hydrocarbons of MoP&NG has identified hydrogen research and its promotion of as one of the major focus areas.

Currently, transition to Hydrogen economy has several challenges, like cost effective production, storage, development of Fuel cell & deployment of different applications, etc. This requires concerted efforts for R&D in these areas and creation of infrastructure for dispensing of hydrogen to different applications for demonstration.

Following projects are currently in progress/ under consideration;

Sl. No.	Project Detail	Total project Cost Rs. crore	Funding by CHT Rs. Crore	Status of approval
1	Scale-up studies and process development for Hydrogen Production by Catalytic Decomposition of Natural Gas: HPCL-R&D, CeNS and IIT, Delhi	29.46	16.73	ongoing
2	Solar H ₂ production & dispensing station: IOCL R&D	65.16	25.00	ongoing

Sl. No.	Project Detail	Total project Cost Rs. crore	Funding by CHT Rs. Crore	Status of approval
3	Demonstration unit for H-CNG production and trials at Rajghat Bus Depot at Delhi: IOC R&D	33.39	9.2	ongoing
4	Fuel Cell buses based on H ₂ produced from Multiple Pathways: IOCL/ KPIT / IISc	296.66	138.32	Under consideration

10. Development of Catalyst Manufacturing Plant in India :

With a view to set up world class Catalyst Manufacturing Unit in India-under Make in India, Expression of Interest (EOI) have been issued from bidders having global reach for marketing of catalysts and catalyst manufacturing capability. The proposed catalyst plant is envisaged to be set up as a Joint Venture between an established Catalyst Manufacturer/Supplier and one or more PSUs under MoP&NG.

11. Awards

CHT is actively associated with the following Annual Awards instituted by Ministry of Petroleum & Natural Gas, Government of India:

- Refinery Performance Improvement Award
- Saksham Awards based on Steam Leak and Furnace Efficiency Surveys
- Innovation Award

The Awardees for the first two categories are selected by the selection committee set up by MoP&NG. For Innovation Awards, nominations for the following three categories were invited from the Industry and the Awardees are selected by the committee constituted by Chairman, SAC, based on guidelines of Governing Council of CHT:

- i) Best Indigenously Developed Technology
- ii) Best Innovation in Refinery (refinery/ group/ individual)
- iii) Best Innovation in R&D Institute (institute/ group/ individual)

Refinery Performance Improvement Awards for 2018-19, Saksham Award for 2019 and Innovation Awards for 2018-19 were presented to the winners by the Chief Guest during the Inaugural function of the 24th Refining & Petrochemicals Technology Meet (RPTM) on 19th January, 2020 in Bengaluru.

12. Swachhata Ranking for PSU/JV Refineries

Swachhata Ranking of PSU/JV Refineries is a new initiative of the Ministry of Petroleum & Natural Gas, started in 2017. Refineries are ranked based on the Swachhata Index developed by Centre for High Technology. Swachhata Ranking for 2018-19 for PSU/JV Refineries was finalised and was presented to the winners by Hon'ble Minister of Petroleum & Natural Gas and Steel, Govt. of India, on 16th September 2019.

13. Activity Committee Meetings

With the aim of sharing of best operational practices & improvements and dissemination of information on latest developments, CHT organised various Activity Committee Meetings in critical areas/ technologies in refining sector and pipelines operations. Currently 14 Activity Committees are in place and 7 ACMs were held during the year 2019-20.

14. Knowledge Dissemination and Experience Sharing

- A Compendium on Best Practices, including Takeaways from Activity Committee Meetings and Innovations in refining sector was prepared and shared with all refineries.
- Discussion Forums on 10 major areas concerning the downstream hydrocarbon has been created on CHT portal. Specific queries can be posted by the authorised co-ordinators from PSU companies for seeking answers from an Expert Panel.

15. Implementation of BS-VI Auto fuels and Lab Co-relation Programme

Readiness for supply of BS-VI fuels were discussed during various review meeting with JS(R) and representatives from PSU refineries. A detailed review of BS-VI projects at PSU refineries along with readiness to supply BS-VI Gasoline and Diesel was done during 21st meeting of Working Group on 22nd November 2019. Refineries had planned up gradation of supply network from refinery up to marketing locations and filling stations before the rollout date 1st April 2020.

CHT initiated "Inter Laboratory Correlation Programme" for better coordination of product quality at industry level. MS, HSD and ATF have been covered under this programme.

16. Supply of Grade A (1000 ppm S) Kerosene: MoP&NG vide letter dated 16th October 2018 communicated to Industry that all refineries will supply Grade-A Kerosene (1000 ppm Sulphur) w.e.f. 01.04.2020. Industry is ready for production from refineries w.e.f. 01.04.2020. Considering the low allocation and limited tankage, further 3 months to be required for dilution.

Project: Biomass Hydrolysis for the production of Fuel grade Hydrocarbons: CSIR-IIP/HPCL

1. Continuous Hydrolysis Plant



2. High Performance Liquid Chromatograph (HPLC)



3. BET Surface Area/Pore Size Distribution

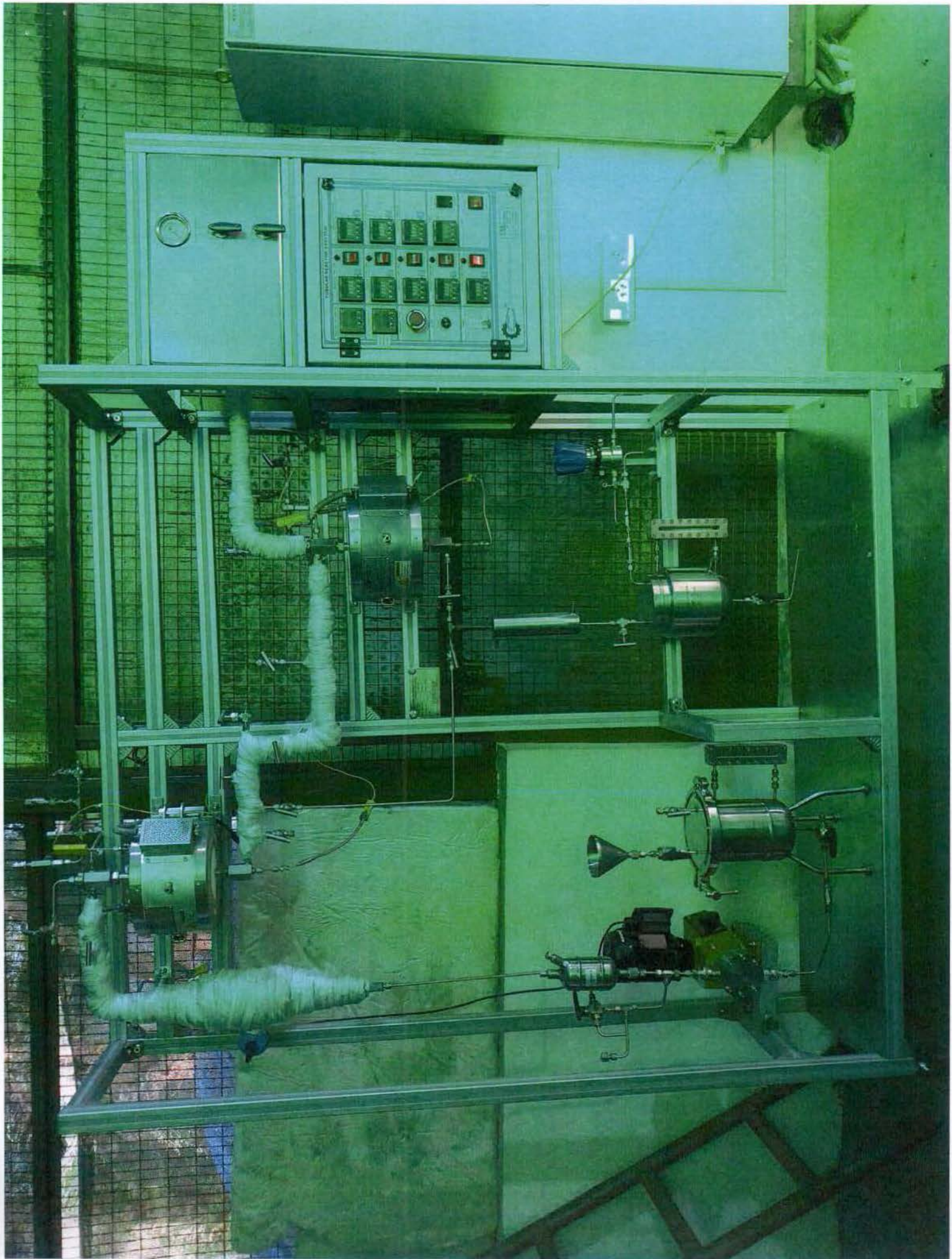


4. Chemisorption (TPR/TPD/TPO)



Equipment: Fixed Bed Catalytic Cracking Upgradation Unit
Project: stabilization and upgradation of Biomass derived bio-oils in a dual stage Catalytic process to produce liquid hydro carbon fuels: TERI





Project: Coal to Liquid (CTL) Fuels Technology Development: EIL/ BPCL



Gasifier at EIL R&D, Gurugram

Project: Parametric Study and Technology Development for Desalter Design: EIL/ BPCL



Proto-type Desalter at BPCL-Kochi Refinery

Project: Development of Catalyst and Process for Slurry Phase Residue Hydroprocessing: CSIR-IIP/ HPCL/ EIL/ BPCL



Slurry Hydrocracker pilot facility at CSIR-IIP

Project: Development of Catalyst and Process for Slurry Phase Residue Hydroprocessing; CSIR-IIP/ HPCL/ EIL/ BPCL





Julabo Recirculating Chiller -2



SHC HTHP BATCH Reactor 1 litre -2



HTSIMDIST & DHA Combi



Julabo Recirculating Chiller -1

