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उच्च प्रौद्योगिकी केन्द्र
पेट्रोलियम और प्राकृतिक गैस मंत्रालय, भारत सरकार

Centre for High Technology
Ministry of Petroleum & Natural Gas, Govt. of India

From the desk of the Executive Director

RPTM
special



Esteemed Readers,
Greetings!!

It gives me immense pleasure to inform that Centre for High Technology (CHT), successfully organised the 24th Refining & Petrochemical Technology Meet (RPTM), in association with Mangalore Refinery & Petrochemicals Ltd., during 19-21 January 2020 at BIEC, Bengaluru with the theme "Driving Refining & Petrochemicals towards Sustenance". The event got overwhelming response with record participation of around 1300 delegates from India and abroad, signifying growing importance and utility of the event. Annual awards were presented during the RPTM to the winners for Refinery Performance Improvement Award, Saksham and Innovation Awards for the year 2018-2019. My heartiest congratulations to all the award winners. I would like to thank the patronage and guidance received from MoP&NG and the Indian refining sector.

Like every year, January 2020 also started off with the Saksham Audit throughout the country, with the purpose of creating awareness amongst various target groups for promoting oil conservation and emission reduction. As in previous years, CHT organizes surveys in the areas of "Furnace / Boiler Efficiency" and "Furnace Insulation Effectiveness" at all the 21 Indian refineries including private refineries (RIL and Essar Oil) and JV refineries (HMEL and BORL). The committee constituted by the Ministry of Petroleum & Natural Gas (MoP&NG) will evaluate the performance results obtained during this survey. I would like to convey my gratitude to the management of all the refineries for extending their co-operation and support in conducting the Saksham Audit.

For the first time, CHT participated in the COP25 conference held in December 2019 in Madrid, Spain. CHT made a presentation on 'Enhancing Energy Efficiency in Refinery Sector' in one of the side events on "Energy Efficiency" hosted by Ministry of Power and the session focused on various initiatives taken up by the Indian refiners to enhance energy efficiencies, challenges ahead and the path forward for sustainability. The event was attended by representatives from various countries and Indian Industry.

My best wishes to all for meeting the future challenges in the year 2020.

(K.K. Jain)
Executive Director

24th Refining & Petrochemicals Technology Meet

The 24th Refining & Petrochemicals Technology Meet (RPTM) was organized by Centre for High Technology (CHT) in association with Mangalore Refinery & Petrochemicals Limited (MRPL) during 19-21st January 2020 at Bangalore International Exhibition Centre (BIEC), Bengaluru, Karnataka. The theme of the Meet was "**Driving Refining & Petrochemicals towards Sustenance**".

Dr. M.M. Kutty, Secretary, P&NG inaugurated the Meet in the august presence of Shri Sunil Kumar, Joint Secretary (R), MoP&NG and senior officials of the Industry. The event got overwhelming response with record participation of around 1300 delegates/speakers/senior executives from oil industry, leading global technology/service providers, catalyst manufacturers, R&D institutes, signifying the growing importance and utility of the event.

A total of 81 Technical Papers from Global leaders in Refining & Petrochemical Technology such as Shell, UOP, Axens, Chevron, CB&I, Solomon, ExxonMobil, KBR, KBC, Grace, BASF, Johnson & Matthey, Mcdermott, LanzaTech etc., were spread across 15 Technical Sessions. Three Poster Sessions were organized during the three days of the Meet covering 78 poster papers. Apart from these, 16 exhibition stalls were put up by oil companies, consultants and vendors for display of their technology, product and services.

Technical sessions covered the entire spectrum of downstream Petroleum and Petrochemicals sector viz. 'Refining and Petrochemicals outlook', 'Driving Refining & Petrochemicals towards Sustenance', 'Moving towards Sustainable future', 'Gasification towards Sustainability', 'Advances in Refining Technology', 'Hydrogen Economy – Road to Sustainable Future', 'Biofuels and Alternatives', 'IR 4.0: Digital Revolution', 'Innovation in Refineries-Profit Improvement',

'Environmental –Best Operational Practices', 'Catalysts: Next Generation', 'Operational Risk Management', etc.



Dr. M.M. Kutty, Secretary, P&NG lighting the ceremonial lamp in the gracious presence of Shri Sunil Kumar, Joint Secretary (Refineries), MoP&NG and other dignitaries from the Oil Industry during Inaugural session of 24th RPTM at BIEC, Bengaluru held on 19th January 2020.



(Dignitaries on the dias during Inaugural session of 24th RPTM standing from L to R): Shri M. Venkatesh, MD, MRPL, Shri Sanjiv Singh, CMD, IOCL, Dr. M.M. Kutty, Secretary, P&NG, Dr. Anil Kakodkar, Chairman, SAC, Shri Sunil Kumar, Joint Secretary (Refineries), MoP&NG, Shri M.K. Surana, C&MD, HPCL and Shri K.K. Jain, ED, CHT



Dr. Anil Kakodkar, Chairman, SAC, presenting the Key Note address during the 24th RPTM at BIEC, Bengaluru



Release of Compendium by Dr. M.M. Kutty, Secretary, P&NG and other dignitaries during the Inaugural session of the 24th RPTM at BIEC, Bengaluru

Shri M. Venkatesh, MD, MRPL welcoming the invited participants of the 24th RPTM reminded that any business requires survival, sustenance and growth.



Shri M. Venkatesh, MD, MRPL, delivering the Welcome Address during the Inaugural session

Dr. Anil Kakodkar, Chairman, Scientific Advisory Committee, in his Key note address, indicated the choice of energy system should be largely driven by domestic resources like solar, biomass, wind and clean coal technologies using domestic high ash coals. As a long term sustainability and energy security, we need to continuously follow the developments worldwide in the arena of energy transition. As energy systems are capital intensive and take time to develop, India can directly leapfrog to energy systems of future, which are sustainable and also specific to our conditions so as to cut down repeat costs involved in development of energy systems. Such changes require framing of policy directions and Govt. support in R&D and fiscal incentives so as to promote changes in the intended direction.

Shri Sunil Kumar, Joint Secretary (R) MoP&NG, in his theme address put forth that India's share in energy will increase at the rate of 4.2% a year and shall reach 11% of the global demand and likely account for 25% of rise in global energy demand by 2040. Oil will continue to play important role in primary Energy Mix. India needs a combination of cleaner diesel & Petrol, CNG, Bio-fuels, Hydrogen & Electric. India's Oil demand is projected to grow @ 3% till 2040 and need to add Refining Capacity. In present environment Refineries need to grow in their core business as well as integrating with Petro chemicals and Bio Refineries need to embrace new technologies and continuously follow the shift in future energy order and disruptions.



Shri Sunil Kumar, Joint Secretary (R) MOP&NG presenting the theme address during 24th RPTM at BIEC, Bengaluru

Dr. M.M. Kutty, Secretary, P&NG, in his inaugural address, stressed that India is at critical juncture faced with rapidly transforming energy landscape bringing in irreversible changes. The world is already seeing impact of changing climate and taking policy decisions to reduce Global warming. India has committed to reduce emissions level by 33-35% per GDP by 2030 over the base year of 2005 with renewable energy and energy efficiency improvements and policy interventions. India is committed to improve access energy to its population in a time bound



Dr. M.M. Kutty, Secretary, P&NG, and Chief Guest, delivering the inaugural speech during the 24th RPTM at BIEC, Bengaluru

manner and is facing triple challenges of energy demand, security and sustainability. Oil and Gas Sector is a major contributor to Indian economy and accounts for 36% share of energy basket. India is 3rd largest consumer of crude and petroleum products and 4th largest refining capacity and accounts 5.1% of world oil consumption. Indian PSU Refineries consistently achieving 100% capacity utilization and reduced Energy Intensity Index (EII) by 17% since 2010 which is three times of Global average. Diversifying into Petrochemicals mitigates the risk of uncertainty in traditional fuels market. India has set an ambitious target of increasing share of natural gas in its primary mix from 6% to 15% by 2030. Considering Air Pollution, LPG was supplied to 80 million households through Prime Minister Ujjwala Scheme and decided to leapfrog from BS-IV fuel to BS-VI fuel in 2020 ahead of earlier plan of 2024. Govt. launched National Biofuel Policy in 2018 key policy decisions were taken to promote ethanol blending programs to target 20% of ethanol blending in petrol and 5% biodiesel blending in diesel by 2030. Govt. is giving impetus to advanced biofuels such as 2G ethanol, and announced PM JI-VAN Yojana Scheme in March, 2019 to provide financial support in the form of VGF to Commercial as well as demonstration plants. Dr. Kutty also added that theme of the Meet 'Driving Refining and Petrochemicals towards Sustainable' is very relevant and pertinent in present times.

Vote of thanks was presented by Shri K.K. Jain, Executive Director, Centre for High Technology.



Shri K.K. Jain, ED, CHT, presenting 'Vote of thanks' during the Inaugural Session. at the 24th RPTM at BIEC, Bengaluru

Poster Gallery & Exhibition Stalls

Dr. M.M. Kutty, Secretary, P&NG, also inaugurated the Poster and Exhibition gallery during 24th RPTM. An exhibition showcasing a wide range of innovative technologies, products and services by PSU / R&D functions like MRPL, BPCL, IOCL/EIL and HPCL, reputed catalysts vendors, consultants and equipment manufacturers was also organised. Dr. Kutty showed keen interest while visiting the stalls and held interaction with the presenters.



Inauguration of Exhibition Gallery and Poster by Dr. M.M. Kutty, Secretary, P&NG during the 24th RPTM at BIEC, Bengaluru



Dr. M.M. Kutty, Secretary, P&NG interacting with MRPL team at the Exhibition Stall during the 24th RPTM at BIEC, Bengaluru on 19th January 2020

Valedictory Session

The 24th RPTM concluded with Vote of Thanks by Shri K.K. Jain, ED, CHT. The RPTM was a great knowledge sharing and learning experience for the delegates as it dealt with various aspects of global energy scenario, refining and petrochemicals integration, process optimization & upgradation, value added products, innovative solutions to create and add value from the existing assets etc.

Awards

During the 24th RPTM, Refinery Performance Improvement Award 2018-19, Saksham Award 2019 and Innovation Awards for 2018-19 were presented by Dr. M.M. Kutty, Secretary, P&NG in the august presence of Shri Sunil Kumar, Joint Secretary (R), MOP&NG, Dr. Anil Kakodkar, Chairman, SAC, Shri Sanjiv Singh, CMD, IOCL, Shri M. Venkatesh, MD, MRPL, Shri M.K. Surana, C&MD, HPCL and Shri K.K. Jain, ED, CHT

Glimpses of Award Function



Team IOCL Paradip Refinery receiving the first prize in Refinery Performance Improvement Award 2018-19



Team BPCL-Kochi Refinery receiving the prize in the category "Best Innovation in Refinery"



Team BPCL-Kochi Refinery receiving the second prize in Refinery Performance Improvement Award 2018-19



Team BPCL-Mumbai Refinery receiving the Commendation certificate in the category "Best Innovation in Refinery"



Team IOCL Guwahati Refinery receiving the Saksham Award 2019 for Best Reduction in Steam Leak



Team BPC R&D Centre receiving the prize in the category "Best Innovation in R&D Institute"



Team IOCL- R&D receiving the prize in the category "Best Indigenous Developed Technology"



Team BPC R&D Centre receiving the commendation certificate in the category "Best Innovation in R&D Institute"

Following are the key highlights/ takeaways from the RPTM:

1. Energy Transition and Outlook

In future, use of electricity is expected to be pervasive in all applications. Fortunately electricity can be produced using all renewables sources like solar, wind, hydro, nuclear or biomass which is abundantly available in country. However, electricity from these sources is variable and currently available battery systems are not so efficient, bulky and require scarce Lithium.

Hydrogen provides solution to these problems. Hydrogen can be stored without loss (unlike battery system) and can be converted back to electricity using fuel cells quite efficiently. Hydrogen systems can also eliminate the need for back up fossil based electricity generation systems, which are required to run intermittently and inefficiently to balance electricity availability from renewable sources. Stationary fuel cells are quiet and have very low emissions, so they can be installed nearly anywhere. These systems take up much less space and provide power on-site directly to customers, without the efficiency losses of long-range grid transmission.

Compared to EV, Hydrogen Fuel cell vehicles use small battery as electricity is produced on board. This also solves the problem of bulky battery and range associated with EVs. The EVs are thus a good solution for short distance city life usage; however, for long distance transport sector, heavy duty vehicles and distributed industrial power generation, hydrogen fuel may be the key in future. However, there is a need to develop technologies to reduce delivered H₂ Cost including production, compression, bottling and transport to end user, Fuel cell technology as well as steam electrolysis.

2. Future Refining

Currently, Delayed Coker is used by Indian refining industry as a major bottom upgradation technology, which produces low value petcoke. Refineries should look for alternative resid upgradation pathways including pitch gasification.

In future, Gasoline fuel quality improvement will be for RON boost to 95 and Benzene reduction from 1.0% to 0.6% volume.

3. Petrochemicals

The demand for oil in the transportation sector is expected to peak in the mid-2030s due to energy transition particularly from transportation sector. But the demand for petrochemicals continues to grow, supported by increasing urbanisation and improving standards of living due to present lower per capita consumption compare to world average. Thus, Integration of Refining with Petrochemicals & Ammonia is becoming more of a necessity rather than a choice due to changing market dynamics, the need to sustain profitability in the long run. There are several advantages in integrating refineries; valorisation of stranded streams viz. LPG / Naphtha from both refinery and petrochemical unit, integrated management of utilities and hydrogen etc. The integration provides hedge against cyclical profitability and also insulate refineries from disruption due to substitution of refinery produced fuels by other forms of energy.

Petrochemical integration is becoming the standard for new world scale refinery investments and in future it is possible some refineries produce only petrochemicals.

4. Alternative Fuels

World over, the share of renewable energy is progressively increasing and it will continue to increase till it replaces fossils fuels to a level of global sustainability. In the interim period, Oil followed by increased share of gas will continue to play an important role in primary Energy Mix.

International Civil Aviation Organisation (ICAO)'s CORSIA, the Carbon Offsetting and Reduction Scheme for International Aviation, which deals with the increase in total CO₂ emissions from international aviation above 2020 levels obligates all carriers to report their CO₂ emissions on an annual basis as of 1st January 2019 and from 2027, all international flights will be subject to offsetting requirements.

There are issues in commercial viability of 2G projects even with VGF as per international experience at present. There is significant potential for decentralized production of Compressed Biogas (CBG) from biomass/ MSW to augment gas supply particularly in rural areas where demand for cooking gas is expected to grow

substantially. Therefore we need to adopt a holistic strategy on

renewable energy by pursuing policy that is biomass feedstock agnostic as well as promote all biofuels on equal footing based on market dynamics and viability in medium and long term. In view of above, special thrust is needed to promote Bio Jet fuels and CBG & other drop in fuels based on economic merits.

India will have to develop infrastructure for import of alternative feed stocks like ethane, LNG, condensate, etc.

There is a need to put thrust on Gasification Technology, which allows diversification to alternative feedstocks like biomass, coal/ petcoke, MSW, plastic waste, etc. The Gasification also enables diversification to other businesses, as syn gas, the product of Gasification, can be used in production of hydrogen, power, petrochemicals, urea or simply as fuel. We need to develop and demonstrate country specific clean coal technologies, including surface and underground coal gasification.

5. Sustainability

Hydrogen is emerging as sustainable energy solution in long run. Many advance countries like Japan, South Korea, etc. have already drawn programme to usher in to hydrogen economy by 2040. In future, with falling prices of renewable electricity, the electrolysis route would be viable.

6. Innovation

For increasing efficiency and to cut down cost of utilities as well capital investment in the petrochemical complexes, we need to promote establishment of large utilities companies having world class capacity to provide utilities and infrastructure at very competitive price under plug and play system.

There is a nexus between energy and water, as production of one is dependent on the other. India has 18% of world population with only 5% of water availability, vigorous efforts are required to reduce water footprint in the industrial application. Refining Industry is water intensive and many refineries are facing severe shortage of fresh water. The shortage of fresh water to refineries particularly land locked refineries is expected to increase and refineries need substantial work to reorganise their water input through utilisation of city sewage water or zero discharge. Further, as Farming sector use almost 80% of our water, there is need to make our farming water efficient.

Several new ideas were presented on improvement in energy efficiency, environment, operational reliability, water conservation and catalyst systems.

7. Digitalisation

Digital transformation of businesses and operational processes can boost cost efficiency of the core business platform via Reduced Operational Risks, connected Operations & Insights, One Dashboard (Crude to Market), Pro-active Decision Making and Anywhere & Anytime Operations. In a rapidly transforming industrial world supported by digitalisation, we need to enable workforce with digital-enhanced skills and transform mindset towards machine. If well executed, it will enable producers to gain the ability to quickly respond to changes in the internal and external environment. With the emergence of Industrial Internet of Things (IIoT), control systems have become even more complicated, and as complication and connectivity increase, so will cyber security risks. There must be a balance between adding intelligence, securing devices and protecting data.

Industry needs to adopt pragmatic approaches and policies in area of project execution including modular approach, digital interventions, etc.

Governing Council (GC) Meeting of CHT

The 38th Meeting of the Governing Council of CHT was held under the Chairmanship of Dr. M.M. Kutty, Secretary, P&NG on 27th December 2019 at MoP&NG, Shastri Bhawan, New Delhi. The meeting was attended by GC members from MoP&NG, viz., JS (E & CVO), JS (GP & M), JS (R), and Secretary, OIDB; CMD, HPCL; Dir (R), BPCL, IOCL; MD, CPCL; NRL; Dir (T), EIL; Dir (BD), GAIL and ED (R&D), GAIL. Shri K.K. Jain, ED-CHT, made a detailed presentation on the progress and status of various activities taken-up by CHT since the last GC meeting. The presentation covered the In-principle approval for Project Proposals

under PM JI-VAN Yojana recommended by SAC on Hydrocarbons of MoP&NG, status of Refinery Performance Improvement Programme (RPIP) of PSU Refineries, Performance Benchmarking of PSU Refineries & Pipelines and Development of Water Consumption Norms & Reduction of Water Footprint at PSU Refineries. One proposal by IOCL (R&D) for funding under HCF was also discussed. GC also approved the CHT budget.

87th Scientific Advisory Committee Meeting

87th Meeting of the Scientific Advisory Committee (SAC) on Hydrocarbons of MoP&NG was held at SCOPE Complex, Lodhi Road, New Delhi on 13th December 2019 under the Chairmanship of Dr. Anil Kakodkar.



Dr. Anil Kakodkar, Chairman, SAC, Shri Sunil Kumar, JS(R), MoP&NG & Shri K.K. Jain, Executive Director, CHT along with SAC members during the 87th Meeting of held at Scope Complex on 13th December 2019

Shri K.K. Jain, ED, CHT welcomed Dr. Anil Kakodkar, Chairman, SAC, Shri Sunil Kumar, JS (R), MoP&NG, other esteemed members of the SAC and the special invitees. The meeting of SAC was convened specially for discussion on proposals received under PM JI-VAN Yojana & evaluated by the Select Committee of SAC. After extensive deliberations, SAC recommended the proposals of IOCL & BPCL (commercial projects) and demonstration project proposal of IOCL R&D for consideration of Steering Committee of CHT. SAC advised ABPRL to submit the operational data expeditiously by Jan 2020 as per the requirement of RFS, based on the same their project may be considered. Regarding HPCL proposal, SAC recommended that the fresh proposal as per RFS requirement may be considered till the decision on all the six projects under Phase-1 is taken. In that case, HPCL may participate again for the second phase. SAC also had detailed review of the on-going R&D and HCF projects. SAC also had detailed deliberation on new projects of IOCL submitted for HCF grant.

Meeting of Select Committee of SAC for evaluation of proposals under PM JI-VAN Yojana

The meeting of Select Committee of SAC for evaluation of proposals received (for VGF/ Grant) under PM JI-VAN Yojana was held under the Chairmanship of Shri L.K. Vijh, Director (T), EIL on 3rd Dec'19 at CHT, Noida. ED, CHT welcomed the Chair, & other members of the Committee. Against the RFS (commercial & demonstration separately) issued under PM JI-VAN Yojana on 26th Aug'19, 6 commercial project proposals (SAB Industries, IOCL, BPCL, HPCL, MRPL & ABRPL) and one proposal (IOCL R&D) for demonstration project were received. Project developers made presentation regarding their technology as well as proposed plant. Committee deliberated in detail about each proposal. The committee has recommended proposals of IOCL, BPCL & ABRPL (commercial projects) and IOCL R&D proposal (demonstration project) for consideration of SAC. The committee has also recommended the proposal of HPCL for consideration of SAC subject to HPCL submitting the trial data of demo plant as per RFS requirement. The proposals of SAB Industries and MRPL were not recommended.

25th United Nations Climate Change Conference

The 2019 United Nations Climate Change Conference, also known as COP25 (25th United Nations Climate Change conference) was held in Madrid, Spain, from 2 - 13 December 2019 under the presidency of the Chilean government.

CHT on behalf of the Designated Consumer in PAT II, presented a session on "Enhancing Energy Efficiency in Refinery Sector" in one of the Side Events on "Energy Efficiency" hosted by Ministry of Power. The session mainly focused on various initiatives taken up by the Indian refiners to enhance energy efficiencies, challenges ahead and the path forward for sustainability. The event was attended by representatives from various countries and Indian Industry.



Shri Sumit Jha, Joint Director, CHT made a presentation on 'Enhancing Energy Efficiency in Refinery Sector' in one of the side events on "Energy Efficiency" hosted by Ministry of Power at COP25 conference in Madrid

Development of Process Scheme for production of Reference Fuel

A 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 & IOC-R&D presented the study carried out using data from 10 refineries detailing the approach for LP model development. Draft Technical Prefeasibility report is expected to be submitted by 1st week of February 2020

Feasibility Study for Ethanol Production from Off-Gases

Out of the 6 refineries considered for Feasibility study in Phase-1, LOA dated 17th Dec. 2019 is issued by BPCL-MR for the study. IOC-JR and IOC-HR could not take up the Feasibility Study due to land constraints. MRPL is taking up the study on its own due to reduced potential due to site constraints. Confirmation is awaited from BPCL-KR and BOREL regarding taking up of the Study.

Water and Waste Water Management in the Oil and Gas Sector

As a part of the newly established Centre of Excellence in Oil, Gas and Energy, a workshop on 'Water and Waste Water Management in the Oil and Gas sector' was organized jointly by Indian Institute of Technology Bombay (IITB) and Engineers India Limited (EIL), New Delhi on 11th January 2020. Based on the discussion in various sessions, a list of potential projects (short as well as long term) was prepared during the brainstorming session. In each of the project, different PSUs expressed their interest based on the nature of issues. A working team for each project shall be formed to develop the detailed proposals.