



सत्यमेव जयते

सीएचटी बुलेटिन

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BULLETIN



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From the desk of Executive Director



Centre for High Technology (CHT), under the aegis of Ministry of Petroleum and Natural Gas, Govt. of India successfully organised the 22nd Refining & Petrochemicals Technology Meet, in association with Indian Oil Corporation Ltd., during 13-15 January 2018 at Bhubaneswar, Odisha with the theme "Emerging Trends in Downstream Hydrocarbon Sector".

Earlier popular as Refinery Technology Meet, RTM was rechristened as Refining & Petrochemical Technology Meet (RPTM) considering the growing significance and integration of Petrochemicals with refining industry in India.

The Meet was inaugurated by Shri Dharmendra Pradhan ji, Hon'ble Union Minister, Petroleum & Natural Gas; Skill Development & Entrepreneurship, Govt. of India, in the gracious presence of His Excellency, Mr. Kenji Hiramatsu, Ambassador of Japan to India, Shri K.D. Tripathi, Secretary, PNG, Shri Sandeep Poundrik, Joint Secretary (Refineries), MoP&NG and Shri Sanjiv Singh, Chairman, Indian Oil Corporation Limited. In his inaugural address, Hon'ble Minister underlined the continued importance of the petroleum sector for energy security and sustaining GDP growth. He mentioned that the Petroleum products play significant role in the personal mobility as well as transportation of goods and industrial activity of the country. Therefore, Indian refining sector needs to grow not only to meet domestic requirement but also maintain its position as Asian Refining Hub.

Recognizing the importance of prospective refining infrastructure in India viewed against the role of petroleum products to cater to the energy needs, a Working Group was constituted by Ministry of Petroleum and Natural Gas for preparing a Report on Enhancing Refining Capacity by 2040. The event also witnessed the release of this historic vision document "Report of the Working Group on Enhancement of Refinery Capacity by 2040" by the Hon'ble Minister.

The Hon'ble Minister presented the Annual awards to the winners for Refinery Performance Improvement Award, Oil & Gas Conservation

Editorial Team

Brijesh Kumar
M. Dattaray
Renu Raina

Fortnight (OGCF) Award and Innovation Awards. The awards were finalised by the Award Selection Committee constituted by MoP&NG. In addition, we played host to OISD award distribution ceremony and successful Interactive Meet on Skill Development Initiatives in Hydrocarbon sector, which was chaired by Hon'ble Minister along with H.E. Ambassador of Japan to India, Secretary, PNG, Joint Secretary (Refineries), Joint Secretary (Skill Development) and captains of Oil Industry in India and abroad.

A record number of over 950 delegates from India and abroad, participated in this meet. For the first time, technical sessions on Gasification, 2G Ethanol, Bio mass upgradation and Petrochemicals were covered in RPTM keeping in view their growing importance. I would like to specially thank MoP&NG for the patronage and guidance. I would also like to thank the Indian Refining and Petrochemical sector, Process licensors, speakers and delegates, particularly from abroad for their valued contribution leading to yet another successful organization of RPTM. For the first time, we have received participations from the Asian countries namely, China, Japan, Malaysia, Sri Lanka, Saudi Arabia and Russia which is encouraging and shall help improve India's business relations in the Refining and Petrochemicals sector on Pan-Asia basis.

CHT, in association with the active participation of Refineries organized 6 nos. Activity Committee Meetings (ACM) during this period on various topics of interest namely Pipeline Operation, Environmental Management, Fuel & Loss and Energy Optimisation, Instrumentation, Catalytic Reforming and Power & Utilities. ACMs serve as a platform for collective experience sharing on operation, troubleshooting and commissioning of units; getting inputs on latest trends and new ideas from external experts and R&D Institutes so that good learnings are obtained from the meet. Detailed discussions make everyone richer in knowledge. Q&A Sessions at the end of the deliberations provide opportunities to clarify doubts, obtain solutions by learning from one another. All the participants and refineries deserve special mention for contributing in the success of these Activity Committee Meetings. We are extremely keen to improve it further with the help from Industry Experts.

Benchmarking study of PSU Refineries for 2016 cycle has been concluded by M/s Solomon Associates, USA. The "how to use data" seminar on final study results were deliberated with Refineries at a workshop at CHT

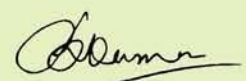
on 30-31st October 2017. Presentations were also made by them in refineries as well as to MoP&NG. As part of initiatives towards reduction of specific energy consumption at PSU refineries, CHT coordinated audit of utilities by PCRA and have initiated a comprehensive study for identifying energy saving measures through EIL. Further, CHT has initiated fresh Refinery Performance Improvement Programme (RPIP) for PSU refineries through global consultants.

After successful implementation of PAT in Refinery sector, BEE has proposed to include Petrochemical sector in PAT cycle IV. CHT has been actively associated in finalising methodology for Petrochemical sector. An Inter-Refinery competition based on Swachhta Index was carried out by Centre for High Technology as the nodal agency designated by Ministry of Petroleum & Natural Gas. This activity was one of the major actions points of Swachhta Pakhwada 2017. Shri K.D. Tripathi, Secretary, PNG presented the awards to the winners on 20th February 2018 in the presence of senior officials.

Efficient & recycling of lubricants can save vital foreign currency as India is largely dependent on import of lube base oil as well crude oil. However, used oil must be managed properly by local waste management authorities or automotive repair shops to prevent contaminating the environment. Against this background, MoP&NG constituted a Working Group to look into various strategies for making a detailed plan for collection of used lubricants and their recycling process to restrict the outflow of used lube oil for burning or other inferior purposes leading to wastage of the valuable base oil. CHT played a significant role in consultation with various stakeholders and finalisation of the report.

Integration of refining with Gasification is new area of interest. A paper on "Gasification" has been included in this edition.

I am grateful to all the agencies, organisations which are working with CHT in achieving the goals set by MOP&NG. We together will continue our endeavour to improve the performance of Oil Companies and encourage innovative methods and technologies to achieve excellence.



(Brijesh Kumar)
Executive Director

Work Commencement Ceremony of Barmer Refinery

HPCL Rajasthan Refinery Limited (HRRL) is a Joint Venture company of Hindustan Petroleum Corporation Limited (HPCL) and Government of Rajasthan (GOR). HPCL holds 74% equity stake in HRRL while balance 26% is being held by GOR. HRRL has been incorporated to set up a green field Refinery cum Petrochemical Complex, with a capacity of 9 MMTPA at Pachpadrain Barmer district, Rajasthan at a cost of ₹ 43,129 crore with a debt to equity ratio of 2:1.

The Project includes setting up an energy efficient and environment friendly refinery cum petrochemical complex with a capacity of 9 MMTPA, producing clean fuels and petrochemicals; setting up Pipeline for transportation of both Rajasthan Crude and imported crude, natural gas from nearby fields and water to the refinery site; petcoke based Captive Power Plant for meeting refinery power and steam requirements, crude and product storage facilities, township and allied facilities and utilities.

The Project shall be utilizing both locally available crude from Rajasthan block i.e. Rajasthan Crude and imported Arab Mix crude. The Project will be producing clean fuels such as BS-VI grade MS & HSD and Petrochemical products such as Polypropylene, Butadiene, LLDPE, HDPE, Benzene and Toluene. The Project will cater to the increased demand of petroleum and petrochemical products in the country.

The final GoI approval was obtained on 9th October 2017 and the Environmental Clearance was received on 13th September 2017. The work commencement ceremony was held in the presence of Hon'ble Prime Minister on 16th January 2018. The construction activities like compound wall, internal roads have commenced.



Shri M.K. Surana, C&MD, HPCL welcoming Hon'ble Prime Minister, Shri Narendra Modi ji during Work Commencement Ceremony of HRRL's Barmer Refinery on 16th Jan. 2018



Hon'ble Prime Minister, Shri Narendra Modi ji being briefed by Shri Dharmendra Pradhan ji, Minister of Petroleum & Natural Gas; Skill Development & Entrepreneurship, Govt. of India about HRRL's Barmer Refinery during its Work Commencement Ceremony



Hon'ble Prime Minister, Shri Narendra Modi ji addressing the gathering during Work Commencement Ceremony of HRRL's Barmer Refinery on 16th Jan. 2018



22nd Refining and Petrochemicals Technology Meet (RPTM) Bhubaneswar, Odisha

22nd Refining and Petrochemicals Technology Meet (RPTM) was organised by Centre for High Technology (CHT) under the aegis of Ministry of Petroleum & Natural Gas, Government of India at MAYFAIR Convention, Bhubaneswar, Odisha during 13-15th January 2018, in association with Indian Oil Corporation Ltd. (IOCL). The theme of the Meet was "Emerging Trends in Downstream Hydrocarbon Sector".

Shri Dharmendra Pradhan ji, Hon'ble Union Minister of Petroleum and Natural Gas; Skill Development & Entrepreneurship, Govt. of India, inaugurated the Meet in the august presence of H.E. Mr Kenji Hiramatsu, Ambassador, Embassy of Japan, Shri K.D. Tripathi ji, Secretary, PNG, Shri Sandeep Poundrik, Joint Secretary (Refineries), MOP&NG and Shri Sanjiv Singh, Chairman, Indian Oil Corporation Ltd. The RPTM was attended by record 950 professionals from India and abroad.



Lighting of the ceremonial lamp by Shri Dharmendra Pradhan Ji, Hon'ble Minister of Petroleum & Natural Gas; Skill Development & Entrepreneurship, Govt. of India. (Standing L to R) Shri Sanjiv Singh, Chairman, Indian Oil Corporation Ltd., Shri K.D. Tripathi, Secretary, P&NG, Shri Sandeep Poundrik, Joint Secretary (Refineries), MoP&NG & His Excellency, Mr. Kenji Hiramatsu, Ambassador of Japan to India

Shri Dharmendra Pradhan Ji, Hon'ble Union Minister of Petroleum and Natural Gas; Skill Development & Entrepreneurship, Govt. of India, stressed that India has to produce not only for itself but has to have responsibility to provide market linkage to neighbouring countries. He emphasized that Eastern belt of India will be the new energy zone of the country. As Petrochemical is poor man's commodity, we should aim to increase our petrochemical consumption from the present level of 10 kg/ capita to the global average of 32 kg/ capita. He advised focus on Research & Development and hoped that Indian refinery sector shall become a provider of technology and best practices.



Shri Dharmendra Pradhan ji, Hon'ble Minister of Petroleum & Natural Gas; Skill Development & Entrepreneurship, Govt. of India, delivering the inaugural speech during the 22nd RPTM at Bhubaneswar.



Release of Report of the Working Group on Enhancement of Refinery Capacity by 2040 by Shri Dharmendra Pradhan ji, Hon'ble Minister of Petroleum & Natural Gas; Skill Development & Entrepreneurship, Govt. of India (Standing L to R) Shri Brijesh Kumar, ED, CHT, Shri Sanjiv Singh, Chairman, Indian Oil Corporation Ltd., Shri Sandeep Poundrik, Joint Secretary (Refineries), MoP&NG, Shri K.D. Tripathi, Secretary, P&NG & His Excellency, Mr. Kenji Hiramatsu, Ambassador of Japan to India

Shri K.D. Tripathi, Secretary, PNG, in his key note address, emphasised focus on value addition through innovation. He stressed that petrochemical demand has strong



Shri K.D. Tripathi, Secretary, P&NG presenting the Keynote address during the 22nd RPTM

linkage with economic growth. Therefore, petrochemical industry is poised for a quantum jump and mentioned that a 1.5 MMTPA Naphtha Cracker is required every 2 years to meet the demand. He pointed out that refineries would further need to address the challenge of declining demand for petcoke, FO and SKO.

H.E. Mr Kenji Hiramatsu, Ambassador, Embassy of Japan, showed strong potential for LNG business between India and Japan and stated that both countries share strongest relationship at present. He also informed that Govt. of Japan has announced 10 Billion US Dollars for capacity building in LNG area in next five years in India.



H.E. Mr. Kenji Hiramatsu, Ambassador of Japan to India, addressing the gathering at the 22nd RPTM

Shri Sandeep Poundrik, Joint Secretary (R), MOP&NG, in his theme address emphasised that India is expected to remain one of the major growth centres of energy consumption. The refining capacity is projected to be 533 MMTPA to meet domestic fuel demand by 2040. Considering that India should aspire to remain Asian Refining Hub, the refining capacity is projected to be 667 MMTPA by 2040 including 25% for export. He further emphasised that refineries need to adopt flexible configuration with Petrochemical and Fertiliser Integration.



Shri Sandeep Poundrik, Joint Secretary (R), MOP&NG, delivering the Theme address during the 22nd RPTM

Shri Sanjiv Singh, Chairman, IndianOil Corporation Ltd., in his welcome address stressed upon the need for flexibility in refinery configuration to meet future challenges of growing importance of petrochemicals as well as alternatives like Bio fuel, H₂ fuel cells, methanol, etc.



Shri Sanjiv Singh, Chairman, Indian Oil Corporation Ltd., delivering the Welcome Address during 22nd RPTM

Shri Brijesh Kumar, Executive Director, Centre for High Technology, in his Vote of Thanks expressed that the overwhelming response received from the entire Oil and Gas sector within the country and from leading technology & service providers from abroad has once again firmly established the popularity and utility of the RPTM.



Shri Brijesh Kumar, Executive Director, CHT presenting the Vote of Thanks during the Inaugural Session of 22nd RPTM

A total of 69 Technical Papers, including 44 papers from Global leaders in Refining & Petrochemical Technology such as Shell, Chevron, UOP, Axens, CB&I, Du Pont, Solomon, Technip, ExxonMobil, KBR, Albemarle, Mitsui, DOW, Lanza Tech, Fluor Daniel, TCC China, KNT Russia, GCE, JNC and Consultants of IHS, ICIS, S&P Global Platts, Stratas were presented during the Technical Sessions. Four Poster Sessions were organised during the 3 days of the Meet covering 79 technical papers. Apart from

these, 12 exhibition stalls were put up by oil companies, consultants and vendors for display of their technology, product and services. Apart from regular speakers / delegates from all over the world, participation from countries like Japan, Russia, Malaysia, China, Saudi Arabia and Sri Lanka were observed for the first time.

There were 3 Technical Sessions related to the theme during which 11 papers were presented on the 1st day of the Meet on the topics 'Emerging Trends in Refining & Petrochemicals' and 'Refining and Beyond'. On the second and third day of the meet, 12 nos. Technical sessions covered the entire spectrum of Downstream Petroleum Refining viz. Advances in Refining Technology, Innovations in Refining, Energy Efficiency Improvement, Advances in Catalyst Management, Automation, Best Practices and Operational Excellence including Petrochemicals Sectors viz. PVC-Options, Styrene, Second Generation Ethanol, Olefins and Biomass Upgradation.

Poster Gallery & Exhibition Stalls

The Hon'ble Minister inaugurated the Poster gallery of technical papers and Exhibition stalls showcasing a wide range of innovative technologies, products and services by reputed vendors, consultants and service providers like Shell, CRI, Criterion, DuPont, among others. EIL, IOCL and HPCL R&Ds showcased their technologies including those taken for commercialization. The Hon'ble Minister held close interaction with poster presenters and exhibitors.



Inauguration of Poster and Exhibition Gallery of the 22nd RPTM by Shri Dharmendra Pradhan ji, Hon'ble Minister of Petroleum & Natural Gas; Skill Development & Entrepreneurship, Govt. of India



Shri Dharmendra Pradhan ji, Hon'ble Minister of Petroleum & Natural Gas; Skill Development & Entrepreneurship, Govt. of India at HPCL Exhibition Stall along with senior officials.

Biofuels are one of the key options to decarbonise the transport sector and the share of biofuels in liquid and gaseous transport fuels will need to increase significantly.

22nd RPTM Feedback from foreign delegates



Shinichi Kojoh
Mitsuichemicals, Japan

Especially, linkage between government and industry is much better than other conferences. It was my special experience to listen to the speech about governmental policy and technical presentations.



Noritaka Ishii
JNC Corp., Japan

Each presentation is very informative. We learned that RPTM is a great opportunity also for a Japanese chemical company, like us.



Song Haodong
China Tianchen
Engineering Corporation,
China

The communication and exchange in technology development and market analysis, the Meet also gives India and foreign companies a platform to interact with each other and create greater value together, which is of great benefit to the big picture of the development of Indian process industry.



E. A. A. K.P. Edirisinghe,
Ceylon Petroleum
Corporation, Sri Lanka

All technical sessions with emerging trends, New innovations, new technology and poster sessions are very useful to understand the future of refining and petrochemical industry.



Mullabaev,
KNT Group, Russia

A very well-organized conference (more than 1000 participants) and a high level of organization by the Ministry of Oil and Gas of India and sponsorship by leading companies.



Cho Jaewon
Aramco Asia

Topics such as updates or insights of metallurgy, mechanical system, design technologies, etc. may be taken up in the next conference. Presenting successful industry experiences of IR 4.0 which are implemented to the real refinery and petrochemical plants will be helpful.

22nd Refinery & Petrochemical Technology Meet (RPTM) goes Digital

Centre for High Technology (CHT) recently launched its new Website i.e. <https://cht.gov.in> in October 2017 with some enhanced features to comply with the increasing emphasis by the Government of India on digitization. While designing the website, all efforts were made for digitalization of processes involved in organizing major events such as Refinery & Petrochemical Technology Meet (RPTM) by CHT as well as information sharing and knowledge dissemination.

The 22nd RPTM held during 13th-15th January 2018, witnessed the manual processes transform into digitized transactions on CHT's website. They are broadly categorized as follows:

1. Uploading of Announcement Brochure, Program Schedule & Award Brochure for the RPTM

2. Abstract submission for the Oral Sessions and Posters
3. Online Evaluation & Selection of Abstracts for Oral Session and Poster category
4. Auto-generated mail intimation to presenters whose abstracts are selected
5. Uploading of technical papers, ppt. files, Bio-data
6. Online registration of Delegates with all details
7. Online Payment transactions
8. Online generation of RPTM Compendium

The digitization made the task of organizing this massive event easier since the processes were user friendly and easy to work with and helped CHT in bringing better transparency in the system, achieve availability of data along with its quick retrieval and analysis.

Awards

In order to encourage competition amongst the refineries and recognise overall performance improvement, Ministry of Petroleum & Natural Gas, Government of India has instituted the annual awards in the following categories:

- Refinery Performance Improvement Award
- Oil & Gas Conservation Fortnight (OGCF) Award
- Innovation Award

The awards were finalised by the Award Selection Committee constituted by MoP&NG. Shri Dharmendra Pradhan ji, Hon'ble Union Minister of Petroleum and Natural Gas; Skill Development & Entrepreneurship, Govt. of India, presented the awards to the winners.

Refinery Performance Improvement Award

The Refinery Performance Improvement Award is based on the performance of refineries against various critical parameters like Crude T'put, Specific Energy Consumption, Specific Steam Consumption, Carbon Emission Intensity, Operating Cost and Specific Water Consumption.

The Award winning refineries for the category 'Refinery Performance Improvement' for the year 2016-17 are as under:

| | |
|--------------|--|
| First Prize | Bharat Petroleum Corporation Ltd., Mumbai Refinery |
| Second Prize | Indian Oil Corporation Ltd., Mathura Refinery |

Oil & Gas Conservation (OGCF) Awards for the year 2017

Oil & Gas Conservation Fortnight (OGCF) is celebrated throughout the country during January every year with the purpose of creating awareness amongst various target groups to appreciate and inculcate the habit of conserving petroleum products. During OGCF, CHT, in association with refineries organizes surveys in the areas of:

- Furnace/ Boiler Efficiency
- Steam leak

These two areas are taken-up every alternate year and are conducted simultaneously at all the refineries including private refineries by teams constituted by CHT which evaluate the performance and the Awards are finalized by the Award Selection Committee constituted by MoP&NG. The award for 2017 is based on the OGCF Survey conducted during January, 2017 in the area of Steam Leak.

The Award winning refinery for the category 'Best Steam Leak Improvement' for 2017 is as under:

| | |
|---------------------------------|--|
| Best Improvement in Steam Leaks | Indian Oil Corporation Ltd., Bongaigaon Refinery |
|---------------------------------|--|

Innovation Awards for the year 2016-17

MoP&NG has instituted R&D/ Innovations Awards for "Best indigenously Developed Technology/ Process" to incentivise and encourage R&D/ Innovation efforts in the Oil Industry. The objective of this Award is to promote innovative scientific endeavour in the country by encouraging and rewarding excellence in innovation and channelizing national and international knowledge and expertise with the mission of giving impetus to innovation activity in the country.

The Innovation Awards are conferred in the following categories:

- Best indigenously developed technology-Team
- Best innovation in Refinery –Team
- Best Innovation in R&D institute

Innovation Awards for the year 2016-17 were given in the various categories as follows:

| Sl. No. | Category | Innovation related to | Winner |
|---------|--|--|--------------------------|
| 1 | Best Indigenously Developed Technology | 'SprayMax' FCC Feed Nozzle – Successful Demonstration by HPCL towards "Make-In-India" | HPCL R&D |
| | | Development and Commercialization of Pressure Swing Adsorption Technology for Hydrogen Purification (H ₂ PSA) | HPCL R&D |
| 2 | Best Innovation in Refineries | Production of Superior Quality Hexane as a by-product from Isomerization Unit | BPCL, Mumbai |
| 3 | Best Innovation in R&D | Development and Commercialization of In-house Technology for Low cost Anti-coking & Sulfiding Additive for Gas/Naphtha Cracker & HT Catalyst | Reliance Industries Ltd. |

Glimpses of the Award Function



Team BPCL-Mumbai Refinery receiving the First Prize in Category 'Refinery Performance Improvement Award 2016-17'



Team IOCL-Mathura Refinery receiving the Second Prize in Category 'Refinery Performance Improvement Award 2016-17'



Team IOCL-Bongaigaon Refinery receiving OGCF Award 2017 for 'Best Steam Leak Improvement'



Team HPCL-R&D receiving Innovation Awards 2017 for the Category 'Best Indigenous Developed Technology-Team' for 'SprayMax' FCC Feed Nozzle – Successful Demonstration by HPCL towards "Make-In-India"



Team HPCL-R&D receiving the Innovation Awards 2017 for the Category 'Best Indigenous Developed Technology-Team' for Development and Commercialization of Pressure Swing Adsorption Technology for Hydrogen Purification (H₂ PSA)



Team BPCL-Mumbai Refinery receiving Innovation Awards 2017 for the Category 'Best Innovation in Refinery-Team' for Production of Superior Quality Hexane as a by-product from Isomerization Unit



Team RIL receiving Innovation Awards 2017 for the Category 'Best Innovation in R&D Institute' for Development and Commercialization of In-house Technology for Low cost Anti-Coking & Sulfiding Additive for Gas / Naphtha Cracker & HT Catalyst



Dignitaries and Delegates of the 22nd RPTM at Bhubaneswar

Shri Dharmendra Pradhan ji, Hon'ble Union Minister of Petroleum and Natural Gas; Skill Development & Entrepreneurship, Govt. of India, also presented the Oil Industry Safety Awards to the winners for the year 2015-16 and 2016-17 in the inaugural session of the 22nd RPTM.

“Keep innovating - Innovation is what will help us grow faster”.

**- Narendra Modi
Hon'ble Prime Minister of India**

Interactive meet with Global companies on Skill Development initiatives

An interaction meet on Skill Development initiatives in Hydrocarbon sector was chaired by Shri Dharmendra Pradhanji, Hon'ble Union Minister of Petroleum and Natural Gas; Skill Development & Entrepreneurship, Govt. of India, in the presence of H.E. Mr. Kenji Hiramatsu, Ambassador of Japan to India, Secretary, PNG, JS (Refineries), JS (Skill Development) and captains of Oil Industry in India and abroad at the side-lines of the 22nd RPTM. Apart from Multinational companies,

representatives from Skill development Institutes namely, IIT, CIPET, Central tool room and various Educational Institutes from Bhubaneswar joined the meet. Shri Pradhan in his address urged to develop an Eco system to develop skill and knowledge centric hub to collectively upgrade human resources capital. Skill Development has been accorded top priority in the Hydrocarbon sector in line with the National Skill Development Mission of Govt. of India.



Shri Dharmendra Pradhan ji, Hon'ble Minister of Petroleum & Natural Gas; Skill Development & Entrepreneurship, Govt. of India chairing the Interaction meet on Skill Development initiatives in Hydrocarbon sector

Union Petroleum Minister, Shri Dharmendra Pradhan, dedicates CPCL's Residue Upgradation Project to the Nation

CPCL a group company of IndianOil, embarked on a value addition project at its Manali Refinery for upgradation of residue to high value distillates such as Diesel, Naphtha and LPG through Delayed Coking process, at an investment of Rs.3,110 crore. The project will reduce production of Fuel Oil and increase percentage of High Sulphur Crude oil processing in the crude mix, resulting in lesser feed cost. An overall increase of 700 thousand metric tonnes (TMT) of LPG and Diesel is expected on an annual basis.

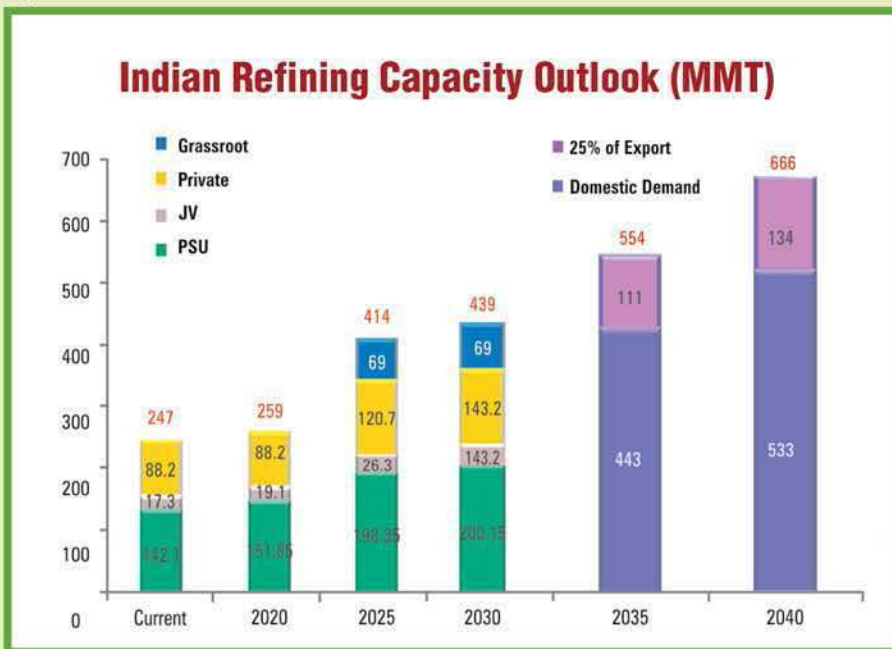
The project was dedicated to the Nation by Shri Dharmendra Pradhan ji, Minister of Petroleum

& Natural Gas & Minister of Skill Development and Entrepreneurship, Government of India on 27th February 2018. Shri K. Pandiarajan, Minister for Tamil Development, Culture and Archaeology, Government of Tamil Nadu, Dr. P. Venugopal, Member of Parliament, Thiruvallur constituency, Shri T.G. Venkatesh Babu, Member of Parliament, Thiruvallur constituency and Shri K.P.P. Samy, Member of Legislative Assembly, Thiruvottiyur constituency, Shri Sanjiv Singh, Chairman IOCL, Shri S.N. Pandey, MD CPCL and other senior officials from Central and State Govt., Oil marketing companies and neighbouring industries graced the occasion.



Enhancing Refining capacity by 2040

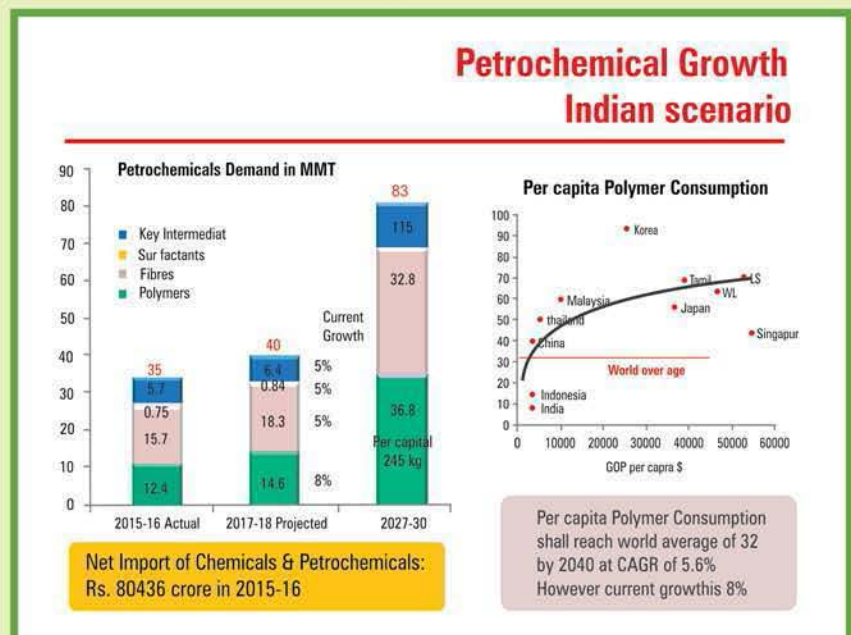
Indian Refining industry has made a spectacular progress over the years. On one hand, there is need to augment refining capacity to make the energy available to millions of our citizens and keep the different sectors of GDP rolling at desired pace. On the other hand, technological advancements in alternate energy and particularly mobility sector are happening. Thus there is need to keep building refining capacity keeping course corrections in mind and integrating more to Petrochemicals and Fertilisers sectors with an eye on Environment. Recognizing the importance of prospective refining infrastructure in India viewed against the role of petroleum products to cater to the energy needs, a Working Group was constituted by Ministry of Petroleum and Natural Gas for preparing a Report on Enhancing Refining Capacity by 2040.



The Working group developed an Energy Demand Projection Model (EDPM) to work out the demand projections of total primary energy in India and eventually, by combining demand and supply, the primary energy demand was projected up to 2040 considering the Indian and global perspective. The Working Group decided on three potential scenarios namely Trend, Transition and Transformation which broadly spell out the potential evolution of the energy sector in India and its impact on oil consumption. The demand for Final energy under Trend scenario is expected to reach from 513 Mtoe in 2015 to 1320 Mtoe in 2040 in the 'Trend' case at a CAGR of 3.9%.

As per the plans submitted by respective refiners, majority of the capacity addition of 123 MMT is expected to be commissioned by 2025. With Green field Projects at Barmer (9 MMTPA) and Ratnagiri (60 MMTPA), the refining capacity will go up to 439 MMTPA by 2030 from 247.6 MMTPA at present.

This capacity will be sufficient to meet the Domestic demand upto 2035. Further the capacity requirement for the year 2040 is projected to be 533 MMTPA to meet the domestic demand and to 667 MMTPA to maintain export of 25%. Refineries configuration needs to be integrated with Petrochemicals and Fertiliser industry to insulate them from any future challenges due to e-mobility and alternate fuels.



India's Petrochemical demand is expected to reach 83 MMT by 2030 from present projected level of 40 MMT in 2017-18. Polymer demand of our country is expected to reach about 48MMT with world average of 32 kg per capita by 2040 at a CAGR of 5.6% from the present level of 14.6 MMT. With the current growth rate of 8%, it is projected to be achieved earlier than 2040.

Takeaways from the 22nd RPTM

1. Refinery configuration needs to be flexible and integrated with petrochemicals, bio-refining and alternative businesses like hydrogen, fertilizers and utilities so as to meet any challenges arising out of disruption caused by alternatives in future. Refineries need to build flexibility of switching product pattern from fuels to Petrochemicals.
2. Besides the conventional feedstocks (viz. Naphtha, Propane, Butane, Rich Gas), the new Petrochemical Complexes would need to utilise feedstocks like imported ethane, condensate, kerosene, hydrocracker bottoms, synthetic natural gas obtained through coal / petcoke gasification etc. However, the choice of Petrochemical feedstock will need to be evaluated based on relative economics of each option.
3. Due to disruptions, MS demand is expected to face maximum impact among all the key fuel products. The surplus naphtha can be diverted as feedstock for petrochemicals production.
4. Future refineries would need to move away from production of Petcoke and FO due to environmental regulations and also kerosene due to its declining demand. Choice of residue upgrading option of Delayed Coker (which results in petcoke) or slurry hydro-cracker / ebullated bed options (to increase the distillate yield over coker option) or asphalt pitch / resid gasification needs study. Gasification, besides reducing refinery bottom also facilitates integration into new business of Petrochemical, Hydrogen, Fertilizers.
5. Production of Methanol through Gasification route and then to DME and olefins requires closer attention and techno economic study.
6. Hydrogen as a product from Refinery may be considered for enabling hydrogen technology and infrastructure to develop and ultimate migration to Hydrogen Economy.
7. Conversion of CO₂ for production of chemicals / fuels needs to be integrated in the plans of Refineries.
8. PVC plants preferably may be considered in Eastern India where numbers of caustic soda plants are available. In addition, production of PVC by carbide route also needs to be evaluated in line with experience of other countries, as it eliminates use of chlorine gas.
9. As there is growing demand of styrenics e.g. ABS etc. at least one plant needs to be considered in the country.
10. An adsorbent based novel technology has been developed at Reliance R&D Centre for efficient removal of sodium from sodium rich Disulphide Oil. The indigenously developed technology will help to save foreign currency replacing the imported costly chemical DMDS as anti-coking and sulfiding additive.
11. BPCL Mumbai refinery has produced stringent quality polymer grade Hexane using a divided wall column in ISOM unit which has been converted from redundant semi-generative catalytic reforming unit. This has led to 27% energy saving and reduced production cost substantially.
12. BPCL Kochi refinery has developed an ion-exchange technology for sulfolane solvent regenerations. In normal practice degradation of solvent used to be mitigated by steam regeneration of slip stream which was not found effective. The problem has been resolved by ion-exchange regeneration which has prevented costly solvent replacement. The similar approach will be very helpful in improving life and performance of MDEA used in ARU.
13. Conversion of Mixed Organic Residue Feedstocks and municipal wastes to Drop-in hydrocarbon Fuels and further chemicals in future need to be explored.
14. Indigenous development of both Refinery and Petrochemical catalysts along with development of Indigenous process technologies need to be

- expedited and implemented to improve self-sufficiency.
15. Initiatives are to be taken for joint ventures with foreign companies for development of niche chemicals in the country.
16. Blending of ETBE may be considered by Refineries for production of 95 RON MS and ethanol use for production of ETBE may be considered within mandate for ethanol blending.
17. Synergy between Refineries and Fertiliser Industry can be developed by WSA technology which produces Sulphur with much less capex compared to conventional technology and this can be converted to sulphuric acid in Fertiliser Industry.
18. Innovative use of plastic waste in road construction by mixing with hot bitumen after initial simple processing has been accomplished by BRPL. For every square meter of road, around 200 grams of plastic waste can be used.
19. Salient Points of Technical Presentations and Poster Papers :
- I) Invista's DTL technology converts Olefins in FCC off gas to MS blending stock
- II) CSIR-IIP has developed a Study for the process of producing light olefin (C2-C4) from synthesis gas derived from coal gasifier. The catalyst and process can handle CO₂ in syngas to the range of 10-20%. The direct syngas to ethylene, propylene and butene is very economic than the commercial two step route through methanol.
- III) IH₂ technology (Shell) converts Bio mass, agricultural residues and municipal waste to blending stock for Diesel and Petrol
- IV) NRL is setting up a bamboo based 2nd Generation ethanol plant of 6.2 crore litre per annum capacity compared to country's requirement of 5.9 crore litre per annum for target of blending 20% Ethanol in Motor spirit.
- V) Refinery off gas, syn gas and also effluent from the Refineries can be converted to Ethanol by LanzaTech technology using Microbes
- VI) In future, creation of new polyolefin hybrids is expected for novel properties of the polymer and easier recycling
- VII) Energy and Water conservation has been achieved by NRL by Coagulant Change over from Aluminium Sulfate to Poly Aluminum Chloride (PAC) at a Conventional Water Treatment Plant
- VIII) UOP's "Energy Efficient LD Parex (EE LD Parex)", which is highly integrated innovative process scheme for the Energy Efficient Aromatic Complex (EEAC) optimises distillation thereby cutting energy costs by as much as 20-30%, as over the conventional design.
- IX) EIL's patented Hydrogen Recovery Process, "EngCryo™" can recover hydrogen from streams having low concentration of hydrogen, like hydrogen containing gases from hydrotreaters and hydrocrackers, off gas from isomerization unit, Off gas from Refinery Off Gas PSA etc., with off gas pressure as low as 4 kg/cm² with higher recovery (95-99%), thereby easing the load on the Hydrogen Generation Units.
- X) HPCL R&D is developing vanadium and zinc-bromine based flow battery for energy storage and conversion applications with the integration of solar PV for the refineries. On replacing the existing lead acid battery, connected with solar PV by flow battery system, the energy efficiency can be increased by more than 50% with more economical way due to its huge longevity and more reliability.
- XI) HPCL R&D has developed Infrared thermography along with tank skin temperature survey to determine the height of sludge in the tanks in order to proceed for decommissioning the tanks leading to saving of time and cost in estimating the sludge with reasonable accuracy.

INNOVATIONS BY INDIAN OIL COMPANIES

With a view to create solutions impacting social and economic values, National Innovation Council was set up by the Government of India, creating a system to produce mutually reinforcing policies, recommendations and methodologies to implement and boost innovation performance in the country.

Sectoral Innovation Council for Petroleum and Natural Gas was constituted as a part of the National Innovation Council initiative to drive innovations in the Petroleum and Natural Gas Sector and to provide executable and implementable policy inputs and initiatives. The Sectoral Innovation Council also recommended awarding Innovations in Refining Sector.

In this regard, MoP&NG has instituted R&D / Innovation Awards for 'Best indigenously Developed Technology / Process' to incentivise and encourage R&D / Innovation efforts in the Oil Industry. The objective of this Award is to promote innovative scientific endeavour in the country by encouraging and rewarding excellence in original invention / innovation and channelizing national and international knowledge and expertise with the mission of giving impetus to innovation activity in the country. Also, it is aimed at recognizing the hidden creative talent in individuals or group out of recognized R&D system that could be harnessed for the benefit of the Nation.

The brief details of the shortlisted schemes for the year 2016-17 are given as under:

Production of superior quality Hexane

BPCL Mumbai Refinery used to produce Food Grade Hexane by Solvent extraction. To meet BS-IV MS quality requirement, the Semi-regenerative Catalytic Reforming Unit (CRU) which was redundant post commissioning of Continuous Catalytic Regeneration Unit (CCRU) was converted to Isomerisation Unit (ISOM) in March, 2017. In order to produce Pharmaceutical & Polymer Grade Hexane, a divided wall column (DWC), was installed as De Iso-Hexaniser (DIH) Column in ISOM Unit, having about 27% energy savings potential compared to conventional four column system, with reduction in production cost from Rs.6700/MT to Rs.204/MT of Hexane produced, apart from savings in refinery plot area. This is world's first top divided wall column, which enabled BPCL to supply stringent quality Hexane as a byproduct alongwith Isomerate required for BS-IV MS production.

In situ Sulfolane Solvent Regeneration using Ion exchange Technology: BPCL-KR

Sulfolane is used as a solvent in Extraction of Aromatics like Benzene & Toluene from Reformate. The Solvent degrades over the period due to Chloride Contamination in feed, Oxygen ingress and temperature and the degraded solvent becomes acidic in nature, which leads to corrosion and contains polymerized solid particles, which leads to erosion. The earlier practice of steam regeneration of Slip Stream was not much effective due to capacity limitation of regenerator and as a result, required replacement of costly Solvent. The problem was resolved by adapting Ion exchange regeneration i.e. Strong Acid Cation bed followed by weak basic Anion bed to remove acid and alkali present in Sulfolane Solvent along with installation of a micron filter at upstream of exchange bed to remove the total suspended solids. The insitu regeneration of the entire system solvent was completed within 1 week time by deploying Skid mounted facilities. The savings arising out of reduction in Solvent Consumption, Steam for Regeneration and pump maintenance works out to about Rs. 25 Crore. The Similar approach could be very useful in improving life & performance of MDEA used in ARU.

Low Cost Anti-Coking Additive for Gas / Naphtha Crackers & Sulfiding Additive for Hydrotreater Catalyst

Di sulfide oil (DSO), consisting of C2 – C4 di-sulfides, is a waste bi-product of LPG desulfurization process (Merox). Disposal of DSO is an issue for petroleum refinery due to its obnoxious odour and high sulfur content (~62 wt. %). Moreover, presence of sodium makes DSO inappropriate for a number of applications as a high value specialty chemicals e.g. anti-coking additive for gas / naphtha cracker, sulfiding additive for hydro treater catalyst, etc. An adsorbent based novel and green technology has been developed by Reliance Industries Ltd. for reduction of sodium concentration of DSO below 0.1 ppm. This development is an example of purely Indian effort from concept to commercialization of indigenously developed technology where in-house resources were utilized for process development, scale up, engineering and commissioning of the commercial unit at Reliance Jamnagar Refinery. This patented technology will provide significant monetary benefit and help to save foreign currency by replacing the imported costly chemical DMDS used as anti-coking and sulfiding additive and will also eliminate the need for various statutory clearances required for import of DMDS.

Development and Commercialization of Pressure Swing Adsorption Technology for Hydrogen Purification (H₂ PSA).

Pressure Swing Adsorption (PSA) is the most widely used process in refineries for purification of Hydrogen to 99.9 mole% purity. The technology is majorly licensed by only two international companies and all the critical details of the technology are closely guarded. HPCL R&D has developed the technology and the first commercial H₂ PSA unit was designed, installed and commissioned at HPCL Visakh Refinery for purification of Hydrogen from CCR off-gases. The plant has a feed processing capacity of 36,000 Nm³/hr and produces 99.5 mole% pure Hydrogen. By way of setting-up of the commercial H₂ PSA unit, HPCL R&D has acquired the technical know-how of the technology including its critical components i.e., adsorbents, process sequencing and valves. This commercialization effort will be a step forward for indigenization of H₂ PSA technology which is expected to have significant market potential in near future in India.

'SprayMax' FCC Feed Nozzle – Successful Demonstration by HPCL towards "Make-In-India".

Fluidized Catalytic Cracking (FCC) unit is a major secondary processing unit in a refinery which converts heavy feedstock to high value products like LPG, Gasoline and Diesel. Feed Nozzle, which is one of the critical hardware components in FCC units are currently supplied by foreign technology licensors due to its highly guarded design and know-how.

In order to reduce the dependency on foreign licensor and to promote Govt. of India's initiative of "Make-In-India", HPCL R&D Centre has developed design of FCC Feed Nozzle (called as "SprayMax" Nozzle) based on the fundamental principle of liquid atomization, and testing the prototype design using air-water system, CFD studies etc. Subsequent to the design, these nozzles were scaled-up and installed at HPCL-Mumbai and Visakh Refinery by replacing licensor's supplied nozzles. Successful performance guarantee test run was conducted which has shown increase in conversion by 1.37wt% with significant reduction in dry gas. This development offers the possibility to not only improve conversion and reliability in FCC unit but also provide an opportunity to license the SprayMax nozzles to other companies.

Development and commercialization of indigenous cost effective Gasoline Sulfur Reduction Catalyst Additive for Fluid catalytic cracker unit in refineries: BPCL R&D

Catalyst plays an important role in FCC process. In addition to main catalyst, a number of catalyst additives

such as ZSM-5 for octane boosting and propylene maximization, GSR (Gasoline Sulfur Reduction) additive for gasoline quality enhancement and CO combustion promoter for reducing after burn in regenerator are also employed in FCC process.

BPCL Corporate R&D Centre (CRDC) has developed additive for reduction of Sulphur in Gasoline produced from FCC. Based on plant trial carried out at BPCL-Mumbai Refinery, per cent sulphur reduction achieved was 22.3% and 25.5% respectively corresponding to 10% and 15% loading of Gasoline Sulphur Reduction (GSR) Additive in base catalyst. The other properties of the gasoline like RON, MON and RVP was found to be unaffected by the addition of indigenously developed GSR additive of BPCL.

Oxygen-rich Process for Capacity Enhancement of Sulphur Recovery unit

With increased processing of High Sulphur Crudes as well as to meet stringent fuel quality specification (BS-IV/VI), there is a need for enhancing Capacity of Sulphur Recovery Unit (SRU). EIL has developed an indigenous technology for capacity enhancement of existing SRU by Oxyrich Process, where Oxygen enriched combustion air is used instead of atmospheric air to reduce nitrogen content and increase acid gas flow. Capacity enhancement up to 30% in existing SRU can be achieved and has been demonstrated at CPCL-Manali and NRL.

HP FurnOKare-A Cost Effective online heater cleaning chemical Formulation - An indigenous and a Make in India initiative - HPCL R&D

In order to remove deposits/scales in furnace heater tubes, HPCL-R&D Centre has developed HP FurnOKare chemical for online cleaning. During commercial trial at HPCL-Vizag Refinery, the furnace bridge wall temperature was reduced by 70 deg. C. After Scale Up, HP FurnOKare is in use at both Mumbai & Vizag Refinery of HPCL and demonstration was carried out at MRPL, where reduction of Furnace Arch temperature by more than 100 deg. C was observed. Subsequently, MRPL placed purchase order to HPCL for supply of HP FurnOKare based on Competitive bidding. Thus, HP FurnOKare, the cost effective indigenous chemical formulation has been successfully commercialized for online furnace cleaning.

Meetings of the Executive Committee of CHT

The 23rd Meeting of the Executive Committee (EC) of CHT was held under the Chairmanship of Shri Sandeep Poundrik, Joint Secretary (R), MoP&NG on 30th October, 2017 at SCOPE Convention, New Delhi. The meeting was attended by Chairman, IOCL; Director (Refineries) of BPCL, HPCL; MD of CPCL, MRPL; Director (T), EIL; Director, CSIR-IIP; FA&CAO, OIBD; Dy. Secretary (R), MoP&NG; and senior officials from NRL and GAIL. During the meeting, detailed review was held on the progress and status of major activities of CHT including Energy Efficiency Improvement Study and Performance Audit of PSU refineries, Mandatory Energy Audit (MEA) taken up through PCRA, Benchmarking Study by Solomon Associates for 2016 Cycle, Performance Improvement Programme of PSU Refineries etc. EC also reviewed the progress of on-going R&D projects funded by CHT.

The 24th EC Meeting was held under the chairmanship of Shri Sandeep Poundrik, Joint Secretary (R), MoP&NG on 16th February, 2018 at Conference Hall, MoP&NG, New Delhi and was attended by Director (Refineries) of IOCL, BPCL, HPCL; MD, MRPL & NRL; Director (T), CPCL; ED I/C

(T), EIL; ED (R&D) GAIL; Dy. Secretary (R), MoP&NG and Dy. Chief F&AO, OIBD. The detailed review included the progress and status of all the major on-going activities of CHT and RBE: 2017-18 & BE:2018-19.



Shri Sandeep Poundrik, Joint Secretary (R), MoP&NG chairing the Executive Committee (EC) Meeting of CHT Seated (L-R) : Shri V. Shenoy, Director (R), HPCL and Shri Brijesh Kumar, Executive Director, CHT on the extreme right

80th Meeting of the Scientific Advisory Committee (SAC) on Hydrocarbons

80th Meeting of the Scientific Advisory Committee (SAC) on Hydrocarbons of MoP&NG was held on 6th September, 2017 at HPCL Petroleum House, Mumbai. The meeting was chaired by Dr Anil Kakodkar. Shri V.S. Shenoy, Director (R), HPCL welcomed the Chair, JS(R) & other members of SAC.

Chairman, SAC emphasized that selection of R&D projects and promotion of technology development should be aimed towards achieving Govt.'s focus on reduction of oil import bill, ensuring energy security and reduction of carbon foot print. R&D institutes need to collaborate more and more among themselves as well as with industry to achieve greater synergy, particularly in the projects of common interest and national importance. He also emphasized on demand driven R&D in priority areas, development of in situ gasification of coal, steam electrolysis for hydrogen production utilizing surplus power whenever available, developments in EVs and enlarging & sustaining bio oil initiative.

Joint Secretary (Refineries), MoP&NG emphasized on technology development for 2G ethanol, role of used cooking oil and waste to fuel and energy conservation at refineries under PAT scheme.

SAC reviewed the status of EOI, way forward on completed projects and progress of on-going R&D projects. SAC recommended continuation of programme under the Hydrogen Corpus Fund (HCF) and simplification of project approval mechanism. SAC requested MoP&NG to constitute a Committee for a comprehensive study for setting up catalyst manufacturing unit in India including scope, capacity, scale up, financing/ operating mechanism and prioritization after benchmarking & impact assessment of developed catalysts.



Shri Anil Kakodkar, chairing the 80th SAC meeting (Seated L-R): Shri V.S. Shenoy, Director (Refinery) HPCL, Mumbai, Shri Brijesh Kumar, Executive Director, CHT, and Shri Sandeep Poundrik, Joint Secretary (Refineries), MoP&NG on extreme right

Swachhta Index

An Inter-Refinery competition on Swachhta Index was carried out by Centre for High Technology (CHT) as a nodal agency designated by Ministry of Petroleum & Natural Gas. This activity was one of the major actions points of Swachhta Pakhwada 2017. The Swachhta Index, developed by CHT, is based on infrastructure available at Refineries not only for its own employees but also for its contract labours, Cleanliness, Systems and processes including waste generation and disposals, initiatives taken for Swachhta awareness and its campaign, waste paper recycle and reuse, processing municipal waste in Refineries, etc. Based on Swachhta Sarvekshan, the index was used to have an inter-refinery competition on the Swachhta theme. The outcome of the Swachhta Ranking of oil refineries is linked with the Swachh Bharat Mission and throws up an action agenda for further improvement.

The refineries of OMCs and their subsidiaries / JVs were divided into three groups for this purpose. The groups were: Group 1: All refineries of Indian Oil Corporation Ltd.

(IOCL) including CPCL; Group 2: Refineries of HPCL, MRPL & HREL and Group 3: Refineries of BPCL, NRL & BOREL. CHT developed the matrix for evaluation parameters and the refineries were accordingly ranked. The areas of the survey included process plant/offsite/and non-plant area and also facilities for contract labours. The highest weightage was given to parameter of cleanliness and the initiatives taken to spread awareness about Swachhta through various competitions among the employees.

A team comprising a member each from MoP&NG and CHT and one each from Indian Oil, HPCL and BPCL visited two refineries from Group 1 and refinery from Group 2 & 3 in September, 2017 for ranking the refineries. The 1st prize for cleanliness was bestowed upon Indian Oil's Panipat Refinery. The 2nd prize was received by BPCL, Mumbai Refinery and HREL, Bhatinda Refinery and the 3rd prize was won by Indian Oil's Paradip Refinery. The winning certificates were presented to the winners by Mr. K D Tripathi, Secretary, MoP&NG in the presence of senior Ministry officials on 20th February 2018.



Shri Sanjiv Singh, Chairman, Indian Oil Corporation Ltd., receiving the winning certificate for Panipat Refinery and Paradip Refinery from Mr. K D Tripathi, Secretary, MoP&NG



Shri R. Ramachandran, Director (R) Bharat Petroleum Corporation Ltd., receiving the winning certificate for Mumbai Refinery from Mr. K D Tripathi, Secretary, MoP&NG



Shri M.K. Surana, C&MD, Hindustan Petroleum Corporation Ltd., receiving the winning certificate for HREL Bhatinda Refinery from Mr. K D Tripathi, Secretary, MoP&NG

***"If you always do what you always did,
you will always get what you always got".***

- Albert Einstein

OGCF Survey 2018 on Furnace Efficiency

Every year CHT organises a simultaneous survey in all Indian Refineries for Steam leaks & Furnace efficiency alternatively during the Saksham month.

This year, CHT organised the Furnace efficiency survey for a period of 4 days.

For the survey, refinery-wise teams are formed with a Team leader-cum-coordinator drawn from the same Refinery and 2-4 team members from other Refineries. CHT mobilised about 70 engineers from Refineries as external team members for simultaneous survey at all locations.

CHT circulated the data collection formats, procedure for conducting the survey and the software for working

out the individual Furnace efficiency as well as overall weighted average efficiency in the Refinery.

The survey could be completed successfully during the period viz., 22nd to 25th January, 2018 and all the Refineries have worked out the Furnace/Boiler efficiency using CHT's software.

The calculation file also gives the breakup of area wise loss which will be useful for the Refineries to act and reduce the losses.

The results of the Survey as calculated by Survey teams is as below:

| Sl No | Refinery | 2018-Survey | | 2016-survey |
|-------|-------------------|------------------------------|------------------------------|------------------------------|
| | | Overall Fired duty MMkcal/hr | Overall Furnace efficiency % | Overall Furnace efficiency % |
| 1 | IOC-Guwahati | 108 | 92.00 | 93.29 |
| 2 | IOC-Barauni | 245 | 90.99 | 90.41 |
| 3 | IOC-Gujarat | 727 | 89.06 | 88.01 |
| 4 | IOC-Haldia | 374 | 86.70 | 91.09 |
| 5 | IOC-Mathura | 258 | 86.47 | 91.53 |
| 6 | IOC-Digboi | 29 | 86.20 | 84.33 |
| 7 | IOC-Panipat | 1635 | 87.81 | 91.12 |
| 8 | IOC-Bongaigaon | 106 | 88.49 | 87.95 |
| 9 | IOC-Paradip | 786 | 92.40 | 86.98 |
| 10 | BPC-Mumbai | 457 | 90.53 | 88.39 |
| 11 | BPC-Kochi | 789 | 89.67 | 90.30 |
| 12 | HPC-Mumbai | 317 | 87.14 | 86.98 |
| 13 | HPC-Vizag | 318 | 87.41 | 90.25 |
| 14 | CPCL-Manali | 595 | 86.41 | 92.34 |
| 15 | NRL | 121 | 91.53 | 90.37 |
| 16 | MRPL | 1079 | 92.53 | 91.93 |
| 17 | HMEL | 262 | 90.78 | 94.81 |
| 18 | BORL | 477 | 90.18 | 88.69 |
| 19 | Essar Oil Limited | 1525 | 88.52 | 86.66 |
| 20 | RIL-DTA | 1256 | 90.16 | 90.79 |
| 21 | RIL-SEZ | 1802 | 90.58 | 91.43 |
| | Industry | 13267 | 89.58 | 90.12 |

Gasification in Petroleum Refinery

-by Brijesh Kumar, ED(CHT)

Refineries currently employ delayed coker as the major resid upgradation technology. However, in the process petcoke is produced, almost 30% petcoke on the feed having 7-8% sulphur. The best use of this coke is in the cement kiln, where the sulphur is converted to Gypsum, a useful ingredient of cement. The balance petcoke is used as fuel in boilers, which is expected to be banned in near future.

Refineries need to concentrate on integrating with petrochemicals for sustainability in view of growing demand of petrochemicals and likely substitution of auto fuels. The coker and petcoke gasification combination has less cost advantage as petcoke can only be gasified in entrained bed gasifier due to low reactivity requiring high temp. The refineries are working on other options like residgasifications, which are also costly/ under development. One good option for refineries is to gasify pitch (~15% on crude) left over after deasphalting of resid. The process would have following benefit;

1. Zero residue
2. Low cost of getting rid of residue as no other resid upgradation technology is required.
3. The cost of gasifier for residue could be low compared to petcoke gasifier due to low temp operation. The savings from metallurgy and volume of gasifier due to lower temp. Absence of cost and energy for pulverizing petcoke (hard to grind).
4. Storing and Feeding resid is comparatively easier than handing solids.
5. Flexibility to process heavy and all kind crude
6. Easy integration with Petrochemicals
7. Hydrogen is produced using resid rather than naphtha/gas
8. Syngas can be easily cleaned and converted to SNG (Synthetic Natural Gas) for use as refinery fuel.

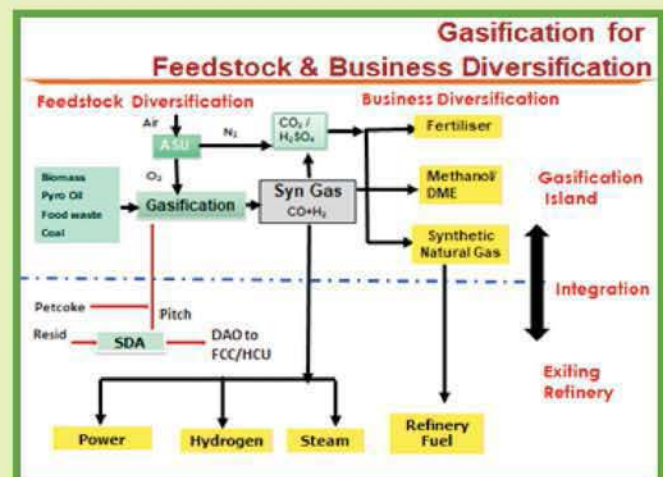
Gasification is environment friendly technology with lower SOx, as sulphur exits as H₂S, which is easily converted to sulphur or H₂SO₄ and also lower NOx as nitrogen exits as Nitrogen gas. All downstream technologies for gas clean up, methanol, urea, hydrogen, power and Synthetic natural gas are all well established and commercially available.

Petcoke being refractory in nature require high gasification temperature, which is feasible only in slagging entrained bed gasifiers. Technology for such

gasifier is available from number of major licensors. Entrained bed gasifier is, however, very versatile as it can handle any kind of feeds. The syn gas is of high quality meeting downstream catalytic processes. The vitreous molten ash poses no environment related issues and can be used as building material. Technology is used in IGCC for power generation and chemicals. Although the units are designed for heat recovery, the efficiency may be hit due to high temp and high ash content.

Gasification is well integrated with Fertilisers. The air separation unit for producing O₂ for gasification also provides nitrogen for urea synthesis. Both CO₂ and H₂SO₄ are also available as by-product for Fertilizers.

| | Petcoke | Indian Coal High ash | Biomass Bagasse |
|--------------------------------------|---------|-------------------------|--------------------|
| <i>Elemental analysis, wt% (MAF)</i> | | | |
| Carbon | 88.6 | 76.4 | 46.7 |
| Hydrogen | 2.8 | 5.3 | 6.2 |
| Nitrogen | 1.1 | 1.9 | 0.7 |
| Sulfur | 7.3 | 0.7 | 0.1 |
| Oxygen | 0.2 | 15.7 | 46.4 |
| Ash | - | 35.8 | 15.77 |
| Ash Fusion Temperature, °C | - | 1250-1350 | 900-1000 |
| Gross Calorific value, kcal/kg | 8186 | 4225 | 3894 |
| Reactivity | Low | Medium | High |



Coal Gasification

Coal is the most abundant fuel resource in India with a cumulative total reserve of nearly 307 Billion tonnes out of which proved, indicated and inferred reserves are 40%, 48% and 12% respectively. India has a share of 7% of the world's total coal reserves and ranks 5th in the world and is the 4th largest coal producer country in the world

(5.6% of total coal production). At the rate of current coal production, Indian coal will last for more than 100 years. On the other hand, India is the 3rd largest coal consumer country in the world (7.9% of total coal consumption), mainly consumed by the power.

In view of the limited reserves of Petroleum and Natural Gas in the country, coal has the potential to be the major energy, ammonia/urea and organic chemicals resource. However, nearly 88% of the coal reserve is of non-coking and 12% is of coking coal and is estimated up to the maximum depth of 1200m. The Indian coal also has the low calorific value (GCV 3100 – 5100 kcal/ kg) and high levels of inorganic impurities (25-55%). The coal gasification process which produces syn gas from coal by reaction with steam is considered to be the best option for improving coal conversion efficiency. The clean syn gas after removal of various hazardous emissions can be used in processing plants to produce energy and chemical products. However, the high ash content in the Indian coal remains a major hindrance towards developing an appropriate technology which can be run on commercial basis. There is a need to develop technology suitable for high ash Indian coal as well as to adopt efficient washing of coal to improve the efficiency in its utilisation.

The typical characteristics of Indian coal being used for power generation are given as under;

- Ash Content 25 – 55 %
- High ash fusion temperature (>1500 C)
- High reactivity (sub-bituminous coal)
- Moisture content 4 – 7 % (18 % during monsoon)
- Low Sulphur content 0.2 – 1%
- Gross Calorific value 3100 – 5100 kcal/ kg
- Volatile matter content 20 – 30 %

The ash in Indian coals is mostly high in silica and hence, abrasive. This requires careful adoption of appropriate technology when designing power plant

Indian coal is not suitable for gasification in entrained bed gasifier due to perceived loss of conversion efficiency with High ash content. For high ash coal fluidised bed gasifier is recommended, however, it is still under development. Mixing of petcoke and coal means only entrained bed can be used for Coal Gasification.

Indian high ash coal can be monetised in following ways;

1. Power generation using CFBC
2. Gasification of washed coal near coal mines to produce power and SNG (Synthetic Natural Gas), Fertilisers and Methanol

Coal to Liquid/ Olefin (CTL/ CTO), plants are very capital intensive and have large carbon and water footprint compared to gas/ naphtha based units. Therefore viability of standalone units needs careful study. On the other hand, integration with other products, viz., Olefins, Fertilizers, hydrogen, power, SNG could improve their viability. Techno-economic studies may be required for different mix of end products including cost of washeries for Indian Coal.

Fundamental reactions in coal gasification

Coal gasification occurs in two steps.

a) Pyrolysis

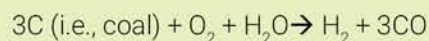


b) Gasification



In the gasifier, a coal particle is first dried by the hot gases and pyrolysis step starts as the temperature of the coal particle exceeds 400 deg. C. Tars, oils, phenols as liquids and hydrogen rich volatile hydrocarbon gases are formed. The residue as char contains remaining carbon and mineral matter. After attaining 700 deg. C of char particles, the main gasification reactions begin.

The desired end product is usually syngas (i.e., a combination of $\text{H}_2 + \text{CO}$), but the produced coal gas may also be further refined to produce additional quantities of H_2 :



Minerals components in the fuel, which don't gasify like carbon-based constituents leave the gasifier either as an inert glass-like slag or in a form useful to marketable solid products. A small fraction of the mineral matter is blown out of the gasifier as fly ash and requires removal downstream.

| Gasification Chemistry | | |
|---|------------------|--|
| Gasification/Combustion Reactions | | |
| $\text{C} + \frac{1}{2} \text{O}_2 \rightarrow \text{CO}$ | (1) -111 MJ/Kmol | ➤ Reactions [1,4,5 & 8] considered to be desirable for gasification |
| $\text{CO} + \frac{1}{2} \text{O}_2 \rightarrow \text{CO}_2$ | (2) -283 MJ/Kmol | |
| $\text{H}_2 + \frac{1}{2} \text{O}_2 \rightarrow \text{H}_2\text{O}$ | (3) -242 MJ/Kmol | |
| Water Gas shift Reaction | | |
| $\text{C} + \text{H}_2\text{O} \leftrightarrow \text{CO} + \text{H}_2$ | (4) +131 MJ/Kmol | ➤ Reaction [6] is important when SNG is desirable |
| Boudouard Reaction | | |
| $\text{C} + \text{CO}_2 \leftrightarrow 2\text{CO}$ | (5) +172 MJ/Kmol | |
| Methanation Reactions | | ➤ Reactions [4-8] considered to be in equilibrium because of reversibility in nature |
| $\text{CO} + 3\text{H}_2 \leftrightarrow \text{CH}_4 + \text{H}_2\text{O}$ | (6) -210 MJ/Kmol | |
| $\text{CO}_2 + 4\text{H}_2 \leftrightarrow \text{CH}_4 + 2\text{H}_2\text{O}$ | (7) -206 MJ/Kmol | |
| CO Shift Reaction | | ➤ Reactions [7-8] gas phase homogeneous reactions |
| $\text{CO} + \text{H}_2\text{O} \leftrightarrow \text{CO}_2 + \text{H}_2$ | (8) -41 MJ/Kmol | |
| Steam Reforming Reaction | | |
| $\text{CH}_4 + \text{H}_2\text{O} \leftrightarrow \text{CO} + 3\text{H}_2$ | (8) +206 MJ/Kmol | |

All these chemical reactions tend to state of equilibrium. The heat evolved from exothermic reactions is used to drive the endothermic reactions. Gasification processes should be carried out with minimum amount of air or oxygen, however, at a certain oxygen level, coal conversion becomes incomplete.

There are various gasification technologies which differ from each other in the nature and pressure of gasifying agents employed, in the way by which the contact is established between the gas and solids, heat is produced and transferred and ash is removed

Moving bed gasifier

Moving bed gasifier is also known as fixed bed gasifier. Here, gases flow relatively slowly through the bed of coal feed. The preferred particle sizes for moving bed gasifier are 5-80 mm as high concentration of fines in feed will lead to unstable operation of the gasifier resulting from pressure drops in the bed or plugging of the bed. Maximum temperatures in the combustion zone are typically in the range of 1500–1800 deg. C for slagging gasifiers and 1300 deg. C for dry ash gasifiers. Coal residence times in moving bed gasifiers are of the order of 15 to 60 minutes for high pressure steam/oxygen gasifiers and can be several hours for atmospheric steam/air gasifiers. As the flow is counter current, the gas leaving the gasifier is cooled against the incoming feed and typical gas exit temperatures are of the order of 400–500 deg. C. This temperature is not high enough to break down the tars, phenols, oils and low molecular hydrocarbons produced in the pyrolysis zone. Thus, these components are carried with the gasifier product gas and a higher percentage of tar in product gas from moving bed gasifier is one of its major disadvantages. Moving bed gasifiers are presently less used than entrained flow gasifiers for the construction of new power plants. There are three gasification processes based on moving bed gasifier and these are BHEL moving bed gasifier, British Gas Lurgi (BGL) and Sasol–Lurgi moving bed gasifier.

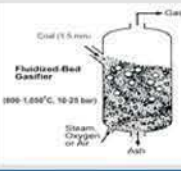
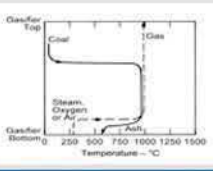
Fluidized bed gasifier

Fluidized bed gasifiers are fed with crushed coal (0.5- 5 mm) that is fluidized in the gasifier by gaseous medium. There is a uniform temperature distribution in the gasifier due to high level of back mixing. Fluidized bed gasifiers usually operate at temperatures (800–1050 deg. C) well below the ash fusion temperatures of the fuels to avoid ash melting, thereby avoiding clinker formation and loss of fluidity of the bed. Residence time of the feed in the gasifier is typically in the order of 10–100 seconds. As the operating temperature is relatively low in fluidized bed gasifier, there is incomplete carbon conversion in a single stage and it is therefore common for the residual char to be either removed and burnt in a separate combustion unit (hybrid cycle) or recirculated into the gasifier.

There are six types of gasification processes based on fluidized bed gasifier. These are BHEL fluidized bed gasifier, high temperature Winkler (HTW) gasifier, integrated drying gasification combined cycle (IDGC), Kellogg Rust Westinghouse (KRW) gasifier, transport reactor gasifier and air blown gasification cycle (ABGC). But only two of them have been operated in industrial scale

Fluidized Bed Gasifier

- Extremely good mixing between feed and oxidant, which promotes both heat and mass transfer, but partially reacted feed also removed with ash affecting carbon conversion
- Operation generally limited to temperature below softening point of ash to avoid slagging, although controlled agglomeration attempted in some designs to increase conversion.
- Sizing of feed particle important. Entrained Fine particle captured in cyclones. Presence of tar in syn gas could be challenging.
- Low temperature makes it suitable for high and medium reactive feed like biomass and coal. Poor conversion with petcoke

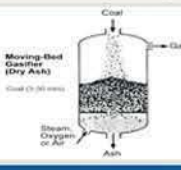
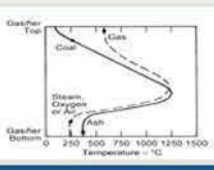



Entrained flow gasifier

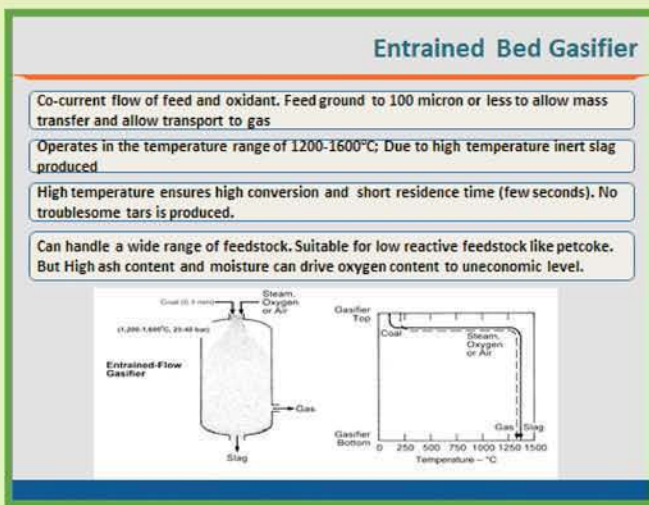
In entrained flow gasifier, fine coal particles (size of the order of < 0.1 mm) concurrently react at high speed with steam and oxygen/air in a suspension mode called entrained flow liquid. Depending upon the method of coal feeding, dry or slurry, the entrained flow gasifiers can accept almost any type of coal. Short gas residence times, measured in seconds (up to 10 seconds), give them a high load capacity but also requires coal to be pulverised. They usually operate at high temperatures of 1400–1600 deg. C (essentially well above the ash slagging conditions). To obtain the high operation temperature, entrained flow gasifiers require high oxygen

Moving Bed Gasifier

- Counter-current operation
- Low outlet gas temperature (425-650°C); even though high temp reached in the heart of bed
- Results in high H₂ to CO ratio (~ 2:1), higher Methane content
- Tars, oils and phenolic byproducts, extensive gas clean up necessary
- Low Oxygen consumption (0.23-0.28 Nm³/Nm³ syngas)
- Not suitable for fines and high caking coal

requirements. Therefore, entrained flow gasifiers are all slagging gasifiers which are either lined with a refractory or a slag self-coating system. Entrained flow gasifiers are the most widely used gasifiers with seven different gasification technologies are in use at industrial scale or under development worldwide. Hitachi, Mitsubishi heavy industries, Prenflo and Shell coal gasification process are the dry fed entrained flow gasification processes. On the other hand, three processes, such as, Babcockpower (Noell), E-gas and Texaco are based on slurry fed entrained flow gasifiers.



Another class of gasifier use Plasma, which are particularly suitable for feed stock having low and variable calorific value, like MSW. Plasma torch consume high electricity

but can be varied to control composition of syn gas. For multi feed systems, two stage gasification- low temp followed by high temp gasifier, has also been proposed. They may have the advantage of feeding petcoke along with pyrolysis oil and tar produced from the 1st stage to produce tar free syn gas.

Entrained flow gasifiers are usually recommended for coals with low ash content for both technical and economic reasons. But Indian coals are high in ash content. Ash fusion temperature is also high (>1400 deg. C) for Indian coals. As the ash is removed in the form of slag in case of entrained flow gasifier, huge heat loss occurs for handling high ash coal.

Moving bed gasifier may be used for handling the Indian coals; particularly the dry ash moving bed gasification technology, but major drawbacks of this technology is the generation of huge tar in the process and difficulties in handling the fines as feed. The raw gas needs to be free from tar and suspended particles for most of the applications considering the technological and environmental issues. Installation of tar handling plant increases the capital cost at the same time efficiency of the process decreases. In many situations, it may be advisable to blend indigenous coals with imported coals having higher CV and lower ash content. Fluidized bed gasification has a number of advantages over the other gasification technologies for high ash Indian coals.

Capacity Building workshop at Guwahati Refinery

BEE, in association with CHT & IOCL-Guwahati Refinery organised a workshop for Capacity building of officers from petroleum sector in the Eastern region on efficient use of Energy, during 9-10th Feb 2018 at IOCL, Guwahati Refinery. The workshop was inaugurated by Shri Brijesh Kumar, ED (CHT) in the presence of Shri S.P. Barua, CGM (TS & HSE), Guwahati Refinery.

Shri Brijesh Kumar, ED (CHT) made a detailed presentation on Indian Refining capacity outlook by 2040, Petrochemical growth scenario and the emerging trends and drivers in Refining sector. He also presented trend of specific energy consumption in Indian Refineries & action taken by CHT to reduce the same and emphasised the need to reduce steam network size in Refineries. The presentation by BEE covered PAT framework, targets, mechanism of issuance of energy saving certificates, platform for trading of e-scerts, penalties, time lines &



Inauguration of the workshop for Capacity Building on efficient use of Energy organised by BEE in association with CHT & IOCL-Guwahati Refinery by Shri Brijesh Kumar, ED (CHT) in presence of Shri S.P. Barua, CGM (TS&HSE), Guwahati Refinery

obligations of Designated consumers etc. The workshop had presentations from Process Licensors viz., HTAS,

Technip and consultants such as CII, GCE, EIL, PCRA etc. Apart from this presentation were also made by vendors like Atlas Copco and Forbes Marshall.

The energy conservation ideas included adoption of new technologies viz., Production of Sulphuric acid directly instead of intermediate Sulphur from H_2S , Organic Ranking Cycle for low grade heat recovery, elimination of PRDS by installing micro turbines to generate power, improving GT efficiency by using VAM to chill the combustion air for GTs. Atlas Copco made a detailed presentation on compressed air system & new technologies available to make the compressed Air system most energy efficient such as Hybrid Technology with Fixed speed centrifugal compressors for the base load and oil free screw compressor with variable speed drive for variable load, use of heat of compression dryers with zero losses, Use of Multiple compressor Control for sequencing, lowering of pressure band & starting/stopping different capacity machines to get the best efficiency and also heat recovery upto 90% of heat of compression to circulating water (Outlet water temperature upto 90 deg C). EIL covered its presentation in the process areas where possibilities exists with special emphasis on SRU viz., oxygen enrichment & common manifolding for MAB and incinerator Air blower and also made presentation on Engryo Technology for separation of H_2 from low pressure offgases with very high recovery of upto 95%. EIL advised to replace the old and inefficient assets to improve the energy efficiency and also made a presentation on steam-power optimisation software developed by them for offline optimisation in CPP. CII covered wide ranging ideas for energy saving in Refineries, apart from green quotient ideas like Solar Thermal heaters for power generation, solar wind hybrid generators, solar LPG hybrid generators for kitchen and bio gas plant. Forbes Marshall made a detailed presentation on condensate recovery and selection of

right type of steam trap for the application with some case studies. The ideas like reducing the tracing steam header pressure, regular maintenance of traps, isolation of redundant steam headers, flashing of high pressure condensate to low pressure steam and heat recovery from hot condensate streams to BFW would all add to energy efficiency in the Refinery. Having ball float valve in each coil in a steam heated tank would ensure only condensate removal with no need to open steam trap bypass. Having condensate pots to remove condensate from atomising steam lines would ensure moisture free steam for proper atomising of fuel.

PCRA made a detailed presentation of energy saving possibilities in utility area.

Some key takeaways from the workshop are low grade heat recovery from R/D streams, improving the GT efficiency with VAM to cool combustion Air, pressure drop reduction in Flue gas duct through CFD modelling, hot feeding to downstream units bypassing the coolers, replacing steam reboilers with hot product/recirculating streams, improving the energy efficiency in compressed air system by having the right type of compressors with latest Technology and controls, efficient separation Technology for maximum Hydrogen recovery, elimination of Sulphur and instead go for H_2SO_4 production, use of optimisation software for the best operating configuration in CPP for a given Steam and Power load, and also adopting green quotient ideas wherever possible.

All the four Refineries in the NE sector gave presentation on the best practices. BEE made a presentation on Small Group Activity which is extensively followed in Japan, which can further help in improving the energy efficiency in units, by adopting the ideas of the group members drawn from shop floor.

Performance Audit in PSU Refineries

Performance audit teams constituted by CHT comprising of multi-disciplinary experts from PSU refineries and also EIL & CHT, visited all PSU refineries and carried out 2-days walk-through audits during the period September, 2017 to February, 2018 under

the overall coordination of CHT. Amongst the various findings & suggestions as spelt out by the committee, refineries gave priorities to about 150 recommendations for initiating action for study / implementation.

Performance Benchmarking by M/s Solomon Associates, USA

For benchmarking of the performance of the India's PSU refineries, CHT engaged M/s Solomon Associates, USA. The work order for calendar year 2016 bench-marking study was placed in 2017 to study 15 PSU fuel refineries, 4 Lube refineries & 1 JV Refinery (BORL). The study is already concluded.

- How-to-use Data Workshop for all refineries conducted at CHT on 30th/31st Oct 2017.
- Findings of the Study were presented by SA to all the participating refineries as well as to MoP&NG during Nov, 2017.
- Additional presentation to specific refineries and MoP&NG was made by SA in Nov. 2017 / Jan. 2018.

The major findings of the Study are as under:

- Energy Cost continues to be a major component of Opex.: 74 % in 2016
- 16 % reduction in EII from 120 in 2010 to 101 in 2016
- PSU refineries have consistently achieved better than World's Best EII Peer Group performance in the Process Fired Furnace Efficiency
- Reducing Steam System Size is a large opportunity area for EII improvement

- Large reduction in Steam System Size since benchmarking: > 9.5 MMT per year reduction in steam usage
- Petrochemical Intensity, (vol. % of Net Input)= Refinery Feed to Chemical Plants + Speciality Solvents + Petrochemicals) (as per M/s Solomon Associates, USA)
Indian Average: 3.6
World Average: 3.9
- 120,000 MT per year of Ammonia (NH₃) is available from SWS for recovery from all refineries in India
- Areas identified for improvement :
 - Economic Thinking Skills
 - Reliability
 - Conversion Unit Utilisation
 - Conversion Unit Yields (Delayed Cokers and Catalytic Naphtha Reformers)
 - Energy Efficiency (as Energy Cost continues to be a major component of Opex.: 74 % in 2016)



Shri Brijesh Kumar, ED, CHT addressing the participants attending the "How to use data Workshop" on final study results of Performance Benchmarking of Refineries for the year 2016 by M/s Solomon Associates at OIDB Bhawan on 30-31st Oct'17



Group photo of the How to use data Workshop on final study results of Performance Benchmarking of Refineries for the year 2016 by M/s Solomon Associates at OIDB Bhawan on 30-31st Oct'17

***"We are seeing the advent of new generation of machines.
While some see a threat, I see an opportunity".***

**- Narendra Modi
Hon'ble Prime Minister of India**

Activity Committee Meetings

1. Pipelines

Venue : Acres Club, Chembur, Mumbai

Duration : 23-24th August 2017

Participants: A total of 75 delegates from various Pipelines viz. IOCL, ONGC, BPCL, HPCL, GAIL, NRL, HMEL, JVs including faculty from IIT-B & IIT-M and reputed vendors, participated in the meet

Chief Guest: Shri Arvind Kumar, Addl. Advisor, PNGRB, New Delhi

Convener : Shri V.S. Sehgal, GM (Operations) Pipelines, BPCL

Best Practices and take ways

1. Use of Magnetic Tomography Method, to assess Integrity of Non-piggable Pipelines.
2. Centralised Pipeline integrity Management system with Geographic Information System (GIS) mapping - A computer based/software driven approach to manage various aspects of Pipeline Integrity. Integrity test on regular basis and its analysis along with physical movement/ surveillance.
3. Combination of chemical cleaning and pigging in a waxy pipeline can be very effective.
4. SPM – Underwater Robotic Inspection
5. Non-intrusive Pressure Pulse technique for determining the hydraulic dia of a waxy crude pipeline along the length of the line.

Points to Ponder

1. Lack of sufficient numbers of vendors for ILI, CP interference Mitigation, Direct Assessment etc.
2. HT transmission lines and AC current interference cause interference in cathodic protection of nearby buried pipelines resulting in corrosion.
3. Maintenance of aging pipelines

2. Environment Management

Venue : IOCL- Barauni Refinery.

Duration : 21-22nd September, 2017.

Participants: 56 nos from the refineries, R&D and domain experts like CSIR -Central Glass and Ceramic Research Institute,

Environment S.A. India Pvt. Ltd.

Chief Guest: Shri S.N. Jaiswal, Scientist & Board Analyst of Bihar Pollution Control Board

Convener : Shri Sunil Kapoor, General Manager (HSE) IOCL, Mathura Refinery

Best Practices and take ways

1. Stoppage of Bearing Cooling Water (BCW) for pumps operating < 150 deg. C for reduction of water consumption
2. Ceramic Membrane instead of polymeric membrane in Reverse Osmosis
3. Comprehensive ClO₂ treatment in reuse water as Fire Water & Cooling Water make-up
4. Organic Waste Conversion into Energy through Bio-methanation Process
5. Confined Bio-remediation of oily sludge and processing of low oil sludge in Delayed Coking Unit (DCU).
6. Plantation of SO_x absorption trees round the refinery area
7. Waterless urinal system

Points to Ponder

1. Disposal of spent catalyst, spent clay, waste insulation and asbestos sheets
2. Implementation of such cost intensive Zero Liquid Discharge (ZLD) plan & disposal of salt.
3. PM10 in ambient air quality beyond limit

3. Fuel & Loss and Energy Optimisation

Venue : BORL-Bina Refinery.

Duration : 25-26th October, 2017

Participants: 70 nos of delegates from refineries, BEE and Vendors like Mechwell, ECPL and Forbes Marshall.

Chief Guest: Shri Abhairaj Bhandari, Sr VP, BORL.

Convener : Shri Anand Pratap Raghav, VP, BORL

Best Practices and take ways

1. Flare gas recovery using thermo-compressor with Natural Gas as motive fluid. This is low cost investment into no operating cost and minimum maintenance cost scheme.
2. Use of Plate type exchangers in Amine re-boilers for

better heat transfer efficiency.

3. Use of Divided Wall Column (DWC) technology in NSU.
4. Use of LRVP in 3rd stage of Vacuum ejector
5. Use for tube inserts for improving heat transfer coefficient by increasing turbulence e.g. HVGO vs Crude heat exchangers.
6. Integration of Renewable Energy (Solar, Wind, etc.) with process e.g. use of Solar Energy for steam generation, heating of thermic fluid, zero liquid discharge, etc.
7. Single FD fan operations in fired heaters instead of parallel FD fan operation by changing logic for auto-start of the standby FD fan.
8. Isolation of steam to storage tanks (e.g. RCO tank) during day time by monitoring the temperature
9. Flash steam (low-low pressure) recovery into useful grade of steam (e.g. low-low pressure steam to LP steam or any other useful level)
10. Condensing type of turbines conversion to motor driven for improving energy efficiency of system and to reduce steam system size.
11. Roof top Solar power plant on non-plant buildings

Points to Ponder

1. Slop generation minimization to reduce reprocessing energy.
2. Fuel gas and steam balance difference (unaccounted) minimization by increasing the measurement accuracy.
3. Flare gas flow meters accuracy improvement at very low flow for loss minimization control measures.
4. Low level heat recovery like Organic Rankine Cycle (ORC).
5. Hydrogen recovery from off gases by using EIL "EngCryo" Technology
6. Benefit evaluation in case of High Emissivity coatings in fired heaters
7. Out of Box thinking for energy efficiency improvement and PAT targets achievement

4. Instrumentation

Venue : The Ocean Pearl, Mangalore

Duration : 9-10th November 2017

Participants: A total of 75 delegates from IOCL, BPCL, HPCL, NRL, EOL, HMEL, CPCL, EIL, OMPL, MRPL and reputed vendors participated in the meet

Convener : Shri Peush Mahajan (Ex Director - Technical, Engineers India Ltd)

Host : MRPL, Mangalore

Best Practices and take ways

1. Formation of Reliability Task Force and implementation of recommendations to improve system reliability.
2. Implementation of Cyber Security Solutions.
3. End Device Monitoring to detect failure of Solenoid Valves in case of redundancy of SOVs considered for shutdown valves.
4. SS/GI Main header and SS branch header for instrument air. Instrument air headers should undergo pneumatic test rather than hydro-testing which is a source of moisture in the Instrument air
5. Refineries may decide to replace solenoid in a phased manner in order to avoid shutdown due to solenoid valve failure.
6. Thermography of power terminals In order to identify loose power terminals
7. Replacing Annubar with Venturi tube to avoid clogging. Alternately Annubar with purged installation may also provide satisfactory results.
8. In order to avoid excessive cabling between MCC and control room, Remote I/O concept may be used in refineries.
9. Magflow meter may be used for flow measurement in sea water service which has shown excellent results

Points to Ponder

1. Furnace tube Skin Thermocouples failure rate.
2. Due to open architecture and Windows Based control systems, the obsolescence and product discontinuation from OEM support is a matter of serious concern..
3. Rim seal system has problem in operation due to low voltage at solenoid valves and normally de-energized system which is not a failsafe system.
4. Gas detector failure reported by many refineries is an issue which needs a serious review within refineries.
5. Unit flare isolation valves at the battery limits have generally Class V leakage rate resulting into considerable leakage
6. Non-availability of redundant sensors in BHEL compressor is a major source of shutdown in their compressors or turbines. Moreover, it is also necessary to standardize the logic system for machine monitoring system.
7. Analyser shelters (Walk-in type shelters with HVAC) are problematic and expensive in terms of maintenance of HVAC.

8. In some areas, lightning affects field instruments and systems in spite of improvements in grounding.

5. Catalytic Reforming and Isomerisation

Venue : BPCL - Kochi Refinery.

Duration : 29-30th November, 2017

Participants: 52 nos of delegates from the refineries, R&D and domain experts like CSIR – IIP and Axens.

Convener : Shri M.R. Subromoni Iyer, General Manager BPCL, Kochi Refinery

Best Practices and take ways

1. DMDS injection and H₂S monitoring which are critical in CCR operation
2. Monitoring of Pt dispersion in Catalyst by cross checking colour against lab results.
3. Usage of divided wall columns in NSU and DIH for energy saving while getting the desired separation
4. FGH production is an added advantage for ISOM and can be adopted by refiners.
5. Use of Light reformat from CCR in ISOM units as feed.
6. LPG absorption using heavy reformat for increased LPG recovery as practiced in some Refineries.

Points to Ponder

1. How CO + CO₂ carry over in makeup gas will effect NHT/ISOM operation? Any CO/CO₂ guard bed other than methanator available?
2. Feasibility of putting De iso-pentanizer in U/S of ISOM FSD which may cause 30% charge enhancement?

3. How olefins, Di olefins & phenol will affect the ISOM reactor operation?

4. Processing Coker naphtha in ISOM-Benefits & problems

6. Power and Utilities

Venue : Essar Oil, Jamnagar

Duration : 14-15th December 2017.

Participants: 51 nos. of delegates from 21 Refineries along with domain experts – M/s Ion Exchange & M/s GE power shared their views on the topic

Convener : Shri Samir kumar Dave, Head Operations- CPP, Essar Oil, Jamnagar

Best Practices and take ways

1. Gemba / Kaizen practice weekly – workplace improvement process, resulting in employee engagement and good housekeeping of plant
2. Insulated coating on substation flooring
3. Use of Cable route detector (non-contact type) to identify live underground cables before excavation
4. E-LOTO implementation -Lock Out / Tag Out
5. Thermography of critical Panels as a detective maintenance

Points to Ponder

1. Tripping of VFDs on voltage dip
2. Disposal of old/used resins of DM Plant
3. GT fuel line tubing's ferrule joint leakage

Photo Gallery



Chief Guest, Shri Arvind Kumar, Addl. Advisor, PNGRB, New Delhi, delivering the Keynote address during Activity Committee Meeting on Cross country Oil & Gas Pipelines at Acres Club, Chembur on 23rd August 2017



Shri V.K. Shukla, Executive Director, IOCL Barauni Refinery, seated in the centre along with the participants of the Activity Committee Meeting on 30th Environment Management held at IOC, Barauni Refinery on 21st & 22nd September 2017.



Shri V.K. Shukla, ED, Barauni Refinery lighting the ceremonial lamp while inauguration of the Activity Committee Meeting on Environment Management. (Standing from L to R) Shri Sunil Kapoor, GM(HS&E) & Convenor, IOC-Mathura Refinery, Shri Sushobhan Sarkar, Advisor (T), CHT, Shri R. Manvi, CGM(TS), Barauni Refinery, Sh. S.N. Jaiswal, Scientist & Board Analyst of Bihar Pollution Control Board & Chief Guest of the meet.



Inauguration of the 1st CHT activity committee meet on Instrumentation by Shri H Kumar (Managing Director – MRPL) in the presence of Shri Peyush Mahajan (Ex Director EIL), Shri Rajan Kapoor (Director – CHT), Shri B Sudharshan (CGM, Instrumentation & Electrical – MRPL), Shri A K Sahoo (Director Finance – MRPL), Shri M Venkatesh (Director Refinery – MRPL) and Shri Rajeev Kushwah (CVO – MRPL)



Participants of the Activity Committee Meeting on Fuel & loss and Energy optimisation held on 25th & 26th October 2017 at BORL-Bina Refinery



Participants of the Activity Committee Meeting on Instrumentation held on 9th & 10th November 2017 at MRPL.



Participants of the Activity Committee Meeting on Catalytic Reforming & Isomerisation held on 29th & 30th November 2018 at BPCL-Kochi.



Shri K C Swain, Head Technical, EOL delivering the Key Note Address during the Activity Committee Meeting on Power & Utilities held on 14-15th December 2017 at EOL, Jamnagar

‘स्वच्छता ही सेवा’



उच्च प्रौद्योगिकी केन्द्र में 15 सितम्बर, 2017 से 02 अक्टूबर 2017 (गांधी जयंती) तक 'स्वच्छता ही सेवा' का अभियान चलाया गया। इस अवसर पर ओ.आई.डी.बी के साथ संयुक्त रूप से विभिन्न प्रकार के कार्यक्रम आयोजित किए गए जिसके अंतर्गत शपथ समारोह, नुक्कड़ नाटक एवं आस-पास के क्षेत्र में सफाई के लिए विशेष अभियान चलाया गया।

- 1) शपथ समारोह, 15 सितम्बर, 2017
- 2) नुक्कड़ नाटक, स्वच्छता पर (22 से 25 सितम्बर, 2017)
- 3) सितम्बर, 2017 माह के तीसरे सप्ताह में ओआईडीबी भवन के आसपास के क्षेत्र में सफाई की गई एवं ब्लीचिंग पाऊडर डाला गया।
- 4) सितम्बर, 2017 के अंतिम सप्ताह में स्वच्छता समापन समारोह मनाया गया।

सतर्कता जागरूकता सप्ताह

उच्च प्रौद्योगिकी केन्द्र में सतर्कता जागरूकता सप्ताह दिनांक 30 अक्टूबर 2017 से 04 नवम्बर 2017 तक मनाया गया। इस अवसर पर कार्यालय में शपथ ग्रहण समारोह आयोजित किया गया जिसमें श्री आई.एच. शिवराय, निदेशक ने कार्यालय के अधिकारियों एवं कर्मचारियों को सतर्कता शपथ हिन्दी एवं अंग्रेजी में दिलाई। इस बार के मुख्य विषय "मेरा लक्ष्य – भ्रष्टाचार मुक्त भारत" पर सभी कर्मचारियों ने एक मत से भ्रष्टाचार को जड़ से खत्म करने के लिए संकल्प लिया।



हिन्दी पखवाड़ा का आयोजन

14 सितम्बर 1949 को हिन्दी को भारतीय संविधान में सरकारी कामकाज की भाषा के रूप में शामिल किया गया था तब से प्रतिवर्ष सभी सरकारी कार्यालयों में हिन्दी पखवाड़ा मनाया जाता है। हर वर्ष की भांति, इस वर्ष भी 01 सितम्बर से 18 सितम्बर 2017 तक उच्च प्रौद्योगिकी केन्द्र, में हिन्दी पखवाड़े का आयोजन किया गया। श्री बृजेश कुमार, कार्यकारी निदेशक द्वारा हिन्दी पखवाड़े का शुभारंभ किया गया तथा इस अवसर पर कार्यालय का काम हिन्दी भाषा में अधिक से अधिक करने के लिए विशेष बल दिया। इस पखवाड़े के दौरान पेट्रोलियम मंत्रालय का हिन्दी दिवस पर संदेश भी पढ़ा गया। राजभाषा कार्यान्वयन समिति के अध्यक्ष श्री राजन कपूर, निदेशक द्वारा हिन्दी पखवाड़ा समारोह की रूप-रेखा प्रस्तुत की गई।

इस अवधि में विभिन्न प्रकार की प्रतियोगिताओं का आयोजन किया गया जिसमें सभी प्रतियोगिताओं में हिन्दी एवं अहिन्दी भाषी अधिकारियों/कर्मचारियों ने बढ़-चढ़कर एवं उत्साहपूर्वक भाग लिया। हिन्दी दिवस यानी 14 सितम्बर को माननीय पेट्रोलियम एवं प्राकृतिक गैस मंत्रालय, कौशल विकास और उद्यमिता मंत्री श्री धर्मेन्द्र प्रधान द्वारा जारी अपील को पढ़ा गया।

18 सितम्बर 2017 को हिन्दी पखवाड़ा समापन समारोह आयोजित किया गया जिसमें राजभाषा विभाग से श्रीमती शोभना श्रीवास्तव (सहायक निदेशक), मुख्य अतिथि के रूप में आमंत्रित किया गया। श्री बृजेश कुमार, कार्यकारी निदेशक ने पुष्प गुच्छ प्रदान कर स्वागत किया। हिन्दी पखवाड़ा में आयोजित प्रतियोगिता के सफल प्रतिभागियों को श्रीमती शोभना श्रीवास्तव (सहायक निदेशक) एवं श्री बृजेश कुमार, कार्यकारी निदेशक ने पुरस्कारों से सम्मानित किया। इस अवसर पर श्रीमती शोभना श्रीवास्तव (सहायक निदेशक) ने हिन्दी भाषा के अधिनियमों से अधिकारियों/कर्मचारियों को अवगत कराया तथा कार्यालय का काम हिन्दी में करने के लिए प्रेरित किया। अंत में श्री बृजेश कुमार के हिन्दी पखवाड़ा समापन भाषण के साथ हिन्दी पखवाड़े का समापन किया गया।



मुख्य अतिथि श्रीमती शोभना श्रीवास्तव (सहायक निदेशक), राजभाषा विभाग हिन्दी पखवाड़े पर उच्च प्रौद्योगिकी केन्द्र, में हिन्दी भाषा के अधिनियमों से अधिकारियों/कर्मचारियों को अवगत कराते हुए।



सत्यमेव जयते



एक कदम स्वच्छता की ओर

Refinery Capacity Expansion Plan of Indian PSU Refiners

| IOCL | Design capacity (MMTPA) | | | |
|-------------------|-------------------------|--------------|---------------|---------------|
| | Existing | 2020 | 2025 | 2030 |
| Guwahati | 1.0 | 1.2 | 1.7 | 1.7 |
| Barauni | 6.0 | 6.0 | 9.0 | 9.0 |
| Gujarat | 13.7 | 13.7 | 18.0 | 18.0 |
| Haldia | 7.5 | 8.0 | 8.0 | 8.0 |
| Mathura | 8.0 | 8.0 | 9.2 | 9.2 |
| Digboi | 0.65 | 0.65 | 0.65 | 0.65 |
| Panipat | 15.0 | 15.0 | 25.0 | 25.0 |
| Bongaigaon | 2.35 | 2.7 | 2.7 | 4.5 |
| Paradip | 15.0 | 15.0 | 21.0 | 21.0 |
| CPCL-Manali | 10.5 | 10.5 | 10.5 | 10.5 |
| CPCL-CBR | 1.0 | 1.0 | 9.0 | 9.0 |
| Total-IOCL | 80.7 | 81.75 | 114.75 | 116.55 |

| HPCL and ONGC | Existing | 2020 | 2025 | 2030 |
|----------------------------|-------------|-------------|-------------|-------------|
| Mumbai | 7.5 | 9.5 | 9.5 | 9.5 |
| Visakh | 8.3 | 15.0 | 15.0 | 15.0 |
| HMEL-Bathinda | 11.3 | 11.3 | 11.3 | 11.3 |
| Rajasthan | - | - | 9.0 | 9.0 |
| MRPL | 15.0 | 15.0 | 18.0 | 18.0 |
| Tatipaka | 0.1 | 0.1 | 0.1 | 0.1 |
| Total-HPCL and ONGC | 42.2 | 50.9 | 62.9 | 62.9 |

| BPCL | Existing | 2020 | 2025 | 2030 |
|-------------------|-------------|-------------|-------------|-------------|
| Mumbai | 12.0 | 12.0 | 12.0 | 12.0 |
| Kochi | 15.5 | 15.5 | 20.0 | 20.0 |
| Bina | 6.0 | 7.8 | 15.0 | 15.0 |
| Numaligarh | 3.0 | 3.0 | 9.0 | 9.0 |
| Total-BPCL | 36.5 | 38.3 | 56.0 | 56.0 |

Refinery capacity expansion plan of Indian refiners (other than PSUs)

| Other refiners | Capacity (MMTPA) | | | |
|----------------|------------------|---------------|---------------|---------------|
| | Existing | 2020 | 2025 | 2030 |
| Essar | 20.0 | 20.0 | 45.0 | 45.0 |
| RIL - DTA | 33.0 | 33.0 | 40.5 | 63.0 |
| RIL - SEZ | 35.2 | 35.2 | 35.2 | 35.2 |
| West Coast | - | - | 60.0 | 60.0 |
| Sub-Total | 88.2 | 88.2 | 180.7 | 203.2 |
| Total | 247.6 | 259.15 | 414.35 | 438.65 |

Interads/2018

उच्च प्रौद्योगिकी केन्द्र

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