



Annual Performance Highlights-2010-11

Refinery Process Technology- Striving For Yield Maximization, Value Addition and Reduction of Carbon Foot Print.....

Process Development/Up-gradation

- **A cost effective process based on hydroprocessing route developed for selective mercaptan removal for ATF production with negligible hydrogen consumption**
- Dual mode deasphalting Technology developed to enhance refinery distillate yield using LPG as a solvent.
- Identified the blend compositions in pre- and post Delayed Coker scenario for meeting the specifications of Bunker fuel (380 Cst) with minimum quality give away in density at Gujarat Refinery.
- The estimates on product yields, properties, operating conditions, catalyst data, etc. for seven cases with varying capacity in the range of 1.3 to 2.9 MMTPA worked out and provided to the licensing partner of INDMAX technology
- IndianOil R&D along with EIL licensed 1.2 MMTPA DHDT unit for Bongaigaon Refinery.
- EIL awarded the job of preparing BDEP for IndAdept^G Unit at Guwahati refinery and the completion schedule is Aug 2011.

Catalyst Research

- **R&D developed DHDS catalyst, INDICAT-DH-IV successfully completed a run of 451 days in diesel mode and 52 days in VGO mode in the Plant-13 of CPCL helping CPCL in the process to make BS-III/BS-IV diesel.**
- New catalyst and additives namely own Indmax catalyst formulation, DHDS catalyst system for reducing T-95 point of diesel, i-Max Premium ZSM-5 additive for GR Indmax unit, Bottoms upgrading additive for Gujarat FCC unit, value added E-Cat and Alumina support for hydroprocessing catalysts developed .
- i-MAX Premium ZSM-5 additive selected by Panipat Refinery based on NVA against global tender.
- A cost effective ZSM-5 zeolite formulation adopting a template free synthesis approach developed using commercial raw materials.

Technical Services

- Study conducted and recommendations made for use of 10% RFCCU spent catalyst for achieving sulfur reduction in FCC LCN and use of ZSM-5 based additive for reduction of volume of FCC LCN in order to meet BS-IV gasoline specifications in absence of Isomerization unit at Gujarat Refinery.
- ***Recommended the use of in-house developed i-Max Premium in GR- INDMAX unit, addition of which resulting in improvement of (LPG+Gasoline) yield by about 1 wt%***

- **Recommended the use of in-house developed IndVi additive in HR-RFCCU with latest feedstock for reduction of CLO by 2 wt% with increase in (LPG+ Gasoline) yield by 1.7 wt%.**
- Fifteen cases on revamp of RFCCU at Panipat Refinery for maximization of light olefins along with capacity augmentation with and without R-R section hardware changes worked out and report shared with Refinery
- Recommended the use of in-house developed IndVi additive (5% in the inventory) in BR-RFCCU for reduction of 2-wt% of CLO yield with corresponding increase in TCO yield.
- Evaluated 60 new FCC/RFCC catalysts for IOC refineries Eight failure analyses carried out and recommendations given, Two Residual Life Assessment Jobs completed
- R&D developed Gamma Rays scanning procedure in collaboration with BARC, Mumbai successfully implemented in Panipat, Mathura & Haldia Refineries for scanning of one column each
- Ten crude oil assays generated for Refineries during the year including troubleshooting of reduction in crude thru put as well as crude quality issues at Haldia Refinery.

Lubricant Technology- Enabling Master Brand Servo® To Break New Grounds.....

- **126 product formulations developed during the financial year 2010-11 catering to entire gamut of Indian Industries out of which more than 85% commercialized. 46 OEM and/or customer approvals and defence certifications**
- **Ready with new generation Gasoline engine oil meeting API SN/ GF5 credentials – the day international specification came into vogue**
- **Servo Syngear 75W-90-LL First Indian synthetic gear oil approved by M/S Voith, Germany for gear box applications of urban metro rail racks**
- A host of approvals from M/S Ashok Leyland, M/S Mahindra & Mahindra for gear and transmission oils.
- RDSO approved Servo RR 606MGPLUS[II] based on Haldia Group II base oils for ALCO Locomotives and clearance for field trials in GM Locomotives
- **Facilitated first overseas business contract of indigenously developed marine shipboard oils with Mauritius Shipping Corporation**
- Test method to evaluate lubricants with higher soot loading (6%) developed on Leyland 370 test bench.
- A Tribocorrosion Tester to evaluate the performance of IC engine lubricants under corrosive environments commissioned
- A host of Industrial Oils developed by R&D received prestigious international approvals: shock absorber oil by M/s. Magneti Marelli , Brazil; Servoprime gas turbine oils by M/s. Siemens; Servo synthetic compressor oil by Burckhardt Compressors and for Polyol ester based Fire Resistant Hydraulic Oil from Danieli .
- Test Rig for Assessing the Shear Stability Characteristics of Multigrade Hydraulic Oils based on Poclairn hydraulics installed and commissioned.
- Tyre mould grease - Servo Press mould grease approved by major Indian Tyre manufacturers
- An in-house designed Vibration Rig for Railway axle bearings greases commissioned as per the requirement of AAR M942 specification
- **Servo Agro Spray Oil approved for Organic farming by IMO, Switzerland**
- **Development of Servo MLO Super for controlling mosquito larvae breeding approved by National Centre for Disease Control, Ministry of Health & Welfare, Govt. of India.**
- Biodegradable Rubber spray oil approved by Rubber Research Institute, Kottayam (Kerala)

Pipeline Research- Validating and Consolidating the Early Breakthroughs.....

- **Inspection of Barauni –Patna (102km), Patna – Mughalsarai (206km) completed. A total of 16 location identification sheets (LIS) generated for verification of reported defects.**
- **Inspection of 14', 112km long Delhi-Panipat Section of Northern region Pipeline successfully detected a pilferage location, which was later validated by a dig site inspection**
 - First high speed crude oil pipeline trial run of 24" CPIG done over 138km of 24" dia Salaya-Mathura Pipeline.
 - Trial run of on 14" dia Panipat- Ambala section of pipeline helped establish the capability of the existing 14" IPIG to negotiate swing check valves present in the pipeline.
 - First commercial version of 12" IPIG and 12" CPIG developed through M/s ECIL, Hyderabad and successfully tried out in 206km long Patna- Mughalsarai section of Barauni- Kanpur pipeline.
 - 12" ultrasonic based IPIG of M/s NDT Services Germany evaluated in the 12' Wet Test Loop at R&D centre.
 - Linear Pull through Rig (LPTR) established at R&D centre, Faridabad. This will facilitate evaluation of IPIG and CPIG of 12", 14", 18" and 22" dimensions under dry condition.
 - A first of its kind, in-house designed pipe defect creating machine installed and commissioned at R& D centre.
 - Hysteresis loop tracer machine for assessment of magnetic properties of various types of pipeline steel installed and commissioned at R&D Centre.
 - Study on rheological behavior of high sulphur crude with various percentages of Rajasthan (Mangla) crude blends carried out and recommendation on feasibility of pipeline transportation sent to Pipelines Division

Fuel Quality Research- Steadfast in Our Commitment to Fuel Quality Up-gradation.....

- Two new diesel multifunctional additive packages (DMFA) developed with promising results of deposit control. Best of the two to be considered for field evaluation.
- Laboratory studies on three new Gasoline Multifunctional Additive (GMFA) formulations revealed superior results towards deposit control and fuel economy. Select additive system of the three to be subjected to further performance validation.
- Low pour Diesel for low temperature ambient operations developed for M/s Starbag Afcons, Germany's Rohtang Tunnel Project
- Aromatic rich MTO developed for M/s. Asian Paints -the largest paint manufacturers in the country
- **Feasibility study of producing Bunker Fuel at Haldia and Gujarat refinery meeting ISO 8217 specification completed**
- **Significant work carried out on the development of a new chemical marker to check kerosene adulteration. Field evaluation planned after toxicological studies**
- **Under Product quality monitoring programme,1430 samples of POL products tested at R&D**

Alternative Energy Sources- Exploring New Vistas of Energy Security.....

- **A multi feed fluidized bed gasification pilot plant (capacity 1-2 kg/hr) installed and commissioned. A micro reactor unit (slurry) also installed and commissioned for GTL and preliminary runs carried out successfully for conversion of syngas to hydrocarbon liquids.**
- **A demonstration unit based on in-house developed single step compact steam methane reforming process for HCNG production procured**

- Studies on the Phase-I of the project, “Use of Hydrogen as fuel blended with Compressed Natural Gas in Internal Combustion Engines”, completed along with Society of Indian Automobile Manufacturers (SIAM) and Ministry of New and Renewable Energy (MNRE)
- 18,000 km field trials on a fleet of 3 wheelers running on HCNG completed along with performance and emission testing at 5000 km intervals
- Field trials of Argemone based biodiesel and diesel blend in diesel passenger cars shown deterioration in fuel economy, but reduction of smoke emissions by around 27%.
- **A Master plan for pursuing Research & Development in Solar Energy areas such as Solar Photovoltaics, Solar Thermal & Solar Hydrogen approved.**
- Retorting pilot plant for extraction of oil from oil shale installed and commissioned. Oil extracted from oil shale samples received from DGH and oil is being characterized.

Biotechnology Interventions- A Green Foot Forward.....

- **Department of Biotechnology, Government of India offered to set up a centre of excellence in Bio-energy Research at IOC R&D. Foundation stone for the Bio Energy Laboratory building laid down by Sh.S.Sundereshan, Secretary, MoPNG on R&D foundation day in presence of Sh.R.S.Butola, Chairman, IndianOil and other functional directors.**
- As part of the on-going collaboration with NREL of USA, a pilot plant for lignocellulosic ethanol designed. Several research areas covering second generation bio fuels being explored
- ***After successfully helping Paradip Port Trust last year, IOC’s Bioremediation technology-Oilivorous S - extended to tackling of oil spills at marine locations caused by collision of ships at Mumbai Coast.***
- IOC(R&D) to play a lead role to demonstrate technology for conversation of CO + CO₂ to ethanol as a part of IOC MOU with Lanza Technologies
- Offered solution for mitigation of microbial corrosion in pipelines.

Petrochemicals & Polymer Research- Definitive Steps in Capability Building.....

- **A state of the art Petrochemical and Polymer Research Facilities successfully commissioned, housing infrastructure and qualified manpower to support IOCL petrochemical operations and business.**
 - Technical support provided to Petrochemical operations:
 - Finalizing the grade slates for first and second 6 months of production, assigning specifications of various polymer grades and lot release parameters keeping in view the market requirement
 - Firming up the criterion for classification of grades
 - Based on the Structure-Property and Performance relationship studies, recommendations for optimization of process parameters manufacturing of various grades
 - Bench marking studies completed for PP-injection moulding grades, PP Raffia and BOPP grades.
 - Preparation of THT catalyst for dedicated HDPE plant.
 - *Production of PE-100 grade from THT and its classification*
 - Additive characterization, quantification and evaluation
 - Advised plant to manufacture PP homopolymer using alternative catalyst, resulting in substantial financial savings

Awards & Accolades- The year that was.....

- **CSIR Award-2009 for S&T Innovations for Rural Development for "Development of environment friendly, non-toxic, bio-degradable 'Servo Agrospray Oil' for agricultural crops".**
- **Technology Award-2010 for successful commercialization of indigenous technology of multifunctional additives**
 - **Chemtech CEW Award-2011** conferred for **INDMAX Technology** under the category of "Outstanding Achievement in Research & Development"
 - **Golden Peacock Innovative Award** for the development of OILIVORUS-S technology for bio-remediation of oily sludge.
 - 4 PRSI awards in the 11th Andhra Pradesh Public Relations (APPR) Conference held at Hyderabad
 - 44 awards in various categories in the The Spring Fest-Flower Festival-2011, Faridabad
 - ABCI silver trophy for the table calendar of R&D Centre on the theme, "IndianOil as I Know"
 - **Following IOC R&D Officers recognized at various conferences for their meritorious contributions:**
 - Mr. K.K. Vimal, RO (P&P) won the Best Paper Award in the National Symposium on "Recent Advances in Analytical Sciences and Applications", organized jointly by Indian Society of Analytical Scientists (ISAS)-Delhi Chapter
 - Mr. S. Saravanan, SRO (RT) adjudged as the winner in World Petroleum Council Youth Forum in the category named 'Mind Odyssey', during PETROTECH 2010
 - Dr. Manoj Kumar Upreti, SRO (BT), bagged the Best Paper Award of PETROTECH 2010.
 - Dr. N K Pokhriyal, SRO (Grease) and Dr. S K Mazumdar, CRM (AO), bagged the best paper awards at the 13th NLGI Conference held at Ooty
 - Dr.SSV Ramakumar, DGM (CD) bagged the Second best innovation case study award at the second Global Innovation Conference, organized by All India Management Association (AIMA) in Bangalore
 - Mr.Anand Kumar, Former Director(R&D) conferred with the Lifetime Achievement Awards by the Indian Society of Analytical Scientists-Delhi Chapter (ISAS-DC) and MAEER's MIT Pune.
 - Dr.A.K.Bhatnagar, Former Director (R&D) conferred with the PETROTECH Lifetime Achievement Award at Petrotech-2010 Conference

IP Assets Accrued.....

- **Twelve Indian patents filed. Six patents granted which include two Indian, three US and one France**
- **85 internal technical reports prepared**
- **60 Research Papers published/presented in various journals and conferences**

Collective Thought and Collaborative Research- MOU/MOC's Signed.....

- A MoU signed between R&D Centre and Indian Institute of Information Technology (IIIT), Allahabad for working on the projects in the areas of Intelligent Systems, Software Engineering, Bioinformatics, Wireless Communication & Computing, Robotics and Gel tracking Technology in Petroleum Product Pipelines
- **R&D agreement with NORNER Innovations: Entered into a collaborative research programme with M/s NORNER Innovations AS, Norway for collaborative research in the area of polyolefins.**

- R&D Centre signed a Memorandum of Collaboration (MoC) with IIT-Chennai for enhancing capability of existing software for Instrumented Pipelines Inspection Gauge (IPIG) will be further enhanced to achieve better accuracy of reporting

Seminars/Conferences/Workshops.....

- **A “Vision Workshop on R&D in Solar Energy” organized at Jodhpur in collaboration with Indian Institute of Technology, Rajasthan**
 - Two-day workshop on “Petroleum Products and crude oil Pipeline Pigging” conducted by the R&D Centre
 - One day workshop on “Hydrogen and CNG safety” organized under the aegis of Hydrogen Association of India(HAI) by IndianOil in association with Department of Energy (USA) and UNIDO at R&D Centre, Faridabad.
 - Three-day workshop on Fluid Catalytic Cracking (FCC) technology organized by the R&D Centre at liPM, Gurgaon
 - Five-day Workshop on “Advances in Steel Plant Lubrication” conducted at R&D Centre for engineers of the Vizag Steel Plant (VSP).
 - Six-day workshop on "Advanced Product Knowledge" was organized at the R&D Centre for Engineers drawn from the Technical Services of the Marketing Division
 - 13th Lubricating Grease Conference organized at Ooty on the theme “Lubricating Greases – Future Prospects” under the aegis of National Lubricating Grease Institute (NLGI), India Chapter.
- **Research Advisory Council Meets held at R&D centre:**
 1. **1st on Alternative & Renewable Energy**
 2. **8th on Fuels and Lubricants**
 3. **9th on Refinery Technology**