CSIR-INDIAN INSTITUTE OF PETROLEUM

DEHRADUN-248 005, UTTARAKHAND (INDIA)

भापेसं

Creating future fuels

सीएसआइआर–भारतीय पेट्रोलियम संस्थान

देहरादून – 248 005, उत्तराखण्ड (भारत)

THE ORGANIZATION

CSIR-Indian Institute of Petroleum (IIP), *an ISO 9001 (2008) accredited organization, was established in 1960, by Govt. of India, as one of the constituent laboratories under Council of Scientific & Industrial Research (CSIR). It is a premier National Laboratory engaged in Research and Development activities mostly in the downstream sector of Petroleum Industry. Its charter includes functions, amongst others, to undertake R&D work in petroleum refining, natural gas renewables and petrochemicals; utilization of petroleum products in IC engines and in industrial & domestic combustion; to provide technical and analytical services to petroleum refining & related industry including technology transfer; to develop human resources for the hydrocarbon and related industries by training their personnel through specialized training courses and assisting the Bureau of Indian Standards (BIS) in formulating standards for petroleum products equipments and devices using these products. Over the years, CSIR-IIP has developed several Technologies/Processes/Products, a large number of them commercialized.*

TECHNOLOGIES

MAJOR PROCESSES LICENSED

S.No.	Technology	No. of Units	Total Licensed Capacity TPA
1	Aromatic Extraction for production of Benzene(B) & Toluene(T)	3	274,000 (B) 147,000 (T)
2	Visbreaking of Petroleum Residual Fractions : Soaker Mode	7	6,600,000
3	Delayed Coking	1	315,000
4	Bimetallic Reforming Catalyst	2	200,000
5	LOBS through NMP extraction	2	750,000
6	Food Grade Hexane	3	100,000
7	Propane Deasphalting	2	100,000
8	Dewaxing / Deoiling, Revamping	1	27,000
9	Conversion of Light Naphtha to LPG and High Octane Gasoline	1	8,000
10	Na/Ca Sulphonate, E P Additive	1	1100
11	Hot Rolling Oil	1	1,000
12	Sulfolane	1	300
13	Para Tertiary Butyl Phenol	1	300
14	Di-tertiary Butyl Para Cresol	1	150
15	Deoiling/Dewaxing Additive for Lubricating Oil	1	30-40
16	Sweetening Catalyst for LPG Refinery streams	1	Based on requirement
17	Up gradation of FCC recycle oil through solvent extraction	1	20,000
18	Wax Deoiling Technology	1	50,000 Paraffin Wax 4,500 MCW
19	Revamp of Visbreaker Unit with improved soaker internals	3	2500,000
20	Benzene Recovery Unit (BRU)	1	600,000

CORE COMPETENCE

- Crude evaluation and physicochemical characterization of petroleum products
- Molecular level characterization of petroleum and related products
- Separation processes
- Catalyst and conversion processes
- IC engine studies including emissions and alternative fuels studies
- Industrial and domestic combustion
- Renewable Fuels & Lubricants
- Process development for petrochemicals and intermediates and for biocatalytic processes.
- Development of additives and specialty chemicals for hydrocarbon sector
- Tribological studies
- Simulation, modelling and process design

MAJOR TECHNOLOGIES

NRL WAX PLANT

View of Wax Slabbing Unit

The CSIR-Indian Institute of Petroleum (CSIR-IIP), Dehradun, has commercialized and commissioned three of its path breaking technologies. The first technology to be commercialized and commissioned by the state-of-the-art grass roots Wax Plant at the Numaligarh Refinery in Assam, with the annual production of 50,000 tons of high quality wax, Numaligarh/BPCL has already captured 55% of the Indian market and also substantial world market, including that in Nepal and Kenya. This wax plant was dedicated to the nation on 5th February 2016 by the honorable Prime Minister of India, Mr Narendra Modi.

BENZENE RECOVERY UNIT (BRU)

Benzene Recovery Unit (BRU) at RIL, Jamnagar

The grass roots unit commissioned by CSIR-IIP at RIL, Johrat the Benzene Recovery Unit at Reliance refinery in Jamnagar. First of its kind in the world, this unit recovers benzene from FCC gasoline. This unique technology produces benzene-free gasoline while simultaneously producing pure benzene. Built at a cost of about Rs 500 crore, this is the first indigenous technology jointly developed by IIP & Reliance.

VISBREAKING WITH SOAKER INTERNAL

The third unit was successfully commissioned and the performance guarantee test run conducted at Indian Oil Corporation Refinery at Haldia. This unit uses an advanced technology to produce high quality fuel oil from a process called visbreaking. Specially designed internals have been installed in the soaker drum of the Visbreaking Unit to eliminate back mixing, thus providing low viscosity fuel oil along with higher yield of LPG gasoline and diesel.

CSIR-IIP-Scientists Commissioning Soaker Internal Technology at Haldia Refinery

TECHNOLOGIES READY FOR COMMERCIALIZATION

REFINING

- Oxidative desulphurization of diesel
- Adsorptive desulphurization of FCC Gasoline and diesel
- Catalyst and process for removal of hydrogen sulphide from (fuel) gas streams with simultaneous production of sulphur
- Regenerative process for removal of sulphur-dioxide form lean gas streams
- Re-extraction technology for dearomatisation of middle distillate
- Recovery of CO_2 from flue gas by adsorption and absorption route
- Ultra-low deep desulphurization
- Isomerization of light naphtha
- Light naphtha to LPG and gasoline (NTGG)
- Deep catalytic cracking (DCC)

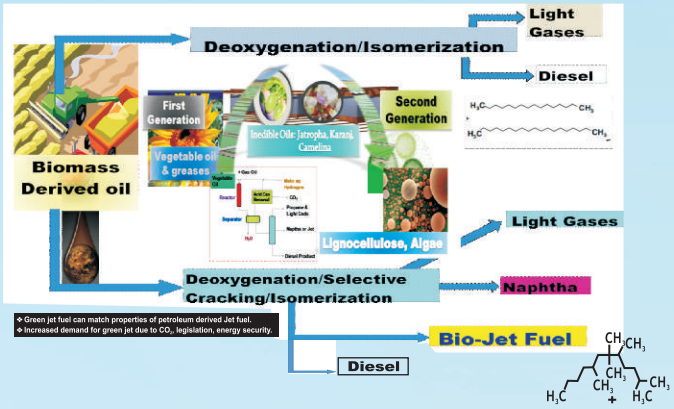
SPECIALTY CHEMICALS, ADDITIVES AND CATALYST

- Microcrystalline wax from crude oil tank bottoms
- Petroleum based electrode pitches
- Specialty carbon materials
- Pour point depressants and VI improvers
- Production of Grade-A Helium
- Additives for fuels, antioxidants, lubricity improvers
- Multifunctional additives (MFA) for fuels
- LPG Sweetening catalyst

BIO-PROCESSES

- Biosurfactant for recovery of oil from crude oil tank bottom sludge
- Bioethanol production from biomass by microorganism

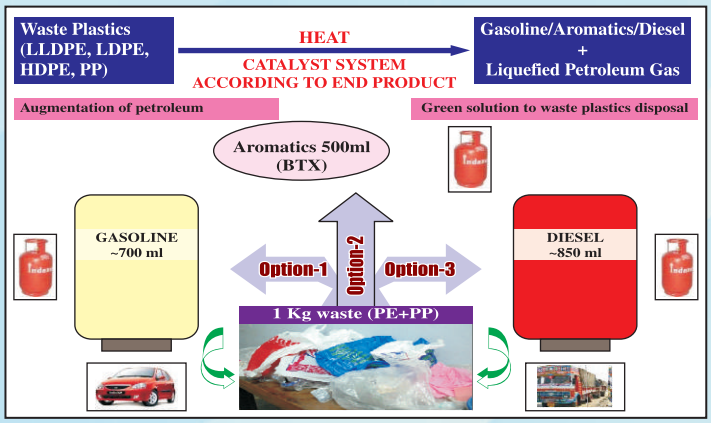
PROCESS FOR BIO-JET FUEL



WASTE PLASTICS TO FUEL AND AROMATICS (CSIR-IIP-GAIL PROCESS)

SALIENT FEATURES

- Exclusive production of either gasoline or diesel or aromatics alongwith LPG
- Liquid fuel (gasoline and diesel) meeting BIS fuel specifications
- Environment friendly process
- Scalable in batch and continuous mode
- All polyolefinic wastes, accounting for 65-70 % of total plastic wastes, can be used
- 1 TPD demo plant has been set up at CSIR-IIP campus



KNOWLEDGE GENERATION

- Research Papers 2500
- Patents Granted 305

TRAINING PROGRAMMES

Developing human resource for hydrocarbon and related industries has been one of the major activities of CSIR-IIP since its establishment and has maintained its leading role in imparting training to personnel from petroleum refining, petrochemical and related industries and Government bodies. CSIR-IIP also import training to International clients.

Faculty & Trainees of the Training Programme on Petroleum Refining Technology for the Executives

LIST OF MAJOR TRAINING PROGRAQMME OFFICERED BY INSTITUTE

- Petroleum Refining Technology (2-7 weeks)
- Petroleum Refining and Petrochemicals Technology
- Advances in Petroleum Refining Technology
- Advances in Processing & Handling of Heavy Crudes
- Crude Assay using Physico-chemical and Analytical Methods
- Fuel Adulteration and Analysis of Petroleum Products
- Solvent Extraction Technology
- Heat Exchange: Design, Operation and Trouble Shooting
- Process Integration (Pinch Analysis) in Refining Industry
- Vehicular Emission & Control
- Operation and Maintenance of CFR Engines
- Deposit Rating of small S.I> Engine Components
- Physico-chemical Analysis & Performance Test Methods for Lubricating Oils and Additives

INTERNATIONAL LINKAGE

TECHNOLOGY AWARDS

CSIR-IIP has the distinction of bagging the prestigious CSIR Technology Awards (in Chemical Sector, Physical Science including Engineering, Business Development and Technology Marketing) since its institution in 1990 as listed below:

- Production of Benzene/Toluene through Sulfolane Extraction (1990)
- Bimetallic Pt-Re Reforming Catalyst (1992)
- Shield for Process Technology Food Grade Hexane (1993)
- Low Air Pressure Film Burner (1994)
- Business Development and Technology Marketing (1996)
- Sulfolane Production Technology (1997)
- Visbreaking Technology (1998)
- Propane Deasphalting of Petroleum Residue (1999)
- Shield for Process Technology NMP based LOBS Production Technology (2000)
- Food and Petroleum Grade Hexane using NMP (2001)
- Development of Comb Type Polymeric Wax Crystal Modifierand Dewaxing Aid and Additives for Production of LOBS (2006)
- Development of New Catalyst for Sweetening of Lighter and Heavier Petroleum Fractions (2007)
- Innovative Technology for Up-grading Fuel Oil Components
- In to Premier Refining Products (2009)
- Business Development and Technology Development Marketing (2011)
- Innovation in Polymer Waste Management and Recycling Technology (2012)
- CSIR Technology Award for Innovation 'A process for simultaneous production of U.S-grade gasoline and high-purity benzene from C6 heart cut of FCC gasoline' (2014)
- Technology Award for the Most Significant CSIR Technology of the Five-Year Plan Period (2015)
- Development of Wax De-oiling Technology and its Commercialization at the Numaligarh Refinery (2016)

Further, CSIR-IIP has also received FICCI, ICMA and NRDC awards for some of the above technologies.

MAJOR FACILITIES

Analytical

- FTIR, SEM, XRD, High resolution GC-MS
- TG-DTA, NMR-500, HPLC, SFC, UV-Vis, DSC, CFPP
- Low resolution GC-MS, AAS, ICP-AES
- GC SCD, GC PFPD
- Polarized Light Optical Microscope
- Asphalt Rheometer
- Nottingham Asphalt Tester, Marshal Stability Tester

TEM

- Bitumen Rolling Thin Film oven Apparatus
- Transmission Electron Microscope (TEM)

Pilot Plant

- Visbreaking Pilot Plant Unit
- Delayed Coking Pilot Unit
- Biodiesel Pilot Plant
- Biomass Fast Pyrolysis Unit
- Bioreactors
- Waste Plastic Unit
- Bench Scale Fixed bed Sweetening Unit
- Pilot Plant for Gas Desulphurization Studies
- Two Column PSA Unit
- Single Column Microadsorber Unit
- Gas Isotherm Measurement Unit

Automotive Division (For all categories of vehicles)

- Two/Three Wheeler Chassis Dynamometer
- Chassis Dynamometer for LCV including Passenger Cars
- Constant Volume Sampler (CVS) & Emission Analyzers for CO, HC, NOx & PM
- Transient Dynamometer
- On-board Emission Analyzer
- Meterlogy
- CFR Engine
- Spray Imaging System
- STAR-CD CFD Software

Tribolgy (Lubricant Testing Facilities)

- Amsler Wear Testing M/c
- Pin on Disc M/c
- FZG Gear Test Rig
- Timken Wear& Lubricant Tester
- IAE Gear Test Rig

Nanotribology

- Particle Size and Zeta Potential Analyzer
- Ultrasonic Probe

Grease Test Facilities

- IP Roller Bearing Test Rig
- Emcor Rust Test Rig
- Evaporation Loss of Grease
- Roll Stability of Greases
- Leakage Tendency of Greases
- Gear Wear Tester

For more information please contact

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