

Training Activities at IIP

2007

INDIAN INSTITUTE OF PETROLEUM
DEHRA DUN 248 005 (UTTARANCHAL) INDIA



Creating Future Fuels



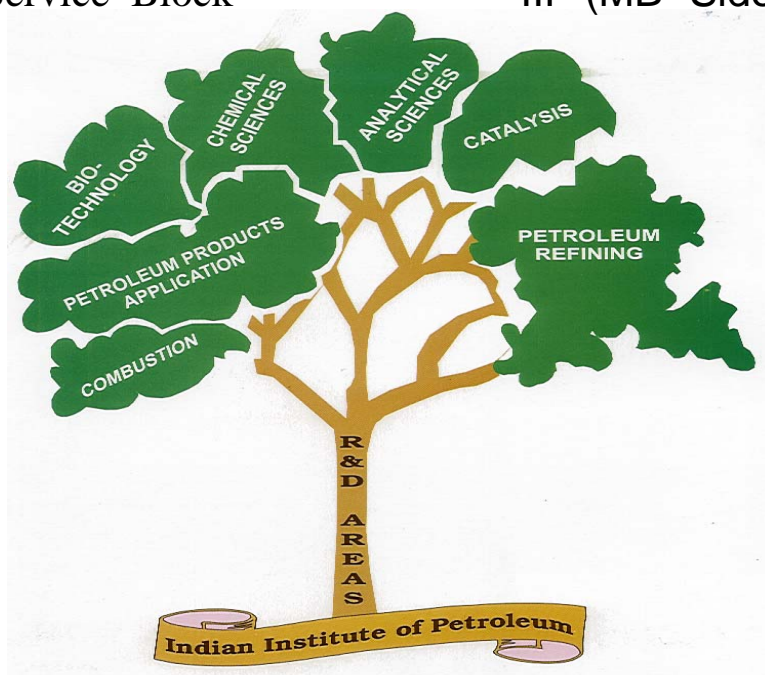
IIP (main building - front view)



IIP – Service Block



IIP (MB- Side view)



(An ISO 9001 Accredited R&D Institute)



Way to IIP guest house



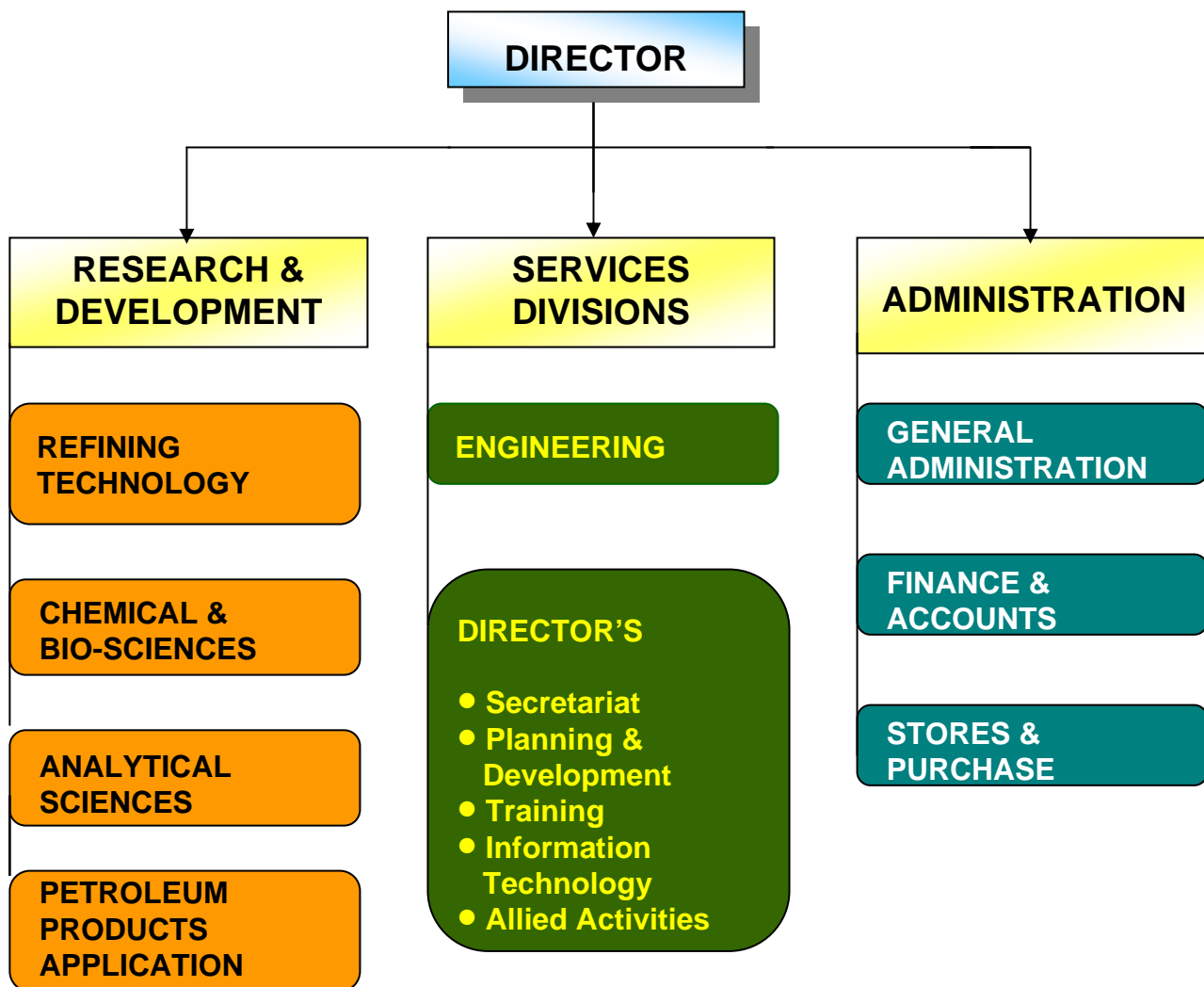
IIP Guest House and Training Hostel Complex

TABLE OF CONTENTS

- Brief profile of IIP
- IIP and training activities
 - Need for training
 - Objective of training
 - Significance of training at IIP
 - Facilities in training division
- List of training programmes
- Faculty for the programmes
- Programme Director(s)
- Who should attend
- Brief programme contents
 - Regular training programmes
 - Advance training programmes
 - Special training programmes
 - Programmes on specific topic

BRIEF PROFILE OF IIP

Indian Institute of Petroleum (IIP), an ISO 9001 accredited organization, is a national laboratory under Council of Scientific & Industrial Research (CSIR) New Delhi. It was established in September 1960 in technical collaboration with the Institut Francais du Petroleu (IFP) France under UNESCO programme and started functioning at Dehradun from April 1963. The major R&D activities of the Institute are covered under the organization structure chart given below :



IIP and Training Activities

Indian Institute of Petroleum (IIP), an ISO 9001 certified Institute, is a National R&D Institute under Council of Scientific and Industrial Research (CSIR), New Delhi. Established in September 1960 in technical collaboration with the Institut Francais du Petrole (IFP), France, it started functioning at Dehradun from April 1963.

The Institute has State-of-the-art equipments and facilities including bench/pilot scale units, mass emission facility for vehicles/engines and other infra-structural support for research including a continuously updated library. IIP carries out R&D on application and use of engine fuels, lubricants and the refinery processes, etc. It is, also, one of the authorized centers for Central Motor Vehicle Rule (CMVR) certification, Genset certification as per Central Pollution Control Board (CPCB) norms, and fuel economy evaluation of fuels/additives/devices for Petroleum Conservation Research Association (PCRA). The state-of-the-art reports, prepared by IIP on vehicle emissions in 1985 and 1994, greatly facilitated framing of emission norms for the country. IIP is recognized by many universities/institutes as a Research Centre for Doctoral Programmes. It has more than 1800 publications in National and International journals. IIP has been granted 135 patents for several processes and products and bagged several prestigious national awards including FICCI, ICMA, VASVIK, NRDC and CSIR Technology Shields.

In addition to carrying out research in the frontier areas of Petroleum, IIP (as one of its mandate) also plays a leading role in organizing specialized training programmes, for engineers (chemical and mechanical) and chemists in the Petroleum Refining, Petrochemicals and Transport sector. IIP imparted training to more than 6000 personnel since its inception. During the last twelve years, IIP has organized more than 140 training programmes. IIP offers a variety of courses to scientific, technical and management personnel employed in petroleum refining & user industry, Government and academic institutions. These are moderately priced courses designed to impart the necessary knowledge and skills and are conducted by talented and highly competence and experienced scientists. Participants shall be provided ample opportunities to have hands-on experience.

NEED FOR TRAINING

Dynamic and growth oriented organizations recognize training as an important aspect of the management function in a rapidly changing economic and social environment. Training is a continuous and incessant learning process in Human Resource Development (HRD). As the strength of any organization is the strength of the human resources in the organizations, training is undoubtedly an important part of the organization renewal as an ongoing process. Training is a process through which a person enhances and maintain his efficiency, capability and effectiveness at work by improving and updating his knowledge, understanding & skills relevant to his job.

OBJECTIVE OF TRAINING

Generally, training is the responsibility of three partners – the training institutions, the participating organizations and the participants. Broadly, “training” is intended to:

- Help the trainees in acquiring knowledge of the subject matter
- Bring about the change in the attitudes, understanding and behaviour among the trainees towards the particular object, programme and problem.
- Help in putting the theory into practice and bringing generalization from the various hypotheses.
- Help in evaluating the abilities, potential & competence of the trainees for particular assignment/ job skill.
- Motivate the trainees for self-learning and development.
- Enhance the problem solving and decision making capabilities of the trainees.
- Help in narrowing down the gap between expected level of performance and actual level of performance among the trainees.
- Provide scientific pace of knowledge and skill to discharge the duties and responsibilities of the trainees meaningfully and purposefully.

SIGNIFICANCE OF TRAINING ACTIVITIES AT IIP

IIP attaches utmost significance to these programmes in view of the following :

- IIP acts as a window to the latest information on the subject for the participants in these programmes
- Participants in the programme have a physical feel of IIP's R&D facilities and appreciation of its strength and the services it can provide to industry
- It forms an instrument of business with the industry involving technical consultancy, technological support and contract R&D

FACILITIES IN TRAINING DIVISION

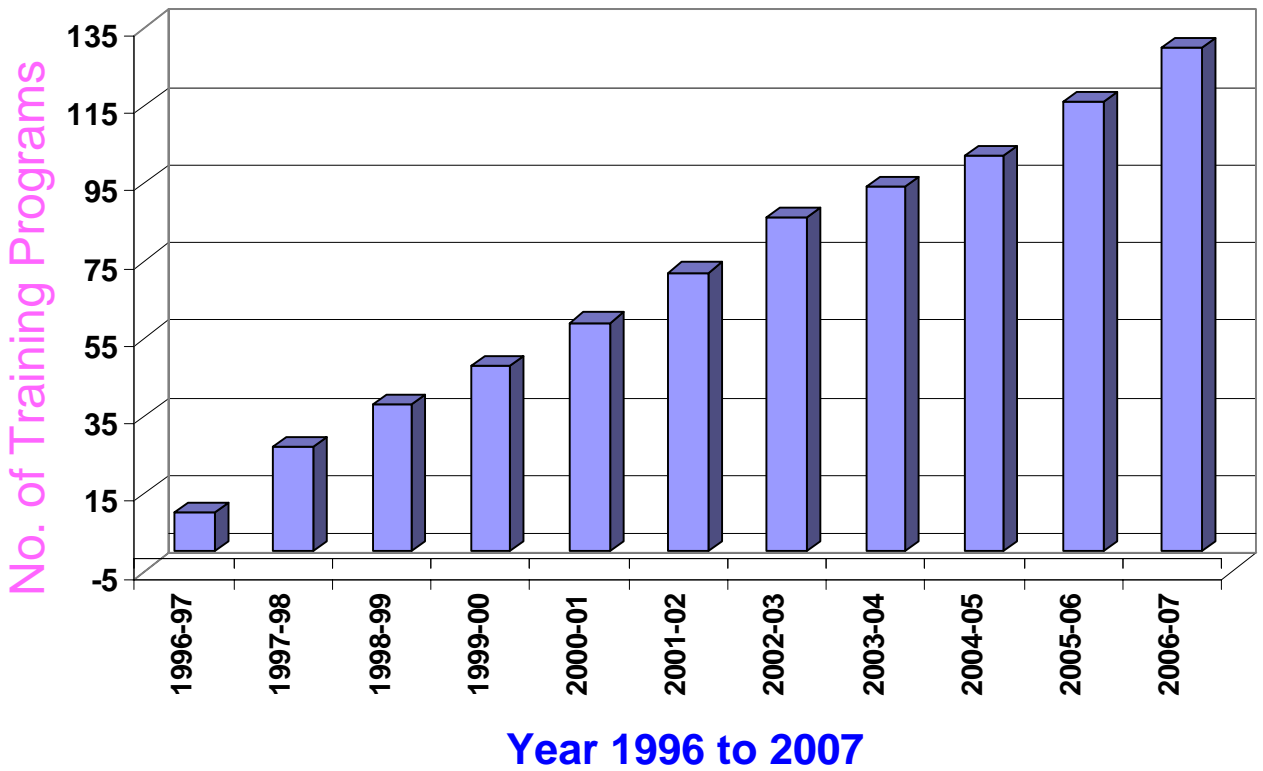
The Training Division of IIP is equipped with an Auditorium, a Conference room and two Lecture Theatres equipped with latest audio-visual facilities including multimedia facility. Situated at a picturesque location, about 8 Km away from main Dehradun township, IIP can accommodate about 50 participants/faculty members in its Guest House - Hostel complex and has adequate transport facilities for local visits/excursion tours.

TYPES OF TRAINING PROGRAMMES

During late sixties, IIP organized long duration training programme of 12 and 18 months. The duration of these programmes was subsequently reduced to 3 months because the participants from the industries were often not permitted to be away from their working places for such a long time. Presently, 2-12 weeks duration programmes are mostly organized as per the requirement of sponsoring organizations.

Earlier only 3 to 4 programmes were organized every year. However, the activity started picking up in 1992 when more and more industry appreciated the importance of such training and the strength of IIP in this area, as is shown in the chart given below. Lately some of the International organizations have also started to nominate their candidates in some of our programmes. Efforts are being made to collaborate with some of international companies to organize in-house training activities at their locations.

TRAINING PROGRAMMES ORGANISED DURING PREVIOUS 10 YEARS (Cummulative)



LIST OF PROGRAMMES

● **REGULAR TRAINING PROGRAMMES**

- [i] Petroleum Refining Technology (6 to 12 weeks)
- [ii] Petroleum Refining and Petrochemicals Technology
- [iii] Application of Fuels & Lubes in Automotive/Industrial Machines

● **ADVANCE TRAINING PROGRAMMES**

- [i] Advances in Petroleum Refining Technology & Related Aspects
- [ii] Engine Fuel, Quality Requirements and Emissions
- [iii] Automotive Emissions and their Measurement

● **SPECIALIZATION TRAINING PROGRAMMES**

- [i] Crude Assay Using Physico-chemical and Analytical Methods
- [ii] Petroleum Refining Technology (2 weeks)
- [iii] Physicochemical Analysis and Performance Test Methods for Lubricating Oils and Additives
- [iv] Deposit Rating of Small S.I. Engine Components
- [v] Analysis of Petroleum Products Related to Forensic Sciences
- [vi] Heat Exchanger: Design, Operation and Trouble Shooting
- [vii] Familiarization with I.C. Engines with Particular Emphasis on Two-wheelers

● **PROGRAMMES ON SPECIFIC TOPICS**

- [i] Solvent Extraction Technology
- [ii] Catalytic Reforming Process Technology
- [iii] Analytical Techniques for Petroleum and Related Products
- [iv] Lube Extraction Technology
- [v] Bitumen – A Paving Material
- [vi] Lube Process Technology
- [vii] Fluid Catalytic Cracking Process Technology
- [viii] Efficient Utilization of Fuel Oils
- [ix] Process Integration in Refining Industry for energy conservation
- [x] Refinery Processes & their significance
- [xi] Petrochemicals: Advances in hydrocarbon Industry

FACULTY FOR THE PROGRAMME

Faculty for the programme is mainly drawn from the working senior scientists/engineers in the respective areas of their R&D expertise. These scientists keep themselves abreast with the latest developments in respective area of work. This knowledge is shared with the participants in different training programmes.

In addition to the above, the institute encourages invitation to guest faculty from Academic Institutions, R&D and Industry to supplement the available expertise in different areas.

PROGRAMME DIRECTORS

Programme Directors are among the Senior Scientist from within IIP having managing contacts with industry, financial institutions and government agencies with over 20 to 25 years of expertise to impart strategic analysis and advice to the participants from sponsoring organizations.



WHO SHOULD ATTEND

REGULAR TRAINING PROGRAMMES

1. Graduate Engineer Trainees (GETS) – New Entrants
2. Middle Management Level personnel working in the following areas:
 - Process
 - Research & Development
 - Quality Control
 - Production
 - Planning
 - Sales/marketing
 - Operation

ADVANCE TRAINING PROGRAMMES

1. Senior Management Level personnel working in the following areas:
 - Process
 - Research & Development
 - Quality Control
 - Production
 - Planning
 - Sales/marketing
 - Operation

SPECIAL TRAINING PROGRAMMES

1. New entrants in hydrocarbon /petroleum sectors
2. Middle Management Level personnel working in the following areas:
 - Process
 - Research & Development
 - Quality Control
 - Production
 - Planning
 - Sales/marketing
 - Operation

PROGRAMMES ON SPECIFIC TOPICS

1. Middle Management Level personnel working in the respective areas:
 - Process
 - Research & Development
 - Quality Control
 - Production
 - Planning
 - Sales/marketing
 - Operation

Brief Programme Contents

REGULAR TRAINING PROGRAMMES

- [I] PETROLEUM REFINING TECHNOLOGY
(OF 2 TO 12 WEEKS DURATION
- FOR GETs / FRESH CHEMICAL ENGINEERS)
- [II] PETROLEUM REFINING TECHNOLOGY
- FOR GETs / FRESH NON-CHEMICAL ENGINEERS)
- [III] PETROLEUM REFINING AND PETROCHEMICALS
TECHNOLOGY
- [IV] APPLICATION OF FUELS AND LUBES IN
AUTOMOTIVE & INDUSTRIAL MACHINES



Training session in progress

[IA] PETROLEUM REFINING TECHNOLOGY(2 WEEKS)

TOPICS

1.0 Introduction to IIP

2.1 General Refinery Configuration (Fuel & Lube Refineries)

2.2 Petroleum Refining Industry: an overview

3.0 *BASICS OF CRUDE OILS, PRODUCTS AND REFINING*

- (a) Crude Assay/ Laboratory Crude Evaluation Techniques
- (b) Laboratory Distillations and their significance
- (c) Major Petroleum Products and their specifications
- (d) Fuel Quality and Euro Norms
- (e) Product Characteristics & Blending correlation
- (f) Additives for Fuels & Lubes

4.0 REFINING PROCESS TECHNOLOGY

4.1 *Physical Separations Processes*

- (a) Atmospheric and Vacuum Distillations - Design Aspects
- (b) Feed Stock Preparation for lubes and conversion processes
- (c) Extraction of Light Aromatics from Naphtha & Kerosene
- (d) Refining of Lube Distillates
- (e) Dewaxing & Deoiling Processes
- (f) Column Internals (Design of tray etc. - Distillation and Extraction Columns)
- (g) Upgradation of Heavy Residues to Transportation Fuels
- (h) Bitumen, Manufacture & Specifications

4.2 *Conversion and Treating Processes*

- (a) Thermal Conversion Processes (Visbreaking & delayed coking)
- (b) Catalytic Cracking(FCC & RFCC)
- (c) Hydrocracking of Middle Distillates
- (d) Sweetening Processes in Petroleum Refining & Sulfur Recovery from stack/fuel gases
- (e) Catalytic Reforming
- (f) Hydroprocessing (HDS, Hydro-stabilization)
- (g) Advance Controls in Refineries
- (h) Process Integration (Pinch analysis)
- (i) Petro-plan (refining related software)

5.0 OTHER SUPPORT PROCESSES

- (a) Hydrogen production in Petroleum Refineries
- (b) Corrosion in Refining Industry

6.0 PILOT PLANT VISIT(S)

[IB] PETROLEUM REFINING TECHNOLOGY(3 WEEKS)

TOPICS

1.0 Insight - IIP

1.1 Petroleum Refining & Processing Schemes for Fuels - An Overview

2.0 CRUDE OILS AND PETROLEUM PRODUCTS

- (a) Characteristics of Crude Oil, Lab Evaluation Techniques and their Significance for Fuels and Feed stocks
- (b) Motor / Industrial Fuels Specifications and significance
- (b) Various standards applicable worldwide viz. ASTM, API, BIS, Euro - I,II,III & IV etc.

3.0 REFINING PROCESS TECHNOLOGY

3.1 Physical Separation

- (a) Atmospheric & Vacuum Distillation - Design & Operation
- (b) Column Internals (Case Studies) - Operational Aspects

3.2 Conversion and Treating Processes

- (a) Thermal Conversion Processes (Visbreaking & Delayed Coking)
- (b) Hydrogen Production & Management
- (c) Hydro-treatment of various streams
- (d) FCC Process/Operation for Distillates and Olefin Generation
- (e) Hydrocracking for Light and Middle Distillates
- (f) Amine Treating / Sulfur recovery (CBA), Sour Water Treatment
- (g) Sweetening of LPG, Gasoline, Kerosene
- (h) Merox (LPG, Gasoline, Kerosene)
- (i) Stream Properties and Blending Correlation

3.3 Simulation and Modelling

- (a) Introduction to Advance Control systems
- (b) Pinch Analysis
- (c) Simulation and design of refinery columns
- (d) Refinery Planning (Petro. Plan)

Contd...2../

4.0 PETROCHEMICALS

- (a) Integration of refineries with petrochemicals (Stream less)
- (b) Overview of Petrochemicals Industry: Technology
Trends - Present & Future
- (c) Building Blocks : Olefins, Benzene & Xylene including (i.) Poly-olefins (ii.) Poly-condensation involving DMT/PTA, MEG
- (d) Role of Catalysis in Petroleum Refining and Petrochemical Industry
- (e) Processes for p-Xylene production
- (f) Additives for Fuels - Application
- (g) Corrosion problems in Refining Industry

5.0 OTHER SUPPORT PROCESSES

- (a) Alternate Fuels
- (b) Process integration (Pinch Analysis)
- (d) Hydrogen production and management
- (e) Advance controls in refineries
- (f) Bio-fuels

6.0 LAB./PILOT PLANTS VISITS AND OPEN

[IC] PETROLEUM REFINING TECHNOLOGY(6 to 12 WEEKS)

TOPICS

1. INAUGURATION

2. Insight to IIP

3.0 Introductory Lectures

- Petroleum Refining Industry in India and Future Trends
- Exploration drilling and production of Crude Oil
- Allotment of project
-

4.0 Basic of Crude Oils

- Chemistry of crude oil: composition and Classification
- Crude Oil Pretreatment
- Transportation of crude oil – general and special problem
- Lab crude evaluation technique for fuel and feed stocks
- Lab distillation, their inter conversion and significance
- Tutorial
- Desalting of crude oil
- Product characterization (Fuels)
- General refinery configuration (Fuel and Lubes)

5.0 Products: Composition, Properties, Specifications and Significance

- Performance evaluation of fuels and lubes
- Motor gasoline & Diesel fuels
- Kerosene and ATF
- Fuel oil, LSHS, HPS
- Speciality products: Waxes, JBO/MTO
- Product characterization (Lubes & Greases)
- LPG-domestic, industrial and automotive
- Naphtha – specifications for different end users, test methods and significance
- RPC/CPC / Needle coke
- LOBS-Various grades / significance
- Bitumen Manufacture – Industrial and Paving
- Buturox Process and Bitumen Emulsification

6.0 Refining Technology

(a) Separation processes

- Vapour –liquid equilibria
- Tutorials
- Atmospheric and vacuum distillation - design of column
- Simulation of distillation systems using Aspen plus
- Tutorials
- Column internals – design of trays etc
- Introduction to separation processes
- Petroleum hydrocarbon solvent: Composition & Classification
- Solvent Extraction (BTX)
- Lube Extraction (NMP & Furfural)
- De-asphalting of Short residue for lubes and other feed stocks
- Solvent dewaxing, deoiling and manufacture of waxes
- Industrial extraction equipments:– selection and process design

(b) Conversion processes

- Thermal Conversion Processes
- Hydrocracking
- Catalytic cracking (Fundamentals and advances)
- Reforming (Fundamentals and advances)
- Hydro-process and advances (HDS, Hydro-stabilization)
- Modelling of catalytic reforming process
- Hydrogenation of cracked stocks
- Sweetening processes
- Hydro-finishing of Lubes and Waxes
- Upgradation of heavy residues
- Hydrogen production and management
- Process Integration (Pinch Analysis)
- Tutorials
- Sulfur recovery processes (techniques including bio- treatment)

7.0 Application of Petroleum Products

- Alternate Fuels
- Combustion in industrial burners, design and trouble shooting
- Furnaces: performance evaluation, efficiency enhancement techniques
- Tutorials

8.0 Refineries Support Processes

- Flare principle and sizing of utility
- Corrosion in petroleum industry
- Control and safety valves
- Refinery and petrochemical integration

9.0 Lab and pilot plant visit

Project Work

Presentation of project work and viva

Objective type tests (6 nos) – weekly

Concluding Session / Open Forum

[ID] PETROLEUM REFINING TECHNOLOGY (12 WEEKS)

Sl. Topics

No.

1. Inauguration
2. Insight of IIP

INTRODUCTORY LECTURES

3. Exploration drilling and production of Crude Oil
4. Petroleum Refining Industry in India and Future Trends
5. Transportation of crude oil – general and special problem
6. Allotment of Projects to the participants

BASIC OF CRUDE OILS

7. Chemistry of Crude Oil: Composition and Classification
8. Crude evaluation technique for fuel and feed stocks
9. Lab distillation, their inter conversion and significance
10. Pretreatment of Crude Oil
11. Product Characterization (Fuels)
12. General refinery configuration (Fuel and Lubes)
13. Product Characterization (Lubes & Greases)
14. Diesel Fuels
15. Kerosene and ATF
16. Fuel oil, LSHS, HPS
17. Speciality products: Waxes, JBO/MTO
18. Bitumen Manufacture – Industrial & Paving
19. Buturox Process and Bitumen Emulsification
20. RPC/CPC / Needle coke
21. LPG-domestic, industrial and automotive
22. Naphtha – specifications, test methods and significance
23. LOBS-Variou grades / significance

REFINING PROCESS TECHNOLOGY

Separation Processes

24. Atmospheric and Vacuum Distillation - Design of Column
25. Simulation of distillation systems using Aspen plus
26. Column internals – Design Of Trays Etc
27. Introduction to Separation Processes

28. Liquid-liquid Equilibria – Principle of Solvent Extraction
29. Lube Extraction (NMP & Furfural)
30. Solvent Extraction (BTX)
31. De-asphalting of Short Residue for Lubes and other Feed Stocks
32. Solvent Dewaxing, Deoiling and Manufacture of Waxes including Isodewaxing
33. Industrial Extraction Equipments:– Selection and Process Design
34. Adsorption for Refining Processes
35. Role of Catalyst /Catalysis
36. Vapour liquid Equilibria

Conversion Processes

37. Thermal Conversion Processes
38. Hydrocracking (Visbreaking and delayed coking)
39. Fluid Catalytic cracking (Fundamentals, Advances & Operation) including Resid
40. Reforming (Fundamentals and advances)
41. Hydro-process and advances (HDS, Hydro-stabilization)
42. Modelling of Catalytic Reforming Process
43. Hydrogenation of Cracked Stocks
44. Sulfur recovery processes (techniques including bio- treatment)
45. Sweetening Processes
46. Hydro-finishing of Lubes and Waxes
47. Upgradation of heavy residues
48. Hydrogen production and management
49. Isomerization
50. Process Integration (Pinch Analysis)

APPLICATION OF PETROLEUM PRODUCTS

51. Vehicle Emission: Legislation and Control
52. Motor Gasoline
53. Additives for Fuels and Lubes
54. Performance Evaluation of Fuels & Lubes
55. Alternate Fuels and Future Fuels Quality
56. Combustion in Industrial Burners
57. CNG and LNG in Transport Sector
58. Characterization of LOB and Additive Response

REFINERIES SUPPORT PROCESSES

59. Advance Controls in Refineries
60. Environmental Control in Petroleum Industry and Effect on Health
61. Flare Principle and Sizing in Utility
62. Fire and Safety in refineries

63. Production Planning in Petroleum Refining Industry
64. Corrosion in Petroleum Industry
65. Storage, Handling and Distribution
66. Control Valves and Safety
67. Energy Conservation and Energy Audit
68. Refinery and Petrochemical Integration
69. Industrial Effluent
70. Roll of ISO towards Total Quality Management (TQM)
71. Hazop (Hazard and Operability Studies)
72. Trouble-shooting
73. Use of Instrumental Techniques Applicable to Hydrocarbon Industry
74. Lab and pilot plant visits
Project Work – Preparation and
Presentation & viva (4 batches)
Objective type tests (5 nos.) bi-weekly
Tutorials
Concluding Session / Open Forum

[II] PETROLEUM REFINING & PETROCHEMICALS TECHNOLOGY (2 WEEKS)

TOPIC

1.0 Introduction to IIP

1.1 Petroleum Refining & Processing Schemes for Fuels - An Overview

2.0 CRUDE OILS AND PETROLEUM PRODUCTS

- (a) Characteristics of Crude Oil, Lab Evaluation Techniques and their Significance for Fuels and Feed stocks
- (b) Motor / Industrial Fuels Specifications and significance
- (c) Various standards applicable worldwide viz. ASTM, API, BIS, Euro - I,II,III & IV etc.

3.0 REFINING PROCESS TECHNOLOGY

3.1 Physical Separation

- (a) Atmospheric & Vacuum Distillation - Design & Operation
- (b) Column Internals (Case Studies) - Operational Aspects

3.2 Conversion and Treating Processes

- (a) Thermal Conversion Processes (Visbreaking & Delayed Coking)
- (b) Hydrogen Production & Management
- (c) Hydro-treatment of various streams
- (d) FCC Process/Operation for Distillates and Olefin Generation
- (e) Hydrocracking for Light and Middle Distillates
- (f) Amine Treating / Sulfur recovery (CBA), Sour Water Treatment
- (g) Sweetening of LPG, Gasoline, Kerosene
- (h) Merox (LPG, Gasoline, Kerosene)
- (i) Stream Properties and Blending Correlation

3.3 Simulation and Modelling

- (a) Introduction to Advance Control systems
- (b) Pinch Analysis
- (c) Simulation and design of refinery columns
- (d) Refinery Planning (Petro. Plan)

4.0 PETROCHEMICALS

- (a) Integration of refineries with petrochemicals (Stream less)
- (b) Overview of Petrochemicals Industry: Technology Trends - Present & Future
- (c) Building Blocks : Olefins, Benzene & Xylene including (i.) Poly-olefins (ii.) Poly-condensation involving DMT/PTA, MEG
- (d) Role of Catalysis in Petroleum Refining and Petrochemical Industry
- (e) Processes for p-Xylene production
- (f) Additives for Fuels - Application
- (g) Corrosion problems in Refining Industry

5.0 LAB./PILOT PLANTS VISITS AND PRACTICALS/TUTORIALS/PRESENTATIONS AND FINAL DISCUSSIONS

[III] APPLICATION OF FUELS AND LUBES IN AUTOMOTIVE AND INDUSTRIAL MACHINES

TOPIC

1.0 GENERAL

- 1.1 Introduction to IIP
- 1.2 Chemistry of crude oils and their physico chemical properties
- 1.3 Physico-chemical testing of Lube Oils and greases
- 1.4 Characterization of Luke Base Stocks

2.0 AUTOMOTIVE FUELS AND LUBRICANTS

- 2.1 Basics and Advances in Two and Four Stroke Gasoline Engines
- 2.2 Basics and Advances in Diesel Engines
- 2.3 Motor Gasoline
- 2.4 Diesel Fuels
- 2.5 Additives for Lubes
- 2.6 Automotive and other Engine Performance Tests
- 2.7 Basic lubrication theory and lubrication in IC engines
- 2.8 Lubrication requirement of Four Stroke Gasoline/Diesel performance tests
- 2.9 Lubrication Requirement of Two Stroke Gasoline Engines, Classification, Specification and Performance Tests
- 2.10 Evaluation and classification of deposit rating of engine parts with reference to oxidation stability and detergency
- 2.11 Alternate fuels and fuels quality trends
- 2.12 Vehicle emission - Legislation and control

3.0 INDUSTRIAL LUBRICATION

- 3.1 Greases : Composition, evaluation and performance
- 3.2 Gear Oils : Specifications and selection
- 3.3 Metal working lubrication
- 3.4 Synthetic lubricants with special reference to cutting fluids (aqueous)
- 3.5 Hot & cold rolling and quenching oils

4.0 PRACTICALS

- 4.1 Diesel and Gasoline Test Benches
- 4.2 Octane and Cetane rating
- 4.3 Standard test benches: CLR, Caterpillar,
- 4.4 Patter AVI, Petter WI
- 4.5 Metrology- Engine deposit rating
- 4.6 Emission Measurement Equipments : Chasis Dynamometer, CVS
- 4.7 Tribology Lab./Tests
- 4.8 Physico-chemical Tests

ADVANCE TRAINING PROGRAMMES

- [I] ADVANCES IN PETROLEUM REFINING TECHNOLOGY AND RELATED ASPECTS
- [II] ENGINE FUEL, QUALITY REQUIREMENTS & EMISSIONS
- [III] AUTOMOTIVE EMISSIONS & THEIR MEASUREMENT

[I] ADVANCES IN PETROLEUM REFINING TECHNOLOGY AND RELATED ASPECTS

TOPICS

1. Refinery / Petrochemical Integration for the 21st Century
2. Advances in FCC Technology
3. Improving Commercial Hydrocracking Performance
4. Gas to Liquid Technologies
5. Heavy Crude Oil & Residue Up-gradation
6. New Technologies for meeting future gasoline specs
7. Catalyst and Process Options for Clean Diesel Fuel for Future
8. Managing Stability and lubricity in light and middle distillates
9. Advances in Hydrocarbon separation technology
10. Bio-technology applications in Refining Industry
11. Equipment - Design, optimization and reliability enhancements

Short Capsules:

1. Hydrogen pinch for effective hydrogen management
2. IIP-EIL reforming model - CRESOP
3. Conversion of NGL/light naphtha to LPG and aromatics
4. DME: Dimethyl Ether – an ecofriendly fuel

[II] ENGINE FUEL, QUALITY REQUIREMENTS AND EMISSIONS

TOPICS

1. Introduction to IIP
2. Indian petroleum/energy scene
3. Petroleum fuels for spark ignition engines
4. Gasoline quality relationship with emissions and emission control including reformulated gasoline containing oxygenates
5. Alternate fuels for spark ignition engines/ passenger cars
6. Petroleum fuels for compression ignition engines
7. Diesel fuel quality relationship with diesel vehicle performance and emissions
8. Future trends in diesel fuel quality including reformulated diesels containing oxygenates
9. Alternate fuels for heavy duty engines
10. Global warming and petroleum engine fuels
11. Newer petroleum fuel refining processes

Practical(s):- Demonstration & Lab visits

1. Analysis of Emissions of Gasoline Vehicles with portable analyzers
2. Smoke measurement of Diesel Vehicles
3. Laboratory Exhaust Gas Analyzers and Particulate Analyzers
4. Mass Emission Measurement
5. Type Approval of Portable CO Analyzer and smoke meter
6. Hands-on Experiences on Portable Analyzer and smoke meter

[III] AUTOMOTIVE EMISSIONS AND THEIR MEASUREMENT

TOPICS

1. Introduction to IIP
2. Air Quality and Impact of Automotive Emissions on Environment & Health
3. Automotive Emission Standards, CMVR Rules and In-use Vehicle Testing
4. Vehicular Emission Measurement Systems and Field Problems
5. Gasoline Fuel and Engine Control Measures for Emission Reduction
6. Diesel Fuel and Engine Control Measures for Emission Reduction
7. Alternative fueled Vehicles for Emissions Control

Practical:- Demonstration & Lab visits

1. Analysis of Emissions of Gasoline Vehicles with portable analyzers
2. Smoke measurement of Diesel Vehicles
3. Laboratory Exhaust Gas Analyzers and Particulate Analyzers
4. Mass Emission Measurement
5. Type Approval of Portable CO Analyzer and smoke meter
6. Hands-on Experiences on Portable Analyzer and smoke meter

Workshop Topic

- Field Problems in Implementation of Inspection and maintenance program for In-use vehicles

SPECIALIZATION TRAINING PROGRAMMES

- [I] CRUDE ASSAY USING PHYSICO-CHEMICAL AND ANALYTICAL METHODS
- [II] PETROLEUM REFINING TECHNOLOGY (2 WEEKS)
- [III] PHYSICO-CHEMICAL ANALYSIS AND PERFORMANCE TEST METHODS FOR LUBRICATING OILS AND ADDITIVES
- [IV] DEPOSIT RATING OF SMALL S.I.ENGINE COMPONENTS
- [V] ANALYSIS OF PETROLEUM PRODUCTS RELATED TO FORENSIC SCIENCES
- [VI] AND HEAT EXCHANGER: DESIGN, OPERATION
TROUBLE SHOOTING
- [VII] FAMILIARIZATION WITH I.C. ENGINES WITH PARTICULAR MPHASIS ON TWO-WHEELERS



Training session in progress

[I] CRUDE ASSAY USING PHYSICO-CHEMICAL AND ANALYTICAL METHODS

TOPICS

1. Chemistry of Crude Oils and their Physico-chemical Properties
2. Physico-chemical Analysis of Fuels - their Specifications and Significance

Practicals Analysis & Chemical Instrumental Techniques

- Copper Strip Corrosion
- Density
- Existent Gum
- TEL
- Reid Vapour Pressure
- Flash Pt./Abels
- Colour Saybolt
- Smoke Point
- Calorific Value (Only demonstration)
- Aromatic %
- Olefines%
- Sulfur
- Sulfur Mercaptan
- Freezing Point
- Silver strip corrosion
- Burning Quality
- Doctor Test
- Viscosity
- Naphthalene %
- Hydrogen Content
- ◇ Gas Chromatography
- ◇ Gas Chromatography & Mass Spectrometry
- ◇ Infra Red
- ◇ Ultraviolet
- ◇ Atomic Absorption
- ◇ HPLC

[II] PETROLEUM REFINING TECHNOLOGY (2 WEEKS PROGRAMME)

TOPICS

1. Chemistry of Crude Oil: Composition and Classification
2. Crude Evaluation Technique for Fuel And Feed Stocks
3. General Refinery Configuration (Fuel and Lubes)
4. Product Characterization (Lubes & Greases)
5. Diesel Fuels
6. Kerosene and ATF
7. Fuel oil, LSHS, HPS
8. Atmospheric and Vacuum Distillation - Design of Column
9. Simulation of Distillation Systems using Aspen plus
10. Thermal Conversion Processes (Visbreaking & Delayed Coking)
11. Hydrocracking: Fundamentals & Advances
12. FCC –Fundamentals & Advances
13. Deep Catalytic Cracking: Resid & DCC
14. Reforming: Fundamentals and Advances
15. Hydro-process and Advances (HDS, Hydro-stabilization)
16. Sulfur recovery processes (techniques including Bio-treatment)
17. Sweetening Processes
18. Hydrogen Production and Management
19. Isomerization
20. Process Integration (Pinch Analysis)
21. GTL : Gas-to-Liquid Technology

- 6.7 Petroleum hydrocarbon solvent: Composition and classification
- 6.8 Solvent Extraction (BTX)
- 6.9 Lube Extraction (NMP & Furfural)
- 6.10 De-asphalting of Short residue for lubes and other feed stocks
- 6.11 Solvent dewaxing, deoiling and manufacture of waxes
- 6.12 Industrial extraction equipments – selection and process design

CONVERSION PROCESSES

- 6.13 Thermal Conversion Processes – Visbreaking and delayed coking
- 6.14 Hydrocracking
- 6.15 Catalytic cracking (Fundamentals and advances)
- 6.16 Reforming (Fundamentals and advances)
- 6.17 Hydro-process and advances (HDS, Hydro-stabilization)
- 6.18 Hydro-finishing of Lubes and Waxes
- 6.19 Hydrogenation of cracked stocks
- 6.20 Modelling of catalytic reforming process
- 6.21 Sweetening processes
- 6.22 Upgradation of heavy residues
- 6.23 Hydrogen production and management
- 6.24 Sulfur recovery processes (techniques including bio-treatment)

7.0 APPLICATION OF PETROLEUM PRODUCTS

- 7.1 Alternate Fuels
- 7.2 Combustion in industrial burners, design and trouble shooting
- 7.3 Furnaces: performance evaluation, efficiency enhancement techniques

8.0 REFINERIES SUPPORT PROCESSES

- 8.1 Process integration (Pinch Analysis)
- 8.2 Corrosion in Petroleum industry
- 8.3 Advance controls in refineries
- 8.4 Refinery and petrochemical integration
- 8.5 Bio-fuels
- 8.6 Role of catalysis in refining industry

9.0 MISCELLANEOUS ACTIVITIES

1. Practical(s) and Pilot Plant Visit
2. Project Work & weekly Tutorials
3. Presentation of project work and viva
4. Objective type tests
5. Evaluation
6. Concluding Forum

[III] PHYSICOCHEMICAL ANALYSIS AND PERFORMANCE TEST METHODS FOR LUBRICATING OILS AND ADDITIVES

PRACTICALS :

(a) Standard Analysis Section & Crude Evaluation Section

- Sp. Gravity, kinematics and VI, Pour point, Flash point, Sulphated ash, Foaming characteristics, TAN and TBN, Evaporation loss by Noacks Method, Emulsion characteristics and demulsification, sulfur by bomb, Copper corrosion, Rust preventive characteristics, Water content by Dean & Stark, Air release value, Elemental analysis by chemical, carbon residue, cold cranking simulation, mini rotary viscometer
- Calibration of different equipments
- Response of different additives
- Sulfur by bomb and XRF method and water by Karl Fisher

(b) Petroleum Products & Application Division

- Shear Stability
- Four ball wear and EP test, Timken OK load, FZG test and Shock load tendency by Disc method
- Calibration of different equipments

(c) Lube & Bitumen Section

- Various oxidation stability tests
- Response of different additives i.e. VI improver, pour point depressant, detergents and dispersants, etc. (their depletion to be monitored by IR/FTIR) also various tests on used oil i.e. toluene-pentene insoluble, fuel dilution, wear metals analysis etc.

(d) Analytical Section

- HPLC: Determination of hydrocarbon types in base oils ASTM D1319 IP 368
- X-ray: Elemental analysis by atomic Absorption including wear metal analysis
- IR: Monitoring the depletion of additives by IR/FTIR & interpretation of spectra

[IV] DEPOSIT RATING OF SMALL S.I. ENGINE COMPONENTS

TOPICS

- Significance of Deposit rating
- 2-T oil specification and their recent trends
- Standard rating procedures such as JPI-55-34-91 & CRC Manual No. 19
- Actual rating of complete piston spark plug, exhaust port deposit, combustion chamber deposits
- OEM'S and oil Industry views on deposit rating.

[V] ANALYSIS OF PETROLEUM PRODUCTS RELATED TO FORENSIC SCIENCES

TOPICS

1. General introduction to Petroleum Products:- Nature and chemical composition
2. Petroleum products & their present day Adulteration
3. Analysis of Petroleum Residues in arson cases using various analytical techniques
4. Application of IR techniques in detection of adulteration of petroleum products
5. Gas Chromatography and its application in petroleum
6. Performance evaluation of Lubricating oils and interpretation for its quality
7. Effect of adulteration on gasoline quality – background and case history
8. Performance evaluation of fuels i.e. Gasoline, HSD for judging the quality

Practicals

- ◇ Viscosity and viscosity index, flash point, total acid and base number, ash sulfated, distillation, smoke point and diesel index
- ◇ Analysis by Gas Chromatography & IR/FTIR Spectroscopy

PROGRAMMES ON SPECIFIC TOPICS

- [I] SOLVENT EXTRACTION TECHNOLOGY
- [II] CATALYTIC REFORMING PROCESS TECHNOLOGY
- [III] ANALYTICAL TECHNIQUES FOR PETROLEUM AND RELATED PRODUCTS
- [IV] LUBE EXTRACTION TECHNOLOGY
- [V] BITUMEN – MANUFACTURING & SPECIFICATION
- [VI] LUBE & WAXES PROCESS TECHNOLOGY
- [VII] FLUID CATALYTIC CRACKING PROCESS TECHNOLOGY
- [VIII] EFFICIENT UTILIZATION OF FUEL OILS
- [IX] PROCESS INTEGRATION IN REFINING INDUSTRY FOR ENERGY CONSERVATION
- [X] REFINERY PROCESSES & THEIR SIGNIFICANCE
- [XI] PETROCHEMICALS: ADVANCES IN HYDROCARBON INDUSTRY
- [XII] PINCH TECHNOLOGY

QUALITY POLICY

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