



ANNEXURE-I

Annexure to Directors' Report on Energy Conservation, Technology Absorption and Foreign Exchange Earnings as per Companies (Disclosure of Particulars in the Report of Board of Directors) Rules 1988.

A) CONSERVATION OF ENERGY

a) Energy conservation measures taken:

As a part of continued efforts towards energy conservation, a number of Energy Conservation projects have been implemented during 2011-12 in refineries resulting in saving of 95,800 Standard Refinery Fuel Tonne (SRFT)/Year equivalent to about ₹340 crore. Some of the major investments in this regard are as under:

Sl. No	PARTICULARS	COST (₹ in Lakh)	FUEL SAVING (Standard Fuel equivalent)MT/Year
1	Optimization of heat load by routing hot stabilized naphtha ex NSF C003 (Pre-topping Column Splitter) directly to MSQ Splitter instead of routing the same via NSF C001 (Main Column Splitter) at Guwahati Refinery	40.0	1800
2	Installation of staged Flare System at Barauni Refinery	230.6	2500
3	Installation of magnetic resonators in GT-4/5 & LAB at Gujarat Refinery	29.4	1000
4	Waste Heat recovery from KHDS furnace by Installing APH at Haldia Refinery	507.9	1133
5	Optimization of RSU throughput (optimizing steam to reboiler) by adjustment of distillation parameters post revamp of NSU column of CCRU & OHCU at Mathura Refinery	1108	3000
6	Installation of auto decantation valves in MS / Naphtha / Diesel tanks at Mathura Refinery	303	1000
7	Improvement in desalter wash water temperature in AVU-I & 2 by installing additional heat exchanger (Brine vs wash water) at Panipat Refinery	30	2480
8	Generation of MLP steam from LP steam generators in PREP HCU at Panipat Refinery	47.6	3200
9	Optimization of GT operation with export of power @ 2.5 MWH (at Assam Power Distribution Company Limited) at Digboi Refinery	175	2500
10	Installation of magnetic resonators in FO & FG lines of Boiler Nos. 1, 2, 3 & 5 at Bongaigaon Refinery	32	626

b) Additional investment and proposals, if any, being implemented for Energy Conservation:

Major ENCON schemes under implementation:

Guwahati Refinery:

- Additional heat recovery from Kero-1 stream for feed preheating of

NSF Splitter-I & Splitter-II heaters.

- Providing de-super heater in C-003 reboiler of Naphtha Splitting Facility.
- Installation of additional heat exchanger in hot section of crude-RCO service to facilitate on-line cleaning of one of the exchangers for sustaining preheat.
- Utilization of Kero & SRGO CR heat potential in CDU for replacement of NSF heaters, F-001 and F-002 of column C-001 & C-002 respectively.

Barauni Refinery:

- Routing of hot CGO & Coker Kero streams ex Coker to DHDT.
- Utilization of stack temperature in HRSG-2 for DM water heating.
- AVU - 1/2 preheat improvement by 10°C through heat recovery from kero, VHSD & wide-cut (present pre-heat 275°C).
- Installation of additional Heat Exchanger for increasing wash water temp. by 5°C with Desalter Brine in AVU-1 & 2.

Gujarat Refinery:

- AU-III preheat improvement by 7°C (from 268°C to 275°C) during 100% North Gujarat crude processing by replacing old heat exchangers with new ones.
- LP steam generation from FCC LCO stream.
- Routing of FPU-2 and VDU hot well off gases to furnace.
- Improve vacuum of MAB & WGC Turbine exhaust.
- Step-less control for DHDT MUG compressor.

Haldia Refinery:

- Step-less control in OHCU MUG compressor.
- Routing of GT-1 atomizing air cooler DM water to HRSG-I de-aerator.
- Routing of GT-2 atomizing air cooler DM water to HRSG-2 de-aerator.
- Implementation of soot blowers in Boiler-3.
- H₂ recovery from FG system.

Mathura Refinery:

- Magnetic Resonators in AVU / CCRU / TPS fuel lines.
- Step less control in 2nd compressor in DHDT.
- Foggy cooler in GT-I & III.
- Pressure balancing of LP steam header.

Digboi Refinery:

- Recovery of H₂ from H₂ rich CRU/WHFU/MSQ off-gas by routing the same through HGU.
- Diversion of Naphtha ex CRU offsite to CRU HDT section bypassing NSU.
- Operation of HGU at design steam carbon ratio of 3.0 mol/mol as against current value of 4.3 mol/mol after attending bright spot on some of the reformer tubes and cracked PG boiler refractory.

Panipat Refinery:

- Step less control for DHDT compressor (490 KWH).
- RSU feed preheat improvement by 46°C through installation of RSU feed vs bottom exchanger at MSQ (Redundant exchanger will be used).
- Utilization of Bio-gas ex PTA ETP in new SRU incinerator.
- Improvement of AVU-1 preheat by 1°C through installation of SKO vs Crude.

- Steam Condensate recovery in PR units & offsite areas (Condensate = 27 MT/Hr)
- Installation of step-less control system in one MUG compressor at OHCU (359 KWH).
- Heat recovery from C-7 (naphtha splitter) O/H & bottom product in NSU-1 for Crude pre-heat improvement (4.75 MMKcal/hr).
- Improvement in Combustion air temp. from 195°C to 290°C by replacement of Glass APH at AVU-2 furnaces.
- Installation of Magnetic resonators in all GTs, UB, VHP and HRSGs fuel lines.
- Improvement of combustion air preheat from 190°C to 250°C by replacement of OHCU Air Preheater.

Bongaigaon Refinery:

- CDU-I/II pre-heat improvement.
 - Replacing old natural draft furnace of CDU-I with balanced draft furnace.
 - Magnetic Resonators in Furnaces.
- (c) Impact of the measures at (a) and (b) above on reduction of energy consumption and consequent impact on the cost of production of goods**

The measures taken under item (a) resulted in savings of 95,800 SRFT in 2011-12. The impact of additional savings with major investments under item (b) in 2012-13 would be approx. 57,000

SRFT.

- d) Total energy consumption and energy consumption per unit of production as per Form 'A' of the Annexure in respect of industries specified in the schedule thereto.**

Necessary information is provided in Form 'A' annexed hereto.

B) TECHNOLOGY ABSORPTION

Details of efforts made in technology absorption are provided in Form 'B' annexed hereto.

C) FOREIGN EXCHANGE EARNING AND OUTGO

- (a) Activities relating to exports, initiatives taken to increase exports, development of new export market for products and services; and export plans:**

IndianOil continued to export petroleum & petrochemical products during the year to various countries. While the export of lubricants increased by 13%, the export of petrochemical products more than doubled during the year. The Corporation exported its petrochemical products like Linear Alkyl Benzene, Polymers and Glycols to various countries during the year and Polymers were exported to Pakistan by road for the first time.

- (b) Total foreign exchange used and earned.**

(₹ in Crores)

Foreign Exchange earnings	19,829
Foreign Exchange used	2,40,482





FORM - 'A'

Form for Disclosure of particulars with respect to Conservation of Energy

	2011-12	2010-11
A POWER AND FUEL CONSUMPTION		
1. ELECTRICITY:		
a) Purchased		
Unit ('000 KWH)	52757	42126
Rate/Unit	6.75	6.87
Amount (₹/Lakhs)	3564	2892
b) Own Generation		
i) Through Dual Fuel (HSD/Natural Gas Generators)		
Unit ('000 KWH)	3884784	3230991
KWH per MT of Std Fuel	7997	6818
Cost/Unit (₹/KWH)	4.39	3.92
ii) Through Steam Turbine/Generators		
Unit ('000 KWH)	1096797	1047340
KWH per MT of Std Fuel	3125	3000
Cost/Unit (₹/KWH)	8.93	7.44
c) Electricity Consumed (a+b) ('000 KWH)	5034338	4320457
2. Coal	-	-
3. Liquid Fuel (FO / Naphtha/ Diesel)		
Qty (MTs)	1935311	1913675
Amount (₹/Lakhs)	661806	479499
Average Rate (₹/MT)	34196	25056
4. Others / Internal Fuel		
a) Internal Fuel		
i) Fuel Gas		
Unit (MTs)	1863039	1504006
Amount (₹/Lakhs)	620230	346805
Average Rate (₹/MT)	33291	23059
ii) Coke		
Unit (MTs)	336627	343758
Amount (₹/Lakhs)	52562	53213
Average Rate (₹/MT)	15614	15480
b) Purchased Fuel		
Natural Gas		
Unit (MTs)	810671	802066
Amount (₹/Lakhs)	223396	132290
Average Rate (₹/MT)	27557	16494
B		
1. Consumption per MT of Production: PETROLEUM		
(i) Actual Production ('000 MTs)	49773	47238
(ii) Consumption per MT of Product		
- Electricity (KWH/MT)	75.865	76.047
- Liquid Fuel (MT/MT)	0.036	0.033
- Fuel Gas/LDO/Coke (MT/MT)	0.036	0.037
- Natural Gas (MT/MT)	0.012	0.017
2. Consumption per MT of Production : LAB		
(i) Actual Production ('000MTs)	102	126
(ii) Consumption per MT of Product		
- Electricity (KWH/MT)	589.994	609.395
- Liquid Fuel (MT/MT)	0.550	0.549
- Fuel Gas/LDO/Coke(MT/MT)	0.214	0.159
- Natural Gas (MT/MT)	0.000	0.000
3. Consumption per MT of Production : PTA		
(i) Actual Production ('000MTs)	555	431
(ii) Consumption per MT of Product		
- Electricity (KWH/MT)	404.964	466.098
- Liquid Fuel (MT/MT)	0.180	0.240
- Fuel Gas/LDO/Coke(MT/MT)	0.220	0.208
- Natural Gas (MT/MT)	0.042	0.000
4. Consumption per MT of Production : PNCP		
(i) Actual Production ('000MTs)	984	497
(ii) Consumption per MT of Product		
- Electricity (KWH/MT)	989.102	1383.198
- Liquid Fuel (MT/MT)	0.001	0.340
- Fuel Gas/LDO/Coke(MT/MT)	0.272	0.000
- Natural Gas (MT/MT)	0.211	0.019
5. Consumption per MT of Total Production		
(i) Actual Production ('000 MTs)	51414	48292
(ii) Consumption per MT of Product		
- Electricity (KWH/MT)	97.918	89.466
- Liquid Fuel (MT/MT)	0.038	0.040
- Fuel Gas/LDO/Coke(MT/MT)	0.043	0.038
- Natural Gas (MT/MT)	0.016	0.017

FORM - 'B'

Form for Disclosure of Particulars with respect to Technology Absorption, Research & Development

1. Specific areas in which R&D carried out by the Company

- (a) Development of Refinery process technologies
- (b) Catalysts development for refining processes
- (c) Refinery Process Modeling
- (d) Trouble shooting, revamp and optimization in refineries
- (e) Material Failure Analyses, Corrosion and remaining life assessment
- (f) Development of Intelligent and Caliper pigs for monitoring health of crude oil and petroleum product pipelines.
- (g) Product development - Lubricant, Greases and Specialties
- (h) Boundary Lubrication and Metal Working Tribology
- (i) Specialty bituminous products
- (j) Development of Fuel additives
- (k) Fuel and Emission Studies
- (l) Alternative fuels -Hydrogen-CNG, bio-diesel, 2nd & 3rd Generation bio-fuels, Solar Energy
- (m) Biotechnology
- (n) Nanotechnology
- (o) Petrochemicals & Polymers

2. Benefits derived as a result of above R&D:

- R&D Centre of IndianOil along with Engineers India Ltd. licensed and commercialized a grass-root 1.2 MMTPA DHDT (Diesel Hydro treating) unit to Bongaigaon Refinery for producing diesel.
- R&D Centre of IndianOil jointly with Engineers India Ltd. provided the technology know-how, for retrofitting existing Xylene Isomerization unit of Bongaigaon Refinery to Light Naphtha Isomerization unit (0.154 MMTPA) for producing Euro-III/ IV Motor Spirit (MS).
- An innovative process for production of PAH (poly aromatic hydrocarbons) free rubber process oil without use of hydrogen developed.
- Demonstration run of IndianOil DHDS catalyst, INDICAT-DH-IV was completed at CPCL in Dec, 2011.
- An innovative process without use of hydrogen, for production of PAH free rubber process oil developed.
- A new Ni-Mo DHDT catalyst and high active Co-Mo DHDS catalyst developed for producing 10 ppm sulfur in diesel.
- A naphtha hydro treating catalyst based on Co-Mo system comparable in performance to commercial catalyst developed.
- In-house developed i-MAX Premium additive (for maximization of LPG/propylene yield in RFCC units) selected against global tender for Panipat refinery.
- Residue Upgradation Additive (RUA) for upgrading bottoms of heavier hydrocarbons developed.

- A Fischer Tropsch catalyst developed for higher once - through conversion (95%) with maximization of diesel.
- 800 MT of premium grade Calcined Needle Coke produced at Bongaigaon Refinery with R&D developed technology.
- A novel laboratory model of an advanced Ultrasonic and Eddy Current based NDT tool developed along with IIT, Madras for detecting defects in Hydrogen Reformer Tubes.
- An improved RLA methodology developed for hydrogen reformer tubes using extensive creep data generated in-house with state of the art creep testing facilities.
- R&D Centre developed Magnetic Flux Leakage (MFL) based intelligent pigs (IPIG) and caliper pigs (CPIG) of 12" & 14" sizes utilized for inspection of 528 Kms. of pipelines during this year.
- For the first time, the 12" tool has been put to use in the evaluation of HPCL's lube oil pipelines at Mumbai with successful detection of metal loss defects.
- Data Acquisition Module of the intelligent PIG has been redesigned and fabricated with advanced electronic system.
- During the year, R&D developed 154 lubricant formulations and received 63 Original equipment/Customer/defence approvals and re-certifications.
- As serving the defence sector is the basic tenet of our lubricant technology area, this year has seen the completion of development of synthetic aviation lubricants using synthetic base oils developed by IICT, Hyderabad. Provisional clearance was accorded by CEMILAC, Bangalore for utilization of these oils in the Military Aircraft based on satisfactory performance in bearing test rig at NAL, Bangalore and engine tests at HAL, Bangalore.
- R&D Centre developed Servo RR 606MGPLUS[II] with Group II base stocks, was approved by M/s Dalian Locomotives, China.
- In a first ever overseas business gain for indigenously developed Servo Marine grades, Mauritius Shipping Corporation adopted these grades after extensive evaluation and commercial orders were received for two years.
- A component based gas engine oil, *SERVO* Green Edge, developed and after presenting product credentials to the leading gas engine OE-Wartsila, Finland, the letter of support for field trial was issued.
- *SERVO* Pride Max meeting the highest level of diesel lubricant specification API CJ-4 earned its first OEM approval from KAMAZ Vectra, the largest automobile corporation of the Russian Federation.
- New generation gas turbine oil, Servoprime 32GR, approved for commercial supply to M/s Reliance Infrastructure Limited.
- Food grade industrial gear oils `Servomesh FG 68 & Servomesh FG 100' developed and were listed in the white book of National Sanitation Foundation (NSF), USA. Similarly, Servogrease FG-2 - an Al -Complex Grease with synthetic base oil and food grade additives was approved by Global Green Co., Bangalore for bottle filling of cover liquid machines.



- Uttaranchal State Organic Certification Agency (USOCA) and Institute of Market Ecology (IMO) extended their approval for Servo Agro Spray oils for organic farming, after auditing the field performance.
- A new formulation of diesel MFA with combustion improver, Servo DMFA (ME) was evaluated in pipeline main engines and fuel savings ranging from 1% to 7% were demonstrated.
- Toxicological studies of R&D developed marker system carried out and found to be toxicologically safe for use in PDS kerosene.
- Under MNRE funded project on "Use of hydrogen (up to 30%) as fuel blended with compressed natural gas in internal combustion engine" vehicles were optimized for use of 18% HCNG in collaboration with 5 leading OEMs.
- A Photo Voltaic (PV) test bed comprising of multiple technologies in capacities of 10 KWp each totaling to 80 KWp has been set up at R&D Centre, which will help to evaluate & validate some of the promising & upcoming PV technologies.
- 15 Patents were filed which include 10 Indian, one US and one Chinese patent. Six patents were granted during the year.

3. Future Plans

- Development of long life, energy efficient cost effective lubricants for railways and other automotive and industrial sectors.
- Frontier areas of nano technology for novel lube and fuel additive development.
- Development of fuel saving and environment friendly additives for fuels.
- Development of bio-degradable and FDA compatible lubricants
- Production of 2nd/3rd Generation fuels
- Setting up of state of the art automotive research laboratory with test benches.
- Development of bio-jet fuel
- Technologies for reduction of GHG emissions
- Development of World Class research facilities for corrosion and failure analysis in refineries
- Co-processing of non-edible oils with refinery streams
- Gasification of pet coke / coal / residue / biomass
- New polymer grade development
- Setting up demonstration units for catalysts production
- Development of novel composites and engineering polymers
- Fuel Cells testing and research
- Solar Energy applications and product development

4. Expenditure on R&D

(a) Capital	:	₹ 56.11 crore
(b) Revenue	:	₹ 125.51 crore
(c) Total	:	₹ 181.62 crore

TECHNOLOGY ABSORPTION, ADAPTATION AND INNOVATION

1. EFFORTS MADE TOWARDS TECHNOLOGY ABSORPTION, ADAPTATION AND INNOVATION

With a view to further improve the product pattern & product quality as well as to meet the environmental emission norms, Indian Oil has adopted most modern technologies in line with the latest developments worldwide. Major steps taken in this regard are given below:

A. Imported Technology

i. Hydrocracker Technology

The first Hydrocracker of the country was commissioned at Gujarat Refinery in 1994, adopting technology from M/s Chevron, USA for conversion of Vacuum Gas Oil to Jet Fuel, Kerosene and Diesel. Thereafter, a new Hydrocracking Unit with the technologies from M/s UOP, USA has been commissioned at Panipat under expansion of refinery from 6.0 to 12.0 MMTPA.

ii. Once through Hydrocracking Technology

Once Through Hydrocracking Units (OHCU) were commissioned at Panipat, Mathura and Haldia refineries with the technologies from M/s.UOP, USA, M/s.Chevron, USA and M/s Axens, France respectively for improvement of distillate yield and diesel quality with respect to Sulphur and Cetane Number..

iii. Diesel Hydro-Desulphurisation Technology

Diesel Hydro Desulphurisation Units have been commissioned at Mathura & Panipat refineries with technology from M/s IFP, France and at Gujarat & Haldia refineries with technology from M/s UOP, USA to meet the Diesel quality requirement w.r.t Sulphur.

iv. Diesel Hydrotreatment Technology

Diesel Hydrotreatment Units have been commissioned at Guwahati, Barauni & Digboi refineries with the technology from M/s UOP, USA and at Mathura and Panipat refineries with technology of M/s Axens, France to meet the Diesel quality requirement w.r.t Sulphur and Cetane No. In addition, technology from M/s Axens has been implemented at Gujarat Refinery under Resid Upgradation Project and technology from M/s Shell Global Solutions, Netherlands has been selected for implementation at Paradip Refinery Project.

v. Fluidised Catalytic Cracking Technology

Fluidised Catalytic Cracking (FCC) technology from M/s UOP, USA has been implemented in Gujarat and Mathura refineries for conversion of Vacuum Gas Oil to LPG, MS and Diesel. Technology from M/s ABB Lummus, USA is under implementation for revamp of FCCU at Mathura Refinery for reliability improvement and maximization of value added Propylene.

vi. Resid Fluidised Catalytic Cracking Technology

The Resid Fluidized catalytic cracking (RFCC) technology from M/s S&W, USA has been successfully implemented at Panipat, Haldia and Barauni Refineries.

vii. Catalytic Iso-Dewaxing Unit at Haldia Refinery

For improving the lube oil quality in line with international standards and augmenting production capability, Iso-dewaxing technology from M/s MOBIL, USA has been implemented at Haldia refinery.

viii. Solvent Dewaxing/Deoiling Technology at Digboi

In order to upgrade the process for production of Paraffin Wax at Digboi Refinery, Solvent dewaxing/deoiling technology from M/s UOP, USA has been implemented.

ix. Hydrofinishing Technology for treatment of Paraffin Wax/ Microcrystalline Wax

Process technology from M/s. IFP, France for hydro finishing of paraffin wax has been implemented at Digboi refinery. The same technology from M/s IFP, France for production of Microcrystalline Wax has been implemented at Haldia Refinery.

x. Biturox Technology

To produce various grades of Bitumen as well as to meet the quality requirements, Biturox technology from M/s Porner, Austria has been employed at Gujarat and Mathura Refineries.

xi. Hydrogen Generation Technology

Hydrogen generation technology from M/s Linde, Germany was adopted in 1993 for Hydrogen production and supply to Hydrocracker unit at Gujarat Refinery and has been implemented at Barauni Refinery under MS Quality Improvement Project. Hydrogen generation technology from M/s. Haldor Topsoe, Denmark is in operation at Gujarat, Mathura, Haldia, Panipat and Barauni refineries and has been implemented at Gujarat Refinery under Resid Upgradation Project. Technology from M/s UHDE, Germany has been selected through BOO operator M/s Prax Air, USA at Paradip Refinery Project. Similar technology from M/s KTI, the Netherlands has been implemented for Hydrogen generation at Guwahati, Digboi, and Mathura refineries and has been commissioned at Haldia Refinery under Once through HydroCracker Project. Hydrogen generation technology from M/s Technip Benelux B.V, Netherlands has been implemented at Bongaigaon Refinery under Diesel Quality improvement project.

xii. Sulphur Recovery Technologies for reduction of SO₂ emissions

Refineries at Gujarat, Haldia, Mathura and Barauni are provided with Sulphur Recovery Technology from M/s. Stork Comprimo (now Jacob), the Netherlands. The Sulphur recovery technology from M/S Delta Hudson, Canada has been employed at Panipat Refinery. Further, Sulphur recovery technologies from M/s.B & V Pritchard, USA has been implemented at Panipat Refinery Expansion Project and has been implemented at Gujarat Refinery under Resid Upgradation Project and the same has also been selected for Paradip Refinery Project. Technology from M/s Technip, KTI, Spain has been implemented at Haldia Refinery under Once through Hydrocracker Project. Technology from M/s Jacobs, Netherlands is under implementation in additional Sulphur Recovery Unit at Mathura Refinery. Technology from M/s.Lurgi, Germany has been selected for Distillate Yield improvement (Coker) project at Haldia Refinery.

xiii. ISOSIV Technology at Guwahati Refinery

For production of unleaded MS at Guwahati Refinery, ISOSIV technology from M/s UOP, USA has been implemented.

xiv. Delayed Coker Technology

For bottom of the barrel upgradation, Coker technology from M/s ABB Lummus, USA has been implemented at Panipat Refinery as

part of Panipat Refinery Expansion Project. Coker Technology from M/s.Foster Wheeler, USA has also been implemented at Gujarat Refinery under Resid Upgradation Project and selected for Paradip Refinery Project as well as at Haldia Refinery under Distillate Yield improvement project.

xv. VGO Hydrotreatment Technology

Technology from M/s.UOP, USA has been implemented at Gujarat Refinery under Resid Upgradation Project. Technology from M/s Axens, France has been selected for Paradip Refinery.

xvi. Continuous Catalytic Reforming Technology

For improvement in Octane number of Motor Spirit, Continuous Catalytic reforming technology from M/s IFP, France has been implemented at Mathura & Panipat refineries. Technology from M/s UOP, USA has been implemented at Gujarat Refinery under MS Quality Upgradation Project and has also been selected for implementation at Paradip Refinery Project.

xvii. Technology for Para -Xylene

For production of Para-Xylene at Panipat, technologies from M/s UOP, USA have been implemented and same have been selected for Paradip Refinery Project.

xviii. Technology for Purified Terephthalic Acid (PTA)

For production of PTA at Panipat Refinery, technology from M/s Du Pont, USA has been implemented.

xix. Technology for Linear Alkyl Benzene (LAB)

Technology from M/s UOP, USA has been implemented for production of Linear Alkyl Benzene at Gujarat Refinery.

xx. MS Quality Upgradation Technology

For MS quality upgradation, Isomerisation technology of M/s UOP, USA have been implemented at Mathura , Panipat and Gujarat Refineries. Technology from M/s Axens, France has been implemented at Haldia, Guwahati, Digboi and Barauni refineries.

FCC Gasoline desulphurization technology (Prime-G) from M/s Axens, France has been employed at Haldia, Mathura, Panipat and Barauni Refineries.

xxi. Naphtha Cracker Technology

Naphtha Cracker Technology from M/s.ABB Lummus, USA has been deployed at Panipat Refinery. Technologies from M/s.Basell, Italy, M/s.Basell, Germany, M/s.Nova Chemicals, Canada & Scientific Design, USA have been implemented for various downstream polymer plants viz. Poly-Propylene (PP) Unit, HDPE unit, Swing Unit (HDPE/LLDPE) and MEG Unit respectively.

Technology from M/s Basell, Italy has been selected at Paradip Refinery Project for production of Poly-Propylene (PP).

xxii. Alkylation Technology

For production of MS, Alkylation technology from M/s Exxon Mobil, USA has been selected for implementation at Paradip Refinery Project.

xxiii. Regenerative type Flue Gas De-Sulphurisation Technology

In order to recover Sulphur Di-Oxide from Boiler flue gases a



Regenerative type Flue gas De-Sulphurisation technology from M/s Cansolv Technology Incorporate (CTI), Canada, has been selected for implementation at Paradip Refinery Project.

xxiv. Spent Acid Regeneration Technology

In order to regenerate fresh sulphuric acid from spent sulphuric acid recovered from Alkylation Unit a Spent Acid Regeneration technology from M/s MECS, USA has been selected for implementation at Paradip Refinery Project.

xxv. ATF Treatment Technology

ATF Treatment Technology from M/s UOP, USA has been implemented at Gujarat Refinery. Technology from M/s Merichem, USA has been selected for Paradip Refinery Project.

xxvi. LPG Treatment Technology

Coker LPG Treatment technology from M/s UOP, USA has been selected for implementation at Haldia Refinery under the distillate yield improvement (Coker) project.

xxvii. Coker Gas Oil Hydrotreatment Technology

Coker Gas Oil Hydrotreatment Technology from M/s Axens, France has been selected for implementation at Haldia Refinery under the distillate yield improvement (Coker) project.

xxviii. MTBE Technology

Technology from M/s CD Tech, USA has been commissioned for production of MTBE at Gujarat Refinery.

xxix. Butene-1 Technology

For production of Butene-1, Technology from M/s Axens, France has been implemented at Gujarat Refinery and has been selected for implementation at Panipat Refinery.

xxx. Sulphur Pelletization Technology

For production of Sulphur in Pellet form, Technology from M/s Sandvik, Germany has been implemented at Gujarat Refinery and has been selected for implementation at Mathura and Panipat Refineries.

B. Indigenous Technology

i. INDMAX Technology

INDMAX technology developed in-house by R&D Centre of IndianOil for converting heavy distillate and residue into LPG/light distillate products has been implemented successfully at Guwahati Refinery and has been selected for implementation at Bongaigaon Refinery. For production of petro-chemical feedstocks viz. Ethylene, Propylene from VGO, INDMAX technology has been selected for implementation at Paradip Refinery Project.

ii. Hexane Hydrogenation Technology

Hexane Hydrogenation process for production of Food grade Hexane (WHO grade quality), developed by R&D Centre of IndianOil with indigenous catalyst has been successfully implemented at Gujarat Refinery.

iii. Diesel Hydrotreatment Technology

Diesel Hydrotreatment technology developed by R&D Centre of

IndianOil and licensed jointly with EIL has been implemented at Bongaigaon Refinery for meeting Diesel quality requirements.

iv. Isomerisation Technology

Isomerisation Technology developed by R&D Centre of IndianOil and licensed jointly with EIL has been implemented at Bongaigaon Refinery for meeting MS quality requirements.

v. INDA DEPT® Technology

INDA DEPT® Technology developed by R&D Centre of IndianOil has been selected for implementation at Guwahati Refinery.

MODERNISATION OF INSTRUMENTATION & CONTROL

DISTRIBUTED DIGITAL CONTROL SYSTEM (DDCS)

DDCS has already been implemented and commissioned in all Process Units and Captive Power Plants of all Refineries. All the new units already commissioned have been provided with DDCS and all those planned in future will be provided with DDCS.

ADVANCED PROCESS CONTROL (APC)

Model based Multi-variable Predictive Advanced Process Control Systems (APC) have been implemented in the various units of the Refineries.

A New Key Performance Index (KPI) based Methodology of APC Benefit assessment based on controller-wise, variable-wise on-stream factors and average values of controlled variables was devised jointly by IOCL and M/s HAIL. Accordingly, KPI based templates have been developed for all existing APC controllers across IOCL and are being used for monitoring realistic APC benefit on regular basis.

OFFSITE MODERNIZATION

As a part of modernization of Oil Movement & Storage (OM&S) facilities the following have already been implemented:

- Automation of Tank Wagon loading at Barauni, Gujarat, Mathura and Haldia Refineries.
- Automation of Tank Truck Loading at Gujarat & Haldia Refineries.
- Blending Automation at Haldia, Mathura, Barauni and Panipat Refineries.
- Auto Tank gauging has been completed at all refineries.

AUTOMATION OF LABORATORIES

Automation of Laboratories has been completed at all refineries.

Networking & Real Time Data Base Management System (RTDBMS)

- Networking of units and offsite facilities has been completed at all refineries.
- RTDBMS has been implemented at all refineries and are in operation.
- DRYA (Data Reconciliation and Yield Accounting Package), implemented in all refineries for working out accurate Daily Production Balance using real time process data.
- PS (Production Scheduling) implemented at Gujarat and Panipat Refineries.
- For the addition of new units installed at refineries as a part of revamp/ fuel quality improvement in DRYA/ PS, job is under progress.

SC/ST/OBC REPORT-I

Annual Statement showing the representation of SCs, STs and OBCs as on 1st January 2012 and number of appointments made during the preceding calendar year

Name of the Public Enterprises:

Indian Oil Corporation Ltd.

Groups	Representation of SCs/STs/OBCs (As on 1.1.2012)				Number of appointments made during the calendar year 2011									
	Total No. of employees	SCs	STs	OBCs	By Direct Recruitment				By Promotion			By Deputation/Absorption		
Total					SCs	STs	OBCs	Total	SCs	STs	Total	SCs	STs	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	15007	2461	1022	1604	747	124	47	211	202	41	14	0	0	0
B	6500	1072	568	120	No recruitment is made in this Group.				532	99	47	0	0	0
C	12597	2597	990	1570	429	69	22	119	1508	304	106	8	2	1
D (Excluding Sweeper)	391	80	34	103	198	32	13	43	0	0	0	0	0	0
D (Sweeper)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	34495	6210	2614	3397	1374	225	82	373	2242	444	167	8	2	1

SC/ST/OBC REPORT-II

Annual Statement showing the representation of SCs, STs and OBCs in various group A services as on 1st January 2012 and number of appointments made in the service in various grades in the preceding calendar year

Name of the Public Enterprises:

Indian Oil Corporation Ltd.

Pay Scale (In Rupees)	Representation of SCs/STs/OBCs (As on 1.1.2012)				Number of appointments made during the calendar year 2011									
	Total No. of Employees	SCs	STs	OBCs	By Direct Recruitment				By Promotion			By Deputation/Absorption		
Total					SCs	STs	OBCs	Total	SCs	STs	Total	SCs	STs	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
24900-50500	4342	658	285	805	747	124	47	211	202	41	14	0	0	0
27600-50500	2876	477	220	409	1	0	0	0	768	133	63	0	0	0
32900-58000	2864	509	185	276	No recruitment is made in this Group.				470	66	24	0	0	0
36600-62000	1712	342	153	100	No recruitment is made in this Group.				371	77	30	2	1	0
43200-66000	1297	260	112	3	No recruitment is made in this Group.				254	58	21	1	1	0
51300-73000	1217	165	60	7	No recruitment is made in this Group.				206	34	19	0	0	0
51300-73000	478	40	6	3	No recruitment is made in this Group.				70	9	0	1	0	0
51300-73000	157	7	1	1	No recruitment is made in this Group.				45	1	1	1	0	0
62000-80000	64	3	0	0	No recruitment is made in this Group.				23	1	0	0	0	0
G.Total	15007	2461	1022	1604	748	124	47	211	2409	420	172	5	2	0