SUBMITTED BY

RELIANCE INDUSTRIES LIMITED

NAGOTHANE MANUFACTURING DIVISION

NAGOTHANE-402125
MAHARASHTRA STATE
INDIA

Unit Profile

Indian Petrochemicals Corporation Limited was incorporated in March, 1969 by the Government of India. IPCL's first Baroda based Aromatics complex was commissioned in 1973. With the discovery of Bombay High reserves in the seventies, a new petrochemical complex, based on associated gases from Bombay High, was conceived in the eighties, and the complex at Nagothane, Maharashtra was commissioned in 1989. This complex produces commodity plastics like PP, LDPE, LLDPE and HDPE and fiber intermediates like ethylene oxide and ethylene glycol. It is also involved in sales of surplus ethylene and propylene feedstock. RIL-NMD also has a fully integrated offsite and utility supply facility that includes a gas turbine based Captive Power Plant with an installed capacity of 85 MW.

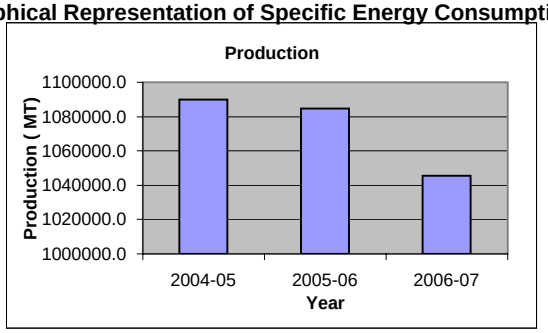
(ii) **Energy Consumption**

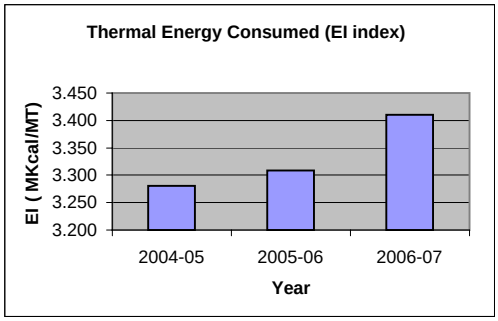
The annual energy consumption of IPCL-NC for the year 2006-2007 stands at 3565872 Mkcal, with an average hourly consumption of 407 Mkcal/hr @ Rs 1005 per Mkcal.The presence of commodity plastics manufacturing facili makes this complex a primarily electrical power consumer and the heat:power ratio of the complex is currently 1.13 MKcal/KWH.

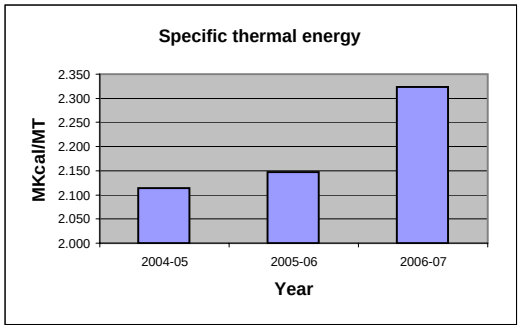
Specific consumption detail:

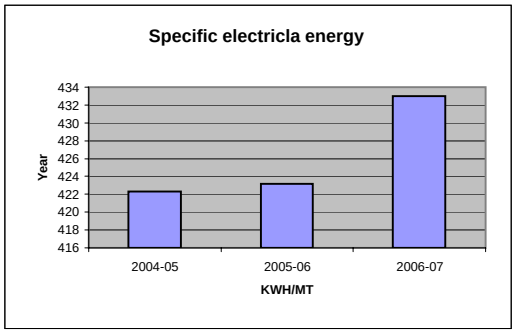
Year	Production	Electricity consumed by the product	Thermal Energy Consumed (EI index)	Overall specific consumption	Specific thermal energy	Specific electricla energy
Unit	**MT**	**Lakhs KWH**	**Mkcal**	**Mkcal/MT**	**Mkcal/MT**	**KWH/MT**
2004-05	1089813.4	4602.438	2304115	3.281	2.114	422.3143271
2005-06	1084772.1	4590.433	2328974	3.309	2.147	423.1702589
2006-07	1045642.0	4527.916	2430038	3.410	2.324	433.0273758

Graphical Representation of Specific Energy Consumption









Energy Conservation Achievements:

IPCL-NC was awarded the first prize in petrochemicals sector during National Energy Conservation Award for 1997 and also in 1998. In the year 1999 it was awarded the Certificate of Merit. IPCL-NC also was awarded GAIL's 'ENCON Award for efficient use of Natural gas.

(iii) **Energy Conservation Commitment, Policy and Organizational Set up**
(Please include a photo copy of unit's Energy Conservation Policy, if decided)
The Energy conservation Policy of RIL is attached)

Reliance Industries Limited
Energy Management Policy

Reliance Industries Limited plays a leading role in the national and global economy by providing quality goods and services in the materials and energy value chain.

Our Mission is:

- To become the lowest specific energy consumer in the industry.
- To widen our options for energy sources and
- To minimize the adverse impact of our operations on the environment.

We plan to achieve the above within the framework of sustaining the business by:

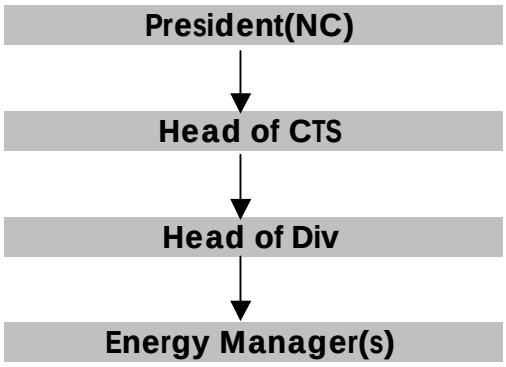
- Integrating energy management with the business management and establishing performance driven goals.
- Upgrading hardware, deploying new technologies and improving our practices to increase energy efficiency, reduce greenhouse gas emissions and minimize environmental impacts.
- Supporting scientific research and technological efforts to deliver new sources of energy including renewable and alternate fuels.
- Carrying out regular audits and training employees to promote energy conservation as a culture across the entire business functions.
- Continuously benchmarking our energy efficiency and energy productivity against others.
- Promoting awareness on energy conservation among all members of the Reliance family and the community at large.

Mukesh D Ambani
March 2007

Energy Conservation Cell set up at IPCL, Nagothane was initiated quite early after commissioning and stabilisaiton of the Cracker and few downstream plants, the Cell has been playing a very vital role for the organization. The Cell is headed by General Mgr. (Central Technical Services) and assisted by a team comprising of Manager.(Central Technical Services) for carrying out various activities of the Cell. The group works in tandem with all the nominated Energy Coordinator of all the plants for Monitoring, Motivating and Implementation of the various schemes in the Complex. It is Committed to saving Energy through de-bottlenecking, technology upgradation, detailed audit studies by Experts and in-house, Optimising of Energy inputs by consuming plants and Utilities Generators and upkeep through better and proactive Maintenance practices. The Organogram of our Complex with respect to Energy Conservation Cell is as under :

ORGANISATION STRUCTURE

IPCL-NC



(iv) **Energy Conservation Achievements**

IPCL-NC was awarded the first prize in petrochemicals sector during National Energy Conservation Award for 1997 and also in 1998. In the year 1999 it was awarded the Certificate of Merit. IPCL-NC also was awarded GAIL's 'ENCON Award for efficient use of Natural Gas' for the period April'02-Mar'03.

IPCL, Nagothane has implemented various schemes big and small, some of them quite innovative and thereby had been successful every year in reducing the Specific Energy Consumption. The year 2006-07 had been quite successful on Energy front. Revenue Saving due to various measures carried out during the year is **Rs. 78** Lakhs.

Major Energy Conservation Projects implemented during the 2006-07 are as under :

1. Aerator stoppage in IWWTP during Monsoon period.

In IWWTP Plant BOD in the effluent water is reduced in aeration tank by aerobic digestion. Aeration tank has two compartments each of 5125 M3 capacity. There are six aerators in each compartment. Each aerator consumes 40 HP of electricity.

Aeration tank is designed for 410 M3/hr of water flow and 2500 Kg/Day of BOD load. Actual flow rate of water flow rate as well as BOD load in non-monsoon season remains much less than the design value.

One compartment of the aeration tank was already taken out of operation during non-monsoon period.

Proposal:

Six number of aerators (3 aerator from each compartment) of the aeration tank was taken out of operation during monsoon period.

Impact of implementation

Energy saving

Stopping 6 aerators will result in 180 KW saving of power. Considering monsoon period of five months and price of electricity at Rs 2.3 per KWH, this will result in saving **of Rs 14.9** lakhs **per annum**

2. Insulation revamp in furnace(1 No.)(H-12)

In Gas cracker plant , the furnaces have Each ultra selective furnace consists of two parts. The bottom radiant section uses radiant heat obtained from fuel combustion and has coils through which the hydrocarbon being cracked flows. The top convection section recovers the heat in the flue gas leaving the radiant section. The radiant box of the furnace is insulated to avoid the heat loss though radiant walls. The furnaces are under operation since last 15 years and the insulation condition has deteriorated over a period of time resulting into the higher heat loss through radiant box resulting in the higher cold face temperature.

Proposal
Based on higher heat loss and the condition of furnace insulation, it was recommended to replace the insulation of furnace H-12.

Impact of implementation
Annual Saving: 5538 MMKCAL

Annual Saving : Rs. 48 Lakhs

3. The stoppage of 6 aerator in TIWWTP in non-monsoon period.

In TWWTP Plant BOD in the effluent water is reduced in aeration tank by aerobic digestion. Aeration tank has two compartments . There are six aerators in each compartment. Each aerator consumes 6 HP of electricity.

Proposal:
One compartment of the aeration tank was taken out of operation during non-monsoon period.
Impact of implementation
Energy saving

Stopping 6 aerators will result in 27 KW saving of power. Considering non-monsoon period of 8 months and price of electricity at Rs 2.3 per KWH, this will result in saving **of Rs 3.6** lakhs **per annum**

4. Installation of high efficiency aerofile FRP fan in one cooling tower cell of cooling tower -02.

The two seven-cell cooling towers at IPCL-NC employ hollow bladed FRP fans of 10 m diameter powered by 75 KW motors. These fans are designed to deliver air at the rate of 38242.5 cum per min. running continuously throughout the year. A measurement of current consumption showed that the fan motors consume 49 KW to 52 KW power (85A to 90A against a full load rated current of 130A), meaning that the fans are loaded only 65-70%. In addition to this, all the fans are required to run continuously to deliver the required supply temperature of cooling water. This results not only in a time crunch for preventive maintenance, but also results in higher power consumption and loss in operating efficiency

Proposal:
As an energy saving measure, it was planned to replace existing metallic blade fan no. 4 of CT 2 by aerofoil design high efficiency FRP hollow blade fans.

Impact of implementation

Energy saving

The replacement of ID fan no. 04 will result in 15 KW saving of power with annual saving of 3 Lakhs.
.

6. Replacement of Asbestos sheet with translucent acrylic sheet.
Replacement of Asbestos sheet with translucent acrylic sheets in Product warehouse and Central workshop

Impact of implementation
Annual Saving: 2.05 Lakhs KWH
Annual Saving : Rs. 4.7 Lakhs

7. Control room lighting revamp.

Earlier there were 112 numbers 2 X 40 W tube light fixtures were installed in the control room. Still the illumination level at the required task was not comfortable because of following reason.

1. More than 15 years old fixtures.
2. Louvers were discolored, absorbing majority of the lights.
3. Power consumption was very high due to conventional ballast.
4. Failure rate was high due to aged fixture wiring and unplanned replacement philosophy.
5. Satisfaction level regarding the lighting of the control room engineers was very low.

EO/EG control room revamping was planned and it was great opportunity to revamp lighting system with new lighting concept. It was planned to have following features while designing the lighting system

1. Lighting is to be done with Existing false ceiling.
2. Lighting fixtures shall be surface mounted type without damaging false ceiling.
3. Innovative design of lighting system shall be there so that control room get up will enhance.
4. Latest trends in the lighting system shall be used.
5. The lighting system shall be such that it should have capability control the light output without develo
6. Lighting system shall be such that it shall be able to control from shift in charge location.
7. There shall not be any glares on the computer screen.

Various options were thought of, to meet the above requirements and Finally Modular Grid type lightin

Impact of implementation

Annual Saving: 0.75 Lakhs KWH

Annual Saving : Rs. 1.8 Lakhs

8. Replacement of conventional ballast with Electromagnetic ballast.

Replacement of conventional ballast with Electromagnetic ballast in PP service building.

Impact of implementation

Annual Saving: 0.85 Lakhs KWH

Annual Saving : Rs. 1.03 Lakhs

(v) **Energy Conservation Plans and Targets**

RIL-NMD has a few ENCON schemes and operational practices planned for the current year. A programme has been launched to replace normal TFL fixtures with energy efficient CFL lighting and replacements have already been effected in cable tunnels of the complex.
The Energy audit by external agency is planned in year 2007-08.
Major future plans for energy conservation are as under :

1. High efficiency FRP fan for Cooling tower (CT-01 & CT-02)
2. The GC furnace ID fan replacement (3.Nos)
3. Corrocated Coating of cooling water circulation pump of both cooling tower (CT-01 & CT-02)
4. Insulation revamp of one number GC furnace (H-14)
5. Installation of solar water heating system in Hostel, Guest house and central kitchen.

(vi) **Environment and Safety**

RIL-NMD firmly believes in the concept of sustainable development and through capacity based planning process and using innovative technologies for enhanced material and energy efficiency of production and consumption. There is separate department that oversees all matters pertaining to health, safety and environment and our complex at Nagothane, inclusive of Township and medical facilities is ISO 14000 certified. the following programs are pursued at all the manufaturing sites for enhancing safety at the workplace.
1. Comprehensive internal and external audting system involving national and international safety councils and external audting organisations.
2.Safety induction training to all contractors' worker at sites.
3.Frequent emergency mock drills.
4.Safety quiz competitions week celebration to create safety awareness among employees.
5.Well-definded team-safety performance appraisal targets.
6.Monthly inter-site safety bechmarking.7.Risk assesment concept with all work permits.
7.Personal protective Equipment(PPE) compliance at work places.

21 Whether any dispute pertaining to statutory requirements of safety and pollution control is pending with any Government Agency. If Yes, give details:

There are no disputes pertaining to statutory requirements of safety and pollution control pending with any Government Agency.

Annexure 'B'

Energy Conservation Measure implemented in 2006-2007

(To be filled up separately for each Energy Conservation Measure)

ID to be filled by BEE	Title of the measure **Aerator stoppage in IWWTP during Monsoon period.**	Sector … **PETROCHEMICAL INDUSTRY**……
Year to be filled by BEE		Technology ……

Description of the energy conservation measure:-
In IWWTP Plant BOD in the effluent water is reduced in aeration tank by aerobic digestion. Aeration tank has two compartments each of 5125 M3 capacities. There are six aerators in each compartment. Each aerator consumes 40 HP of electricity. Aeration tank is designed for 410 M3/hr of water flow and 2500 Kg/Day of BOD load. Actual flow rate of water flow rate as well as BOD load in non-monsoon season remains much less than the design value. One compartment of the aeration tank was already taken out of operation during non-monsoon period.
Six number of aerators (3 aerator from each compartment) of the aeration tank was taken out of operation during monsoon period.

Picture/ sketch/ drawing before modification (if available)	**Picture/ sketch/ drawing after modification**
	

Agency that executed the project (with complete address and email): In House

Total investment, Rs.: Nil	Year of implementation: 2006-07
First year energy cost savings, Rs.: 14.9 lakhs	
First year other savings, Rs.:	

On annual basis	kWh 000'	Coal (Tons)	Gas Nm^3	Oil (kL)	Other
Energy consumption before	360				
Energy consumption after	180				
Energy tariff, Rs/ kWh/ Ton/ Nm^3/ kL …	2.3				

Company complete address: RELIANCE INDUSTRIES LIMITED –(NMD) P.O. PETROCHEMICALS TOWNSHIP NAGOTHANE, DIST RAIGAD, MAHARASHTRA PIN 402 125 Contact person who could be contacted for more information: SHRI RAMESH KASHIKAR	We authorise Bureau to use this information for dissemination Signature Date

Energy Conservation Measure implemented in 2006-2007

(To be filled up separately for each Energy Conservation Measure)

ID to be filled by BEE	Title of the measure **Insulation revamp in furnace(1 No.)(H-12)**	Sector … **PETROCHEMICAL INDUSTRY**……
Year to be filled by BEE		Technology ……

Description of the energy conservation measure:-
In Gas cracker plant , the furnaces have Each ultra selective furnace consists of two parts. The bottom radiant section uses radiant heat obtained from fuel combustion and has coils through which the hydrocarbon being cracked flows. The top convection section recovers the heat in the flue gas leaving the radiant section. The radiant box of the furnace is insulated to avoid the heat loss though radiant walls. The furnaces are under operation since last 15 years and the insulation condition has deteriorated over a period of time resulting into the higher heat loss through radiant box resulting in the higher cold face temperature.
Based on higher heat loss and the condition of furnace insulation, it was recommended to replace the insulation of furnace H-12.

Picture/ sketch/ drawing before modification (if available)	**Picture/ sketch/ drawing after modification**
	

Agency that executed the project (with complete address and email): In House

Total investment, Rs.: 167	Year of implementation: 2006-07

First year energy cost savings, Rs.: 48.73 lakhs

First year other savings, Rs.:

On annual basis	kWh 000’	Coal (Tons)	Gas Nm^3	Oil (kL)	Other
Energy consumption before			1020.2		
Energy consumption after			369		
Energy tariff, Rs/ kWh/ Ton/ Nm^3/ kL …					

Company complete address:

RELIANCE INDUSTRIES LIMITED –(NMD)
P.O. PETROCHEMICALS TOWNSHIP
NAGOTHANE, DIST RAIGAD, MAHARASHTRA
PIN 402 125

Contact person who could be contacted for more information:
SHRI RAMESH KASHIKAR

We authorise Bureau to use this information for dissemination

Signature

Date

Energy Conservation Measure implemented in 2006-2007

(To be filled up separately for each Energy Conservation Measure)

ID to be filled by BEE	Title of the measure **The stoppage of 6 aerator in TIWWTP in non-monsoon period.**	Sector … **PETROCHEMICAL INDUSTRY**……
Year to be filled by BEE		Technology ……

Description of the energy conservation measure:-
In TWWTP Plant BOD in the effluent water is reduced in aeration tank by aerobic digestion. Aeration tank has two compartments. There are six aerators in each compartment. Each aerator consumes 6 HP of electricity**.**
One compartment of the aeration tank was taken out of operation during non-monsoon period.

Picture/ sketch/ drawing before modification (if available)	**Picture/ sketch/ drawing after modification**

Agency that executed the project (with complete address and email): In House

Total investment, Rs.: Nil	Year of implementation: 2006-07

First year energy cost savings, Rs.: 3.6 lakhs

First year other savings, Rs.:

On annual basis	kWh 000'	Coal (Tons)	Gas Nm^3	Oil (kL)	Other
Energy consumption before	54				
Energy consumption after	27				
Energy tariff, Rs/ kWh/ Ton/ Nm^3/ kL …	2.3				

Company complete address: RELIANCE INDUSTRIES LIMITED –(NMD) P.O. PETROCHEMICALS TOWNSHIP NAGOTHANE, DIST RAIGAD, MAHARASHTRA PIN 402 125 Contact person who could be contacted for more information: SHRI RAMESH KASHIKAR	We authorise Bureau to use this information for dissemination Signature Date

Energy Conservation Measure implemented in 2006-2007

(To be filled up separately for each Energy Conservation Measure)

ID to be filled by BEE	Title of the measure **Installation of high efficiency aerofoil FRP fan in one cooling tower cell of cooling tower -02.**	Sector … **PETROCHEMICAL INDUSTRY**……
Year to be filled by BEE		Technology ……

Description of the energy conservation measure: -

The two seven-cell cooling towers at IPCL-NC employ hollow bladed FRP fans of 10 m diameter powered by 75 KW motors. These fans are designed to deliver air at the rate of 38242.5 cum per min. running continuously throughout the year. A measurement of current consumption showed that the fan motors consume 49 KW to 52 KW power (85A to 90A against a full load rated current of 130A), meaning that the fans are loaded only 65-70%. In addition to this, all the fans are required to run continuously to deliver the required supply temperature of cooling water. This results not only in a time crunch for preventive maintenance, but also results in higher power consumption and loss in operating efficiency.

As an energy saving measure, it was planned to replace existing metallic blade fan no. 4 of CT 2 by aerofoil design high efficiency FRP hollow blade fans. As an energy saving measure, it was planned to replace existing metallic blade fan no. 4 of CT 2 by aerofoil design high efficiency FRP hollow blade fans.

Picture/ sketch/ drawing before modification (if available)	**Picture/ sketch/ drawing after modification**
	

Agency that executed the project (with complete address and email): M/s Maya Fan

Total investment, Rs.: 3.3	Year of implementation: 2006-07

First year energy cost savings, Rs.: 3.6 lakhs

First year other savings, Rs.:

On annual basis	kWh 000’	Coal (Tons)	Gas Nm^3	Oil (kL)	Other
Energy consumption before	53				
Energy consumption after	38				
Energy tariff, Rs/ kWh/ Ton/ Nm^3/ kL …	2.3				

Company complete address: RELIANCE INDUSTRIES LIMITED –(NMD) P.O. PETROCHEMICALS TOWNSHIP NAGOTHANE, DIST RAIGAD, MAHARASHTRA PIN 402 125 Contact person who could be contacted for more information: SHRI RAMESH KASHIKAR	We authorise Bureau to use this information for dissemination Signature Date

Energy Conservation Measure implemented in 2006-2007

(To be filled up separately for each Energy Conservation Measure)

ID to be filled by BEE	Title of the measure **Replacement of Asbestos sheet with translucent acrylic sheet.**	Sector … **PETROCHEMICAL INDUSTRY**……
Year to be filled by BEE		Technology ……

Description of the energy conservation measure: -
Replacement of Asbestos sheet with translucent acrylic sheets in Product warehouse and Central workshop

Picture/ sketch/ drawing before modification (if available)	**Picture/ sketch/ drawing after modification**

Agency that executed the project (with complete address and email): In House

Total investment, Rs.: 6.87	Year of implementation: 2006-07

First year energy cost savings, Rs.: 4.87 lakhs

First year other savings, Rs.:

On annual basis	kWh 000'	Coal (Tons)	Gas Nm^3	Oil (kL)	Other
Energy consumption before					
Energy consumption after					
Energy tariff, Rs/ kWh/ Ton/ Nm^3/ kL …					

Company complete address: RELIANCE INDUSTRIES LIMITED –(NMD) P.O. PETROCHEMICALS TOWNSHIP NAGOTHANE, DIST RAIGAD, MAHARASHTRA PIN 402 125 Contact person who could be contacted for more information: SHRI RAMESH KASHIKAR	We authorise Bureau to use this information for dissemination Signature Date

Energy Conservation Measure implemented in 2006-2007

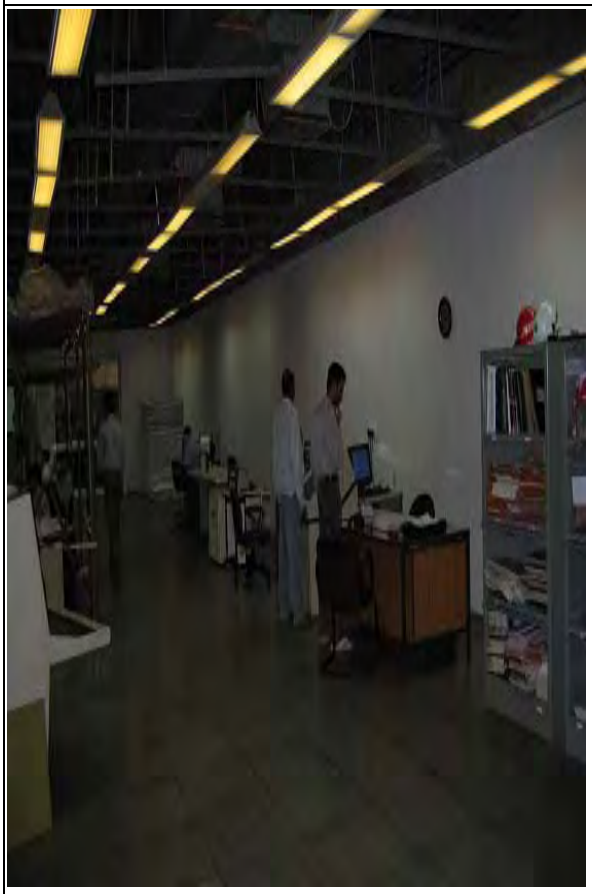
(To be filled up separately for each Energy Conservation Measure)

ID to be filled by BEE	Title of the measure **EO/EG control room lighting revamping.**	Sector … **PETROCHEMICAL INDUSTRY**……
Year to be filled by BEE		Technology ……

Description of the energy conservation measure: -
Earlier there were 112 numbers 2 X 40 W tube light fixtures were installed in the control room. Still the illumination level at the required task was not comfortable because of following reason.
1. More than 15 years old fixtures.
2. Louvers were discolored, absorbing majority of the lights.
3. Power consumption was very high due to conventional ballast.
4. Failure rate was high due to aged fixture wiring and unplanned replacement philosophy.
5. Satisfaction level regarding the lighting of the control room engineers was very low.

EO/EG control room revamping was planned and it was great opportunity to revamp lighting system with new lighting concept. It was planned to have following features while designing the lighting system
1. Lighting is to be done with Existing false ceiling.
2. Lighting fixtures shall be surface mounted type without damaging false ceiling.
3. Innovative design of lighting system shall be there so that control room get up will enhance.
4. Latest trends in the lighting system shall be used.
5. The lighting system shall be such that it should have capability control the light output without developing any dark patches.
6. Lighting system shall be such that it shall be able to control from shift in charge location.
7. There shall not be any glares on the computer screen.

Various options were thought of, to meet the above requirements and Finally Modular Grid type lighting system was designed. To have control on lighting output (variable from 150 Lux to 500 Lux) Ultra slim tube lights tri phosphor coating was finalized (T5) with dimmable ballast.

Picture/ sketch/ drawing before modification (if available)	**Picture/ sketch/ drawing after modification**
	

Agency that executed the project (with complete address and email): In House					
Total investment, Rs.: 7		Year of implementation: 2006-07			
First year energy cost savings, Rs.: 1.8 lakhs					
First year other savings, Rs.:					
On annual basis	kWh 000'	Coal (Tons)	Gas Nm^3	Oil (kL)	Other
Energy consumption before	10.75				
Energy consumption after	2.12				
Energy tariff, Rs/ kWh/ Ton/ Nm^3/ kL …	2.3				

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Energy Conservation Measure implemented in 2006-2007

(To be filled up separately for each Energy Conservation Measure)

ID to be filled by BEE	Title of the measure **Replacement of conventional ballast with Electromagnetic ballast in PP service building.**	Sector … **PETROCHEMICAL INDUSTRY**……
Year to be filled by BEE		Technology ……

Description of the energy conservation measure: -

Overall 760 tube lights were having conventional ballast and was consuming

	Fixture Type	No of tube lights	Energy consumption per annum in KWH
Before Revamping	2X36W – T12 type with conventional ballast fixtures	760	204624
After Revamping	2X36W – T12 type with electronic ballast fixtures	760	119364

Total energy saving with new lighting system is 85260 units per annum and total saving in rupees will be Rs.2 lacs per annum.

Picture/ sketch/ drawing before modification (if available)	**Picture/ sketch/ drawing after modification**

Agency that executed the project (with complete address and email): In House

Total investment, Rs.: 2.33	Year of implementation: 2006-07

First year energy cost savings, Rs.: 2.03 lakhs

First year other savings, Rs.:

On annual basis	kWh 000'	Coal (Tons)	Gas Nm^3	Oil (kL)	Other
Energy consumption before	23.6				
Energy consumption after	13.76				
Energy tariff, Rs/ kWh/ Ton/ Nm^3/ kL …	2.3				

Company complete address: RELIANCE INDUSTRIES LIMITED –(NMD) P.O. PETROCHEMICALS TOWNSHIP NAGOTHANE, DIST RAIGAD, MAHARASHTRA PIN 402 125 Contact person who could be contacted for more information: SHRI RAMESH KASHIKAR	We authorise Bureau to use this information for dissemination Signature Date