

## **Rashtriya Chemicals and Fertilisers Limited Thal Unit, Alibag, Raigad (Maharashtra)**

### **Unit Profile:**

Thal Unit of Rashtriya Chemicals & Fertilisers Ltd. (RCF) located about 100 KM south of Mumbai on the western coast of Raigad district, is a giant fertiliser unit..

The fertilizer plant comprises of two mixed feed (gas + naphtha) based ammonia plants of 1500 MTPD capacity each and 3 urea plants of 1725 MTPD each. *The unit has received ISO14001 certification in June 2001. We are certified with OHSAS 18001 (Occupational Health & Safety Assessment Series) from September 04.*

To take benefit of the market potential existing for industrial chemicals, a complete range of diverse value-added products are manufactured at Thal. The installed plants include 2500 T/year Dimethyl Formamide (DMF), 5000 T/year methylamine, 5000 T/year Dimethyl Acetamide (DMAC) and a Formic acid plant of 10000 T/year capacity. *We have received ISO-9001 in the year 1997 for our industrial chemicals manufacturing and despatches.*

We have commissioned a new Methyl Amine Plant in June.05 having installed capacity of 6400 MTPY.

In the year 2004-2005 we have exported DMF,DMAC & Formic Acid.

Also our unit is implementing an Argon recovery project from purge gas in Ammonia plant which is wealth from waste. The production of argon is expected by November 2006.



*The performance in the year 2004-2005 was so magnificent that all the previous production records have now become insignificant history. The dream figures of highest ever capacity utilisation of 106.94 % for Ammonia and 107.44 % for Urea plants with lowest ever specific energy consumption have been achieved.*

The annual turnover of the company (Trombay + Thal) was Rs.2840.44 Crores in the year 2004-05 which was the highest ever turnover achieved, registering a growth of 20.82 % over last years (2003-04) turnover of 2351.09 Crores.

## Energy Consumption:

In past 20 years of continuous operation, production & energy targets have been regularly met or exceeded. In the recent past new standards of production and efficiencies were set and record production figures were achieved. The performance record of Ammonia, Urea, and Chemical group of plants to date, together with efficiencies, reliability and length of continuous runs achieved, illustrates RCF's firm commitment to operational excellence since inception. These achievements, comparable to best in the country, have been accomplished without compromising safety or environmental standards.

The unit was adjudged as the " Best production Performance Fertiliser Unit in the country " by Fertiliser Association of India.

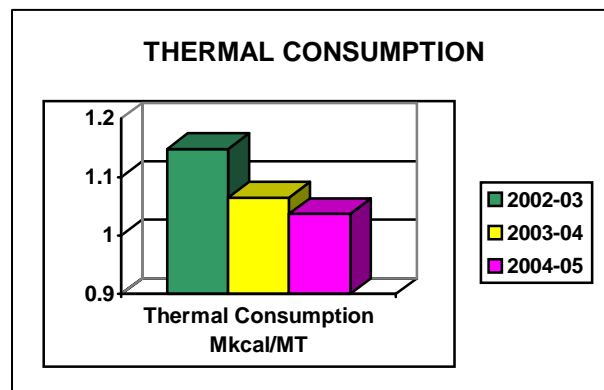
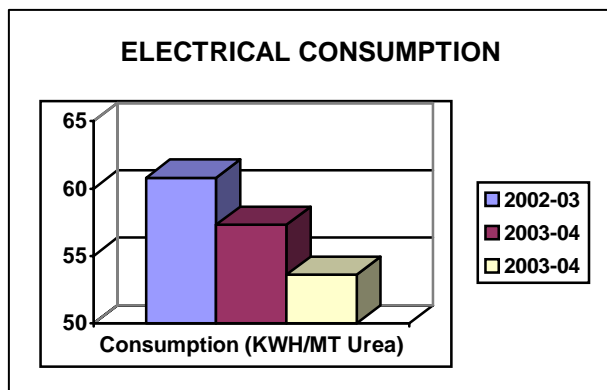
Specific Energy consumption of Ammonia has dropped to 9.132 Mkal/MT for the year 2004-2005 against 9.202 Mkal/MT for the year 2003-04. This has been possible due to maximisation of capacity utilisation and best co-ordination between operation and maintenance for increasing stream days. Highest ever stream days of 353.80 Days were achieved for ammonia plant in the year 2004-2005. Our one train of ammonia plant achieved stream days as high as 364.32 days. Also our Urea plants have achieved highest ever stream days of 340.06 Days.

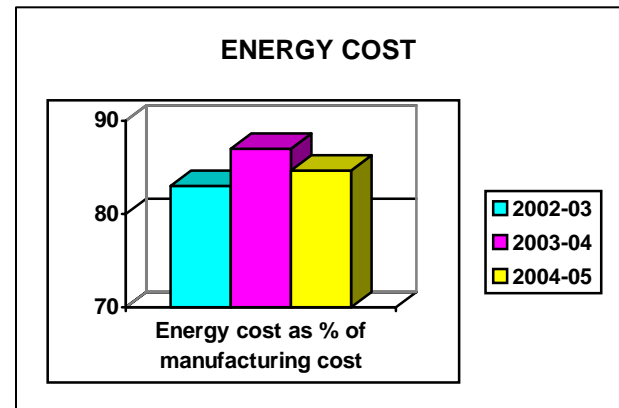
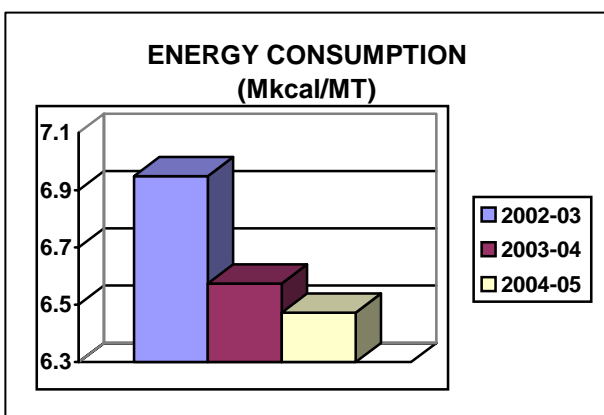
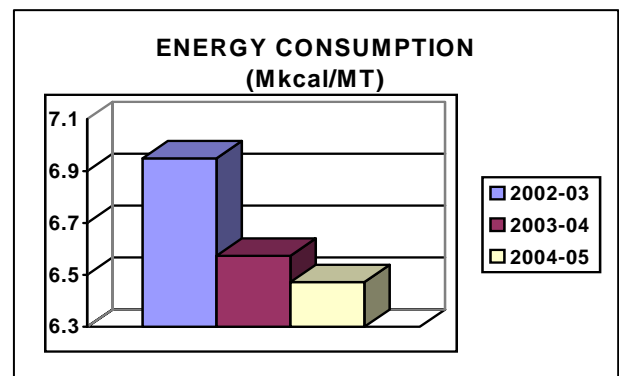
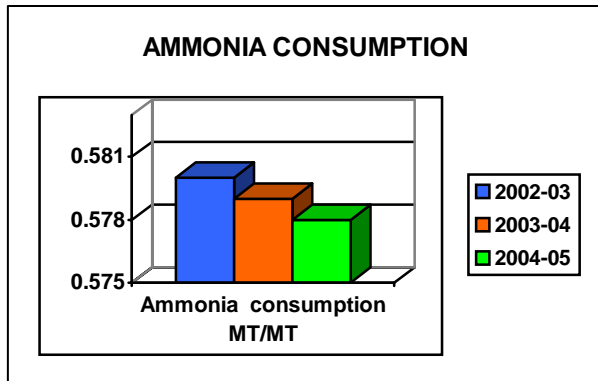
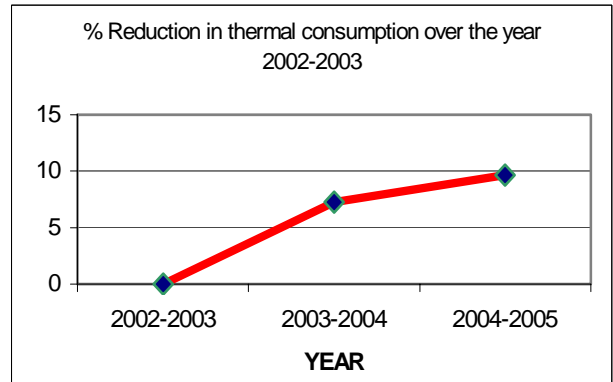
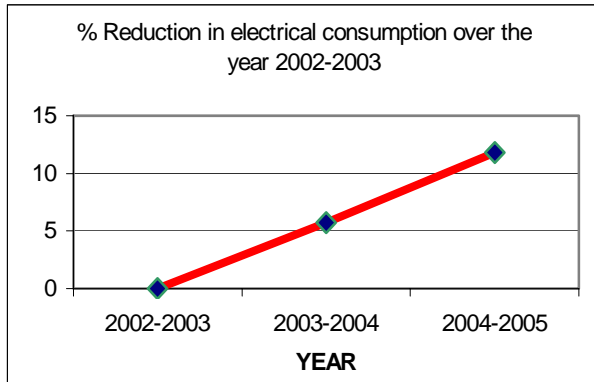
We are committed to reduce energy consumption of our products to match with the best at national & international level.

Specific energy consumption for Ammonia and Urea plants is shown below :

Plant	2002-03	2003-04	2004-05
Ammonia production (MTPY)	885550	1014900	1058720
Ammonia (Mkcal/MT)	9.639	9.202	9.132
Urea production (MTPY)	1537300	1731350	1833750
Urea (Mkcal/MT)	6.949	6.574	6.477

YEAR	ELECTRICITY		THERMAL	
	Consumption (KWH/MT UREA)	% reduction over 2002-2003	Consumption (MKCAL/MT UREA)	% reduction over 2002-2003
2002-2003	60.80	--	1.148	--
2003-2004	57.30	5.76	1.065	7.23
2004-2005	53.61	11.83	1.037	9.67

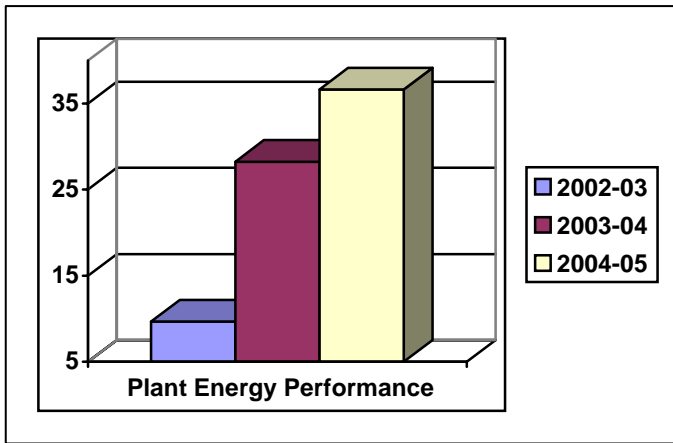




Although there is steep hike in naphtha prices and increase in naphtha consumption (Costlier substitute) due to natural gas shortage, we have been able to reduce the cost of energy as % of manufacturing cost for the year 2004-2005 against the previous year. This is due to substantial reduction in thermal consumption & Electrical consumption on all fronts.

### **Energy Conservation Commitment, Policy & Organizational Set up.**

The energy levels maintained by 20 years old RCF, Thal plants itself shows our commitment & outlook towards Energy conservation. In spite of feedstock crisis, plants at Thal have performed well largely due to the proactive and painstaking efforts taken in the field of energy conservation and capacity enhancement through technical foresight. All this was coupled with shrewd management in the areas of manpower resources, contracting, finance. The Graph indicates Plant energy performance in last three years over the base year 2001-02 performance.



YEAR	Energy Consumption Mkal/MT of Urea	PLANT ENERGY PERFORMANCE
2001-2002	7.218	
2002-2003	6.949	9.66
2003-2004	6.574	28.23
2004-2005	6.477	36.63

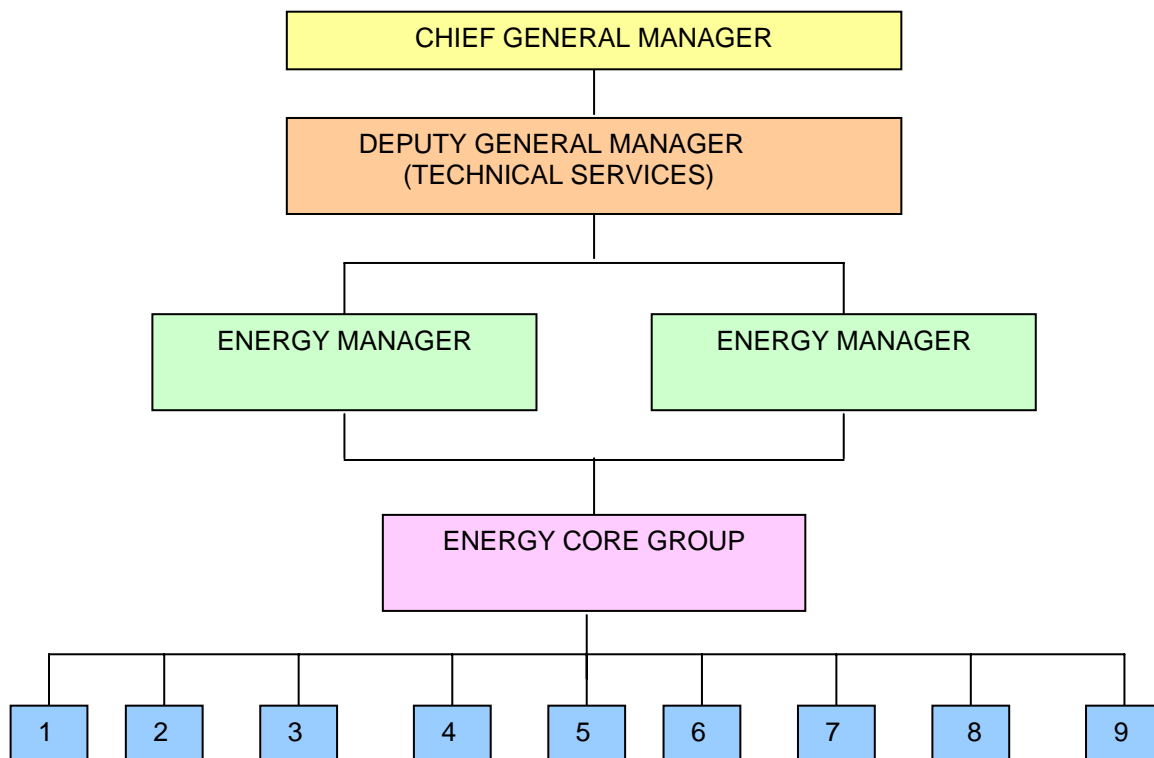
**Calculations for improvement in Plant Energy performance is enclosed as Annexure-III.**

Our organisation has An exclusive Energy Conservation Cell. The cell is headed by Chief General Manager of the Unit. As per the EC Act-2001 our unit has two designated 'Energy Managers'. These two Energy Managers are reporting to Chief General Manager. Energy conservation is the exclusive duty of these two Energy Managers. There are EIGHT certified Energy Auditors who have passed exam conducted by BEE in 2004.

Energy cell conducts a monthly review meeting. In this meeting core group members present the various energy saving potential in their working areas. After brain- storming sessions and cost benefit analysis, the schemes are finalised for implementation after proper approval. The projects already undertaken are reviewed in the monthly meeting.

Energy conservation week is celebrated every year from 14<sup>th</sup> December to 21<sup>st</sup> December. All the plants including chemical group & utilities are invited to present their achievements towards energy conservation alongwith the future plan and targets. The plant making best efforts and realising the set targets is awarded. Also slogan competition, poster competition & Quiz competition is held which is open to all.

ENERGY CONSERVATION CELL STRUCTURE



## ENERGY CONSERVATION ACHIEVEMENTS

During the year 2004-2005, we have implemented 45 energy saving schemes resulting into power saving of 32.51 Lakh KWH & 68935.30 Mkal (Gas +Naphtha). Potential Savings worth Rs. 1470.93 Lakhs were accrued against investment of Rs.449.18 lakhs.

Sustained operations of all the plants i.e process and utilities with minimum downtime resulted into highest ever productions with lowest ever energy levels and highest stream days for the year 2004-05.

Major schemes implemented during the year are listed below :

### ENERGY CONSERVATION SCHEMES

#### 1. CORROCOATING OF COOLING TOWER PUMP IN AMMONIA PLANT

Corrocoating of two cooling tower pumps in Ammonia plant has been carried out resulting into substantial power saving.

##### Before Corrocoating :

Power cons. : 882 KW for one pump

##### After Corrocoating :

Power cons. : 840 KW for one pump

Power saving : 84 KW Total for two pumps

Savings : Rs.33.72 Lacs/Yr



#### 2. ADVANCED CONTROL SYSTEM USING MODEL BASED MULTIVARIABLE CONTROL TECHNOLOGY FOR AMMONIA PLANT STREAM –II.

Advanced Control System has been installed in Ammonia Plant stream-II. It mainly controls following process parameters :

- Pri. Ref. outlet temperature.
- Oxygen % in flue gas.
- Steam to carbon ratio.
- Hydrogen/Nitrogen ratio.
- RPM of Benfield Turbine
- RPM of Process Air Compressor
- RPM Of Ammonia Refrigeration Compressor

##### Before ACS :

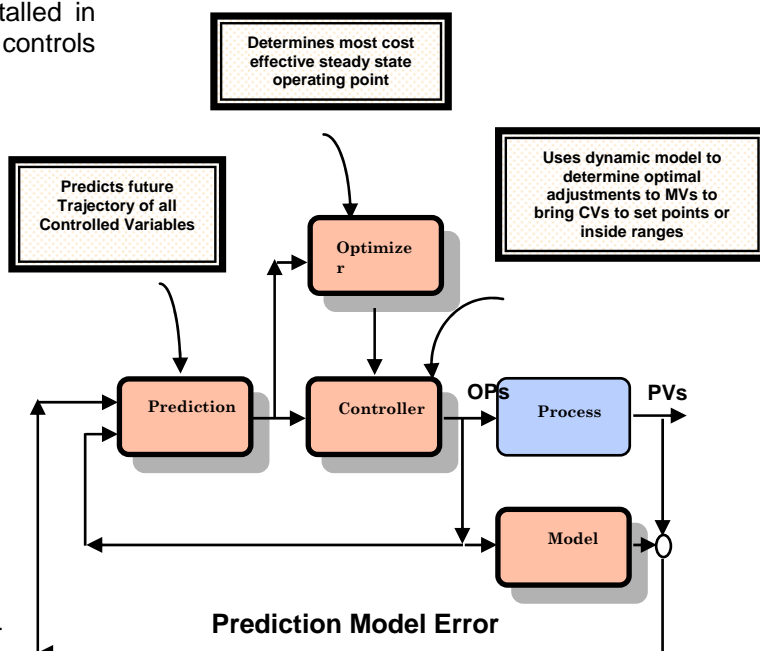
Sp.Energy : 9.093 Mkal/MT

##### After ACS:

Sp.Energy : 9.045 Mkal/MT

Net saving : 0.0481 Mkal/MT

Savings : Rs.215.76 Lacs/Yr



### 3. HOLLOW FRP BLADES FOR BENFIELD SOLUTION COOLER IN AMMONIA PLANTS

Benfield solution cooler fan blades for 6 fans were replaced with hollow FRP in ammonia plant.

#### With Solid fan blades :

Power cons. : 14.01 KW per fan

#### With Hollow fan blades :

Power cons. : 7.68 KW per fan

Power saving : 6.33 KW per fan

Savings(8nos) : Rs.20.33Lacs/Yr



### 4. INSTALLATION OF EVAPORATIVE COOLING SYSTEM FOR PROCESS AIR COMPRESSORS IN BOTH TRAINS.

Availability of process air from Process air compressor was a major bottleneck in Ammonia production & consequently in the Urea production. This was due to high suction temperature of Process Air from atmosphere. This limitation was more evident in summer season. Reducing suction temperature of process air with the help of Evaporative Cooling System has resulted in compression of more volume of process air at the same RPM. This has lead to increase in Ammonia production. The scheme remains in line for 150 days in a year in both streams.

#### **Savings per stream:**

Increase in air flow : 0.38 TNCH

Saving in steam :1242 MTPY

Monetary savings :Rs.9.43 Lacs/Yr



### 5. INTERCONNECTION OF BOTH NATURAL GAS COMPRESSORS DURING LOW NG AVAILABILITY.

Natural gas booster compressor (NGC) of both trains were interconnected for stopping one NGC during low natural gas availability.

#### **Steam saving due to stopping of one NGC**

Steam saving : 4.5 MT/Hr

No. of days actual stopped : 15 Days

Monetary savings : Rs.12.30Lacs /Yr

Savings : Rs.24.35 Lakhs/Year



## 6. PASSIVATION AIR BLOWERS FOR CO<sub>2</sub> COMPRESSORS IN ALL THREE TRAINS OF UREA PLANT

Low capacity passivation air blowers (2 running+ 2 standby) have been installed in Urea plant instead of old large capacity blowers (1 running+1 standby)

### Earlier Blowers :

Capacity : 5000 M<sup>3</sup>/Hr  
Power cons. : 160 KWH

### New Blowers :

Capacity : 1300 M<sup>3</sup>/Hr  
Power cons. : 50 KWH  
  
Power saving : 110 KW  
  
Savings : Rs.44.16 Lacs/Yr



## 7. USE OF UREA CONCENTRATE FOR CROWN WASHING IN UREA PLANTS

MV-6 (1st stage vacuum separator) is washed with hot condensate twice a week in each unit to remove the polymers deposited on the crown. This added water is removed in E-14 & E-15 concentrators which requires additional low pressure steam. In order to save this additional steam MV-6 crown washing line was modified to use concentrated urea melt was used for crown washing. This was implemented in two streams.

### Savings per stream after modification:

Steam saved : 468 MTPY  
  
Monetary Savings : Rs.7.03 Lacs/Yr



## 8. LINING UP OF MP SECTION OFF GASES FROM UREA PLANT TO AMMONIA PLANT PRIMARY REFORMER

Off gases from MP Section of Urea plants were earlier being vented to the atmosphere. This was causing an undue loss of hydrogen and Hydrocarbons. In the said scheme the gases are being used as fuel in the primary reformer of ammonia plant. The scheme has been lined up in all three units.

Natural gas saving : 133.7  
Sm<sup>3</sup>/Hr for all streams  
  
Monetary Savings : Rs. 30.30 Lacs/Yr



#### 9. INSTALLATION OF MAGNETIC RESONATORS ON NAPHTHA FUEL LINE TO BOILER –2 IN STEAM GENERATION PLANT.

The magnetic resonators are placed across naphtha fuel line of the boiler. The major constituent of naphtha fuels are hydrocarbon chains. The polarisation of hydrocarbon chains occurred due to magnetic field. This polarisation results in excitation of the hydrogen atoms present in the chains to a higher energy level i.e from para form to ortho form. Thus converting hydrogen to higher reactive state and phenomena of resonance in the fuel and breaking of complex hydrocarbon chains to simpler hydrocarbon chains.

Naphtha saving : 616.54 MTPY

Monetary Savings : Rs.117.69Lacs/Yr



#### 10. USE OF 14 ATA T.G EXTRACTION STEAM AS ATOMISING STEAM IN NAPHTHA BURNERS FOR STEAM GENERATION PLANT.

Earlier HP steam was used for atomising fuel naphtha. With implementation of this scheme 14 ata extraction from Turbogenerator set is now being utilised for atomising. This has resulted into more extraction from T.G thus improving its efficiency and reduction in specific consumption of steam to T.G.

Steam saving : 0.82 MTPH

Monetary Savings :Rs.97.61Lacs/Yr



### OTHER SCHEMES IMPLEMENTED DURING THE YEAR 2004-2005

#### AMMONIA PLANT

1. Replacement of 20 W tubelights by energy efficient 14 W T-5 tubelights (25 no fittings.) in Apr.04.
2. Primary reformer walls are provided with refractory layers. During thermal scanning it was found that the temperature at furnace casing and burner plate was as high as 250 °C. It was suspected that some of the refractories were in damaged condition. It was causing loss in terms of radiation & convection. These Damaged refractories were replaced with "Z" block insulation. The temperature has come down to 70 °C . This has resulted into fuel saving.
3. Our Synthesis gas compressors are consuming steam much more than design since inception. An attempt was made to reduce the steam consumption by changing guide blade carrier of SGC in Ammonia-I. This has resulted into saving of 0.071 MKcal/MT for single train.
4. Replacement of 20 W tubelights by energy efficient 24 W T-5 tubelights (25 no.).

## UREA PLANT

5. Replacement of 20 W, 140 No.tubelights(Consuming 26 watts) by energy efficient 14 W (Consuming 15 W)T-5 tubelights (70 no.).
6. There are three compressors in Urea plant each having capacity of 1400 Nm<sup>3</sup>/Hr. Out of three one compressor is always in line. Requirement of air for Urea plant is approx. 1200 Nm<sup>3</sup>/Hr. There was always venting of 200 Nm<sup>3</sup>/Hr. This was direct power loss. To avoid this Auto loading unloading operation for Instrument air compressors was made functional..
7. Corro-coating of cooling water pump 'C' which is an spare pump was carried out in Urea plant. Only 2 full capacity & one small capacity pump are always in line. Whenever one full capacity pump is in maintenance, this "C" pump can be utilised to derive benefits of power saving.
8. Replacement of 20 W, 210 No.tubelights(Consuming 26 watts) by energy efficient 24 W (Consuming 25 W)T-5 tubelights (70 no.)
9. Tempered water circuit pumps (P-4) were stopped in all three units . With the inlet temperature of cooling water to E-7 being maintained at 45 ° C with the tempered water circuit pump in line and at a pH of 7.5 +, the depositing tendencies on the cooling water side are high. This resulted in fouling and poor heat transfer in E-7. On stopping of the pump the inlet temperature of E-7 on cooling water side has reduced to 37° C and the fouling of the heat exchanger has correspondingly reduced. This has resulted in better condensation and better operational control even st higher loads. The power consumption has reduced by 12.3 KW for each pump. The saving is for total 3 pumps, one for each plant.
10. With new bimettalic stripper the bottom temperature of the stripper was maintained at 202 ° C to prevent corrosion . This was causing excess steam consumption of 25 Kg/MT of Urea due to overloading of downstream sections. After installation of Passivation air compressor for air to stripper, the corrosion tendency has reduced and the stripper bottom temperature could be maintained at 203-204 ° C. This has accrued a benefit of 12 Kg of steam per MT of Urea.

## STEAM GENERATION PLANT

11. Use of gravity line already existing for supply raw water to all plants increased from 12 to 24 hours. Water coming from State Industrial development corporation was directly supplied to the plants for 12 Hrs a day through gravity line and 12 Hrs a pump was run last year. But now the pump has been stopped permanently and the water is supplied through gravity line 24 Hrs a day.
12. Old hydraulic governors for the pump supplying Boiler feed water to steam generation boilers was replaced with Electronic governer for both BFW turbines (502A & 503A). It has resulted into saving of 0.908 MT of high pressure steam per Hour.
13. Underloaded Transformer No. TR-41, TR -321 & TR -641 were switched off .
14. T.G condensate was earlier collected in Make up tank and then pumped to deaerator as D.M.water. Now the TG condensate is directly diverted to De-aerator to avoid running of Make-up water pump thus saving power of 11.67 KW.
15. Earlier urea turbine condensate was received in D.M. water plant and then it was pumped to Ammonia plant. But now it is directly diveretd to to SGP boilers thus reducing the D.M water from D.M.Plant and hence pumping time has been reduced to 8 Hrs which was earlier 24 Hrs. This has lead to power saving.
16. Use of raw water instead of Make-up water as coolant for Analyser cooler thus avoiding running of Make-up water pump for 4 hours daily.
17. Use of redundant Lighting transformer for plant lighting.
18. Earlier a dedicated pump was running for supplying D.M. water to Thal Ammonia extension plant (TAE). But now Urea process condensate is diverted to TAE and the dedicated pump consuming 5 KW has been stopped.
19. Corro-coating of cooling water pump has been carried out resulting into power saving of 11.43 KW.
20. Replacement of Mercury vapour lamps with Sodium vapour lamps(40 NOS).

### PRODUCT HANDLING PLANT

21. PLC logic for belts was modified which has resulted into automatic switching off of idle empty belts. This has resulted into power saving of 34.47 KW.
22. Construction of chute for truck & wagon loading has resulted into stopping of ET-17 belts & motors thus giving a power saving of 13.20 KW.

### WORKSHOP

23. Replacements of packaged A/C with window A/C has resulted into total power saving of 8.87 KW.
24. Feeding of street lights of the area around ETP through Energy saver and chemical group of plants from lighting transformer.

### ELECTRICAL ENGINEERING SERVICES

25. Replacement of inefficient Central A/c machines with split type with flexibility of different operating temperatures has resulted into power saving of 7.42 KW.
26. Replacement of tube lights with CFL in Technical building.
27. Replacement of 70 nos. of A/C in offices and utility buildings.

### ***Energy Conservation Plans and Targets***

1. End-to-End to survey of Ammonia plant including proposal for additional coil in waste heat section.
2. Use of low grade waste heat for refrigeration/Cooling for PAC in ammonia plant, CO<sub>2</sub> in Urea plant etc.
3. Use P-8 solution for crown washing in 1st vacuum separator MV-06 for Unit-11.
4. Revamping of Polishing Mixed Bed Unit in water treatment plant.
5. Installation of Magnetic resonator for burners in the SGP boiler No. 1.
6. Installation of variable frequency drive (VFD) for Ammonia, Urea & SGP plants (17 nos.).
7. Re-Commissioning of Flapper position limit switch for 19 Urea bag conveyor flappers for empty belts control.
8. Installation of Solar water heater for Central canteen & Hospital..
9. Use of solar power for Street lighting.
10. Replacement of reciprocating compressor by Screw compressor for one unit of air conditioning in administration building.
11. Corro-coating of 2 No. cooling water pumps in Ammonia plant and 2 No. in Steam generation plants.
12. Calcium silicate insulation for steam piping in Steam generation plant to avoid losses through convection and radiation.
13. Provision of vibrators for flappers in Product Handling Plant.
14. Helical coil heat exchangers for suction cooling of CO<sub>2</sub> compressor in Urea Plant.
15. Zirconium coating of Refractory in Primary Reformer furnace of Ammonia Plant.