

# Indian Farmers Fertiliser Cooperative Limited

## Phulpur Unit-I, Ghiyanagar, Allahabad (Uttar Pradesh)

### **Unit Profile**

**Indian Farmers Fertiliser Cooperative Limited (IFFCO)**, globally acclaimed cooperative in fertilizer production and marketing has been striving for socio-economic upliftment of the rural population of India since inception. To ensure timely availability of quality fertilizers to the farmers, IFFCO came into being on 3<sup>rd</sup> November, 1967. Initially, IFFCO commissioned Kalol and Kandla plants in Gujarat in early 1975. Subsequently, the society expanded its base by erecting two more plants at Phulpur in U.P. in the year 1981

**IFFCO-Phulpur Unit -I**, is located at Phulpur, Allahabad in the state of Uttar Pradesh. It has been the world's largest naphtha based Urea complex, consuming one full naphtha rake (2000 MT) daily. Unit –I started its commercial production in March, 1981 and has a 977 MTPD Ammonia Plant designed and engineered by M/s. MW Kellogg , U.S.A. based on Steam Naphtha Reforming Process and 1670 MTPD Urea Plant based on M/s. Snamprogetti Technology. Three coal fired boilers having 125 MT/hr capacities each and 12.5 MW Turbo-Generator supplied by BHEL , India along with associated offsite facilities like DM water plant, Inert gas plant etc. was commissioned in March,1981

### **Energy Consumption**

Ammonia & Urea manufacturing is highly energy intensive and it contributes more than 80% of the total cost of production Urea. Therefore, a slight change in energy consumptions affects the cost of production in a big way. Apart from cost of production reduction in energy saves the valuable fast depleting natural resources such as Naphtha & Coal. Therefore, the Energy conservation is a major corporate objective at IFFCO and it is a continuous process at its units.

IFFCO-Phulpur complex has become one of the lowest energy consuming units amongst Naphtha based fertilizer plants in India. It has substantially reduced its energy consumption during last three years. The details are highlighted below:

<b>Plant</b>	<b>2003-04</b>	<b>2004-05</b>	<b>2005-06</b>	<b>2006-07</b>
<b>Ammonia –I</b>	9.466	9.452	9.335	8.734
<b>Urea - I</b>	7.489	7.630	7.433	7.091

All figures are in **Million kCal/MT**

### **Energy Conservation Commitment and Policy**

As energy contributes more than 80% of cost of production and sharp rise in energy cost, energy conservation receives top priority at IFFCO Phulpur.

### **Energy Management Policy**

IFFCO Phulpur Unit is playing a vital role in the national economy by providing chemical fertiliser 'Urea' to the Indian Farmers for prosperity and growth. Manufacturing Process of Urea Complex is highly energy intensive and therefore, IFFCO Phulpur Unit is committed to produce good quality product with a mission to reduce the specific energy consumption 1% every year. Action Plan for achieving the target, is as follows:

- ✚ Regular Monitoring of Specific Energy Consumption and its Periodical Review.
- ✚ Adoption of Proven, Energy Efficient and Eco-Friendly Technologies.
- ✚ Adoption of Fuel and Energy Substitution resulting into improvement in efficiency and low cost.
- ✚ Gainful Recovery of Waste heat and Low Level Energy.
- ✚ Energy in Electrical Appliances including lighting to be conserved by modification/modernization.
- ✚ Review and Appraisal for Maximizing Equipment Efficiencies. Benchmarking the Performance of the Unit with the other efficient Units.
- ✚ Training for All Employees for Energy Conservation.

### **Energy Conservation Achievements since Commissioning**

Phulpur unit has always been a leader in adopting new developments in the field of fertilizer production and numbers of modifications / revamp have been carried out over the years which have resulted in substantial improvement in energy consumption. Major modifications carried out in Phulpur-I are listed as below :

#### **PHULPUR-I**

1. Purge Gas recovery unit in Ammonia-I plant  
Net Improvement in energy saving : 0.1108 GCal/MT of Ammonia
2. Synthesis Converter Retrofit  
Net Improvement in energy saving: 0.117 GCal/ MT of Ammonia
3. Lo - Heat benfield retrofit in CO2 removal system  
Net Improvement in energy saving: 0.096 GCal/ MT of Ammonia
4. Modified CO2 Compressor Turbine in Urea plant  
Net Improvement in energy saving: 0.16 MT Steam / MT of Urea
5. Installation of Pre- Concentrator in Urea plant (In Year 2001-02)  
Net Improvement in energy saving : 0.08 GCal/ MT of Urea

There has been a steady decline in specific electrical and thermal energy consumption. Energy consumption in Phulpur-I has been brought down from the level of **12.5 GCal / MT** in initial years to the current level of **7.4 GCal / MT** i.e. a reduction of about **41 %** . Following table shows the energy consumption pattern & savings achieved in energy during last three years which shows a remarkable reduction.

Plant	2003-04	2004-05	2005-06	2006-07	% Reduction over (2003-04)
Ammonia -I	9.466	9.452	9.335	8.734	7.7
Urea -I	7.489	7.630	7.433	7.091	5.3

All figures are in **Million kCal / MT**

### **Recent Energy Conservation Projects (2006-2007) :**

Energy conservation is an ongoing process at IFFCO . Following major proposals are in hand at Phulpur unit as a part of its future plans for energy conservation.

#### **▪ Energy Saving Project (ESP):**

Phulput unit has launched its major Energy Saving Project (ESP) worth Rs. 91.95 crores for its existing Ammonia plants. Phase- I of the project has been completed during March & April 2005. Phase-II of the project consisting of following schemes in Ammonia-I have been completed in 2006-2007.

<b>ITEM DESCRIPTION</b>	<b>Savings</b>	<b>Investment in Rs. Lakhs</b>	<b>Project commencement &amp; completion year</b>
<b>AMMONIA-I</b>			
S-50 Converter & Syn. Loop Boiler	-	-	
Synthesis gas compressor Revamp	-	-	
Ammonia Wash Unit	-	-	
Final gas Chiller	-	-	
<b>Integrated Energy Savings for above schemes</b>	<b>0.695 MkCal/MT</b>	<b>7045</b>	<b>Comm. : Sept.'03 Compl. : July'06</b>
Installation of Capacitors for Power Factor Improvement	<b>16 kW/hr.</b>	<b>27.0</b>	<b>Compl. : 06-07</b>
Reduction of Lighting Energy through T-5 lamps	<b>5.2 kW/hr</b>	<b>1.5</b>	<b>Compl. : 2007</b>
Reduction of Lighting Energy through various schemes (like CFL Lamps , Post Top Lantern fittings, street Light Fittings installation , etc.)	<b>57.3 kW/hr</b>	<b>2.83</b>	<b>Compl. : 2007</b>

#### **Installation of S-50 radial flow Synthesis Converter and MP Boiler:**

In order to get higher conversion, a new S-50 converter with a lower heat exchanger and an internal electrical start-up heater was installed at the down stream of existing Ammonia Synthesis Converter. The new converter having catalyst volume of 79 m<sup>3</sup> , increased the ammonia conversion per pass and reduced the gas circulation through the synthesis loop, thereby reducing the overall steam consumption in the Synthesis Compressor Turbine. With higher heat of reaction, Medium Pressure steam generation from the new vertical MP boiler installed downstream of new S-50 converter was chosen to optimize the overall steam balance of the plant.



### **S-50 Converter and MP Boiler**

#### **Synthesis Gas Compressor LP & HP case internal replacement:**

The present Syn Gas Compressor was of mid 1970 design and the operating conditions have changed largely after the installation of S-50 Converter and Loop re-piping, operating condition, particularly circulation rate changed drastically. This decreased the operating pressure of Synthesis loop. The new internals of LP & HP case was designed to meet the new operating condition and better efficiency. The combined efforts of matching the system & operating conditions, improvement in efficiency leads to lesser steam consumption in the Synthesis Compressor Turbine.

#### **Ammonia Wash Unit**

In order to send oxides free make-up gas directly to the Synthesis Converter, an Ammonia Wash Unit was installed between LP & HP case of Synthesis Compressor. The make up gas is washed with an Ammonia stream from Ammonia Separator to remove the oxides. Installation of Ammonia Wash Unit and Synthesis loop re-piping reduced the circulation rate in the synthesis loop and thereby reduced the power consumption in the Synthesis Gas Compressor.



### **Ammonia Wash Unit**

## **Installation of Final Gas Chiller:**

Due to lower recirculation rate in Synthesis Gas Compressor, Refrigeration Compressor load was reduced. With the intention of increase in load of the Refrigeration Compressor, Final Gas Chiller was introduced to cool down the make-up gas to 6 deg.C from the present level of 27 deg.C. This will increase the volumetric efficiency due to lower inlet temperature of make-up gas leading to reduction in steam consumption in the Synthesis Gas Compressor for the same work output.



**Final Gas Chiller**

- **R-LNG Conversion Project :**

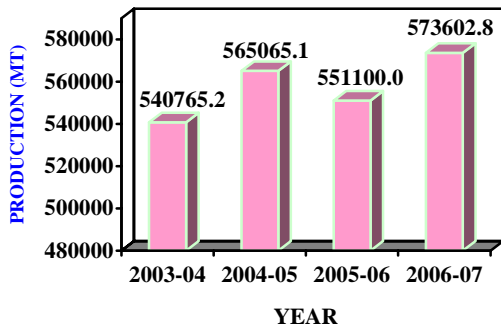
With increasing cost of Naphtha, Urea production from naphtha based plants comes to be very costly. Keeping this in view, one of the main guidelines provided under the new fertiliser policy is that all naphtha based urea plants are to be switched over to NG/RLNG so that they can also become viable and compete in the business of urea manufacturing. With this background, IFFCO-Phulpur has switched over to RLNG in place of use of costly liquid fuels naphtha, fuel oil, & diesel. RLNG changeover in Phulpur-I unit carried out during July 2006. Agreement with GAIL was entered on 25<sup>th</sup> August, 2004. Gas Pipe line laying of about 140 km from Tulendi to Phulpur was completed by GAIL. Accordingly, conversion of Ammonia-I Plant from Naphtha to R-LNG and RLNG conversion in Service Boilers-1 & 2 and 3 as support fuel successfully completed in 2006-07.



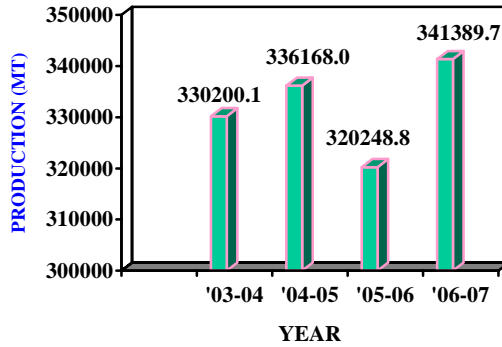
**GAIL Terminal at Phulpur Unit**

**PERFORMANCE AT A GLANCE**

**UREA-I PRODUCTION**

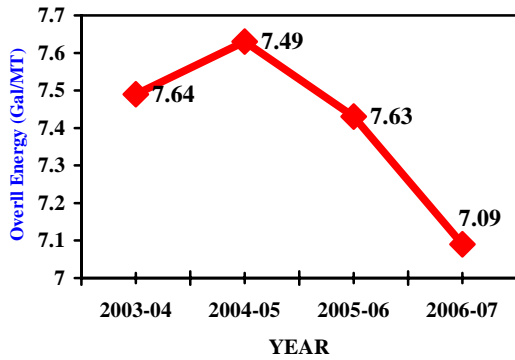


**AMM- I PRODUCTION**



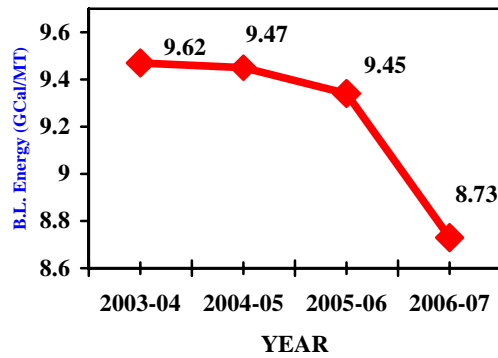
**UREA - I ENERGY CONSUMPTION**

7.2 % reduction over 2003-04



**AMM - I ENERGY CONSUMPTION**

9.3% reduction over 2003-04



Year (2006-2007)

