INDIAN FARMERS FERTILISER COOPERATIVE LIMITED Phulpur

About IFFCO:

During mid- 60's the Co-operative sector in India was responsible for distribution of 70 per cent of fertilisers consumed in the country. This Sector had adequate infrastructure to distribute fertilisers but had no production facilities of its own and hence dependent on public/private Sectors for supplies. To overcome this lacuna and to bridge the demand supply gap in the country, a new cooperative society was conceived to specifically cater to the requirements of farmers. It was an unique venture in which the farmers of the country through their own Co-operative Societies created this new institution to safeguard their interests. The number of co-operative societies associated with IFFCO have risen from 57 in 1967 to more than 36,000 now.

IFFCO commissioned the ammonia - urea complex at Kalol and the NPK/DAP plant at Kandla both in the state of Gujarat in 1975. Another ammonia - urea complex was set up at Phulpur in the state of Uttar Pradesh in 1981. The ammonia - urea unit at Aonla was commissioned in 1988. The annual installed capacity of all the plants was 1.62 million tonne of Urea and NPK/DAP equivalent to 309 thousand tonne of phosphates.

In 1993 IFFCO had drawn up a major expansion programme of all the four plants under overall aegis of IFFCO VISION 2000 . The expansion projects at Aonla, Kalol and Phulpur have been completed on schedule. The latest feather in the cap of IFFCO was completion of Kandla Phase-II on 5th August 1999 which has heralded realisation of all the objectives set forth under VISION - 2000. As per the tradition of IFFCO the project was completed more than two months ahead of schedule. As a result of these expansion projects IFFCO's annual capacity has been increased to 3.69 million tonne of Urea and NPK/DAP equivalent to 825 thousand tonne of phosphates.

The distribution of IFFCO's fertiliser is undertaken through over 36,000 co-operative societies. The entire activities of Distribution, Sales and Promotion are co-ordinated by Marketing Central Office (MKCO) at New Delhi assisted by the Marketing offices in the field. In addition, essential agro-inputs for crop production are made available to the farmers through a chain of 166 Farmers Service Centre (FSC). IFFCO obsessively nurtures its relations with farmers and undertakes a large number of agricultural extension activities for their benefit every year.

At IFFCO, the thirst for ever improving the services to farmers and member co-operatives is insatiable, commitment to quality is insurmountable and harnessing of mother earths' bounty to drive hunger away from India in an ecologically sustainable manner is the prime mission.

IFFCO, today, is a leading player in India's fertiliser industry and is making substantial contribution to the efforts of Indian Government to increase food grain production in the country.

Unit Profile

Situated near Allahabad in Uttar Pradesh , IFFCO Phulpur complex has two production units – **Phulpur unit-I** and **Phulpur unit-II** and is the world's largest fertilser complex based on naphtha as feed stock. **Phulpur unit- I** comprising of one 900 Te/day Ammonia Plant and a 1500 Te/day Urea Plant along with associated offsites facilities like Steam generation plant, Power generation plant, DM water plant, Inert gas plant etc. was commissioned way back in 1981.

Due to increasing demand-supply gap of Urea in the country, Govt. of India has given approval for expansion project at Phulpur site since basic infrastructure facilities were available at Phulpur. The unit

Phulpur-II was commissioned in December 1997 and consists of 1350 MTPD Ammonia plant and 2200 MTPD Urea plant along with associated offsites facilities based on latest state of art technologies.

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 :

Plant	*2001-02*	*2002-03*	*2003-04*
Ammonia –I	9.648	9.621	9.466
Urea - I	7.689	7.636	7.489
Ammonia-II	8.094	7.989	7.944
Urea - II	6.111	6.001	6.024
Urea (I+II)	6.70	6.64	6.59

Note 1 : All figures are in Mkcal/MT
Note 2 : Charts depicting the performance of the unit are enclosed as attachement -1

Energy Conservation Commitment, Policy and Organizational Set up

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

On March 5, 2001, IFFCO Phulpur formulated its Energy Management Policy, which states : " IFFCO is committed to manufacture and supply of quality urea with minimum possible energy through:

- Adoption of latest developments and technologies.
- Better operation and maintenance practices.
- Minimise waste by recycling / reutilization and optimize resource consumption
- Creating awareness among each and every individual about energy conservation.
- Creating safe healthy working conditions and eco-friendly environment ".

Energy Conservation Cell :

The energy consumption is monitored on daily basis. Phulpur unit has constituted a task force, headed by Joint General Manager – Technical. The task force comprises of senior persons from various departments, viz. Production, Maintenance, Utilities, Technical Services, Finance & accounts etc. It meets periodically to discuss the various loss points either due to plant operating troubles or owing to design limitations or development of new technology. Besides this, for improving the energy efficiency within the existing facilities, studies are carried out and modifications are done in-house .

The Engineers and operators / technicians connected to each plant are regularly sent for in house / outside training programmes and Seminars on energy conservation to created their their interest in this area as well as make them aware of the various methods / developments in the field of energy conservation. Reputed professionals are invited as Faculty for the in - house programmes.

Energy Conservation Achievements

Phulpur unit has always been a leader in adopting new developments in the field of fertilizer production and number 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 / MTof Urea

5. Installation of Pre- Concentrator in Urea plant (In Year 2001-02)
Net Improvement in energy saving : 0.08 Gcal/Mt of Urea

Similarly in **Phulpur-II** some of the energy saving features which have been incorporated in the new plant since design stage are as follows :

PHULPUR-II

- Gas turbine drive, with Naphtha as fuel, for process air compressor.
- Heat recovery unit connected to the gas turbine for generating high pressure steams to meet the requirement of Ammonia and Urea Plant.
- Medium pressure process condensate stripper.
- GV - Low energy CO2 removal system.

Purge Gas recovery unit based on Membrane Separation Technique has been installed in Dec. 2001 which has resulted in energy saving by 0.11 Gcal/MT of ammonia.

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 **7.5 Gcal/MT** i.e. a reduction of about **40%.** Similarly in Phulpur – II the energy consumption is improving day by day and it is at a level of **6.0 Gcal/MT** of urea which is lowest among the contemporary naphtha based plants in the country. Following table shows the energy consumption pattern & savings achieved in energy during last three years which shows a remarkable reduction.

Plant	2000-01	2001-02	2002-03	2003-04	%reduction over 2001
Ammonia -I	10.105	9.648	9.621	9.466	**6.32**
Urea -I	8.115	7.689	7.636	7.489	**7.71**
Ammonia –II	8.334	8.094	7.989	7.944	**4.68**
Urea - II	7.072	6.111	6.001	6.024	**14.82**

Note : All figures are in Mkcal/MT

Recently, IFFCO-Phulpur unit - II has bagged Prestigious " **National Energy Conservation Award 2003 "** from Bureau of Energy Efficiency, Govt. of India, Ministry of Power. The Award has been given by Hon'ble Union Minister of Power Shri Anant G. Geete on December 14, 2003 in New Delhi.

Energy Conservation Plans and Targets

Energy conservation is an ongoing process at IFFCO . Phulput unit has launched its major Energy Saving Project (ESP) worth Rs. 150 crores for its existing Ammonia & Urea plants. This project is scheduled to be implemented in 3 phases by the year 2006. Following major proposals are in hand at Phulpur unit as a part of its future plans for energy conservation :

ITEM DESCRIPTION	**Saving in GCal/MT**	**Investment in Rs. Crores**	**Pay back Years**
AMMONIA-I			
LTS Guard & BFW Preheater	-	-	-
Switch over to GV 2-Stage CO2 Removal System	-	-	-
S-50 Converter & MP Boiler	-	-	-
Ammonia Wash Unit	-	-	-
Retrofit of syngs compressor	-	-	-
New make-up gas chiller			
Integrated Energy Savings for Ammonia-I schemes	**0.716**	**87.10**	**3.26**
AMMONIA-II			
LTS Guard Bed	-	-	-
S-50 Converter	-	-	-
Final gas chiller	-	-	-
Integrated Energy Savings for Ammonia-II schemes	**0.157**	**33.57**	**3.15**
UREA-I			
Installation of MP Pre-decomposer	-	-	-
Revamp of Existing CO2 Compressor	-	-	-
Variable frequency drive for hydrolyser pump	-	-	-
Integrated Energy Savings for Urea-I schemes	**0.081**	**19.87**	**3.0**
UREA-II			
Installation of MP Pre-concentrator in one stream and MP pre-decomposer in both streams	-	-	-
Installation of exchanger to increase CO2 compressor discharge Temp.	-	-	-
Installation of 5 additional reactor trays each in both streams	-	-	-
Integrated Energy Savings for Urea-II schemes	**0.052**	**9.01**	**1.4**
Total Investment of all above schemes, Rs. Crores		**149.55**	

Environment and Safety

IFFCO Phulpur Unit is totally committed for maintaining an eco-friendly environment. For controlling air pollution, plants have been provided with Bag Filters, Electro Static Precipitators, Dust Extraction Systems, etc. A lush green belt with about 3 lakh trees has been developed all around the factory premises which is a natural means of air purification. To overcome the problem of fly ash disposal, generated in the Captive Power plant, a dense phase dry fly ash disposal plant has been installed which directly fills the fly ash in closed tankers for transportation of the ash to the cement plants manufacturing Portland pozzolana cement.

Phulpur Unit has always put its best efforts for conserving water. The effluent generated in the plant is recycled back after purification in Reverse Osmosis Plant. Even the sewage water generated in the township is reused in the plant after treatment in sewage treatment plant. The plant is running on zero effluent discharge and total recycle basis. The present specific water consumption is the lowest among the fertiliser industry in the country. Plant and its township have ISO 14001 certification which speaks volumes about its environmental commitment.

The complex has won number of awards for its environment improvement efforts. In 2002, it had won the 1st Environment Excellence award from Indo-German Greentech foundation and TERI award on Environment Excellence for industries with turnover of Rs. 500 crore and above.

Similarly safety of employees is the prime concern of management at IFFCO Phulpur and all measures are taken so that no untoward incidence took place. The safety committee headed by chief of the Fire & Safety department meets regularly and discuss the safety related problems with plant personnels and remedial actions are taken accordingly. No. of training programmes are organised including practical demonstration of safety related equipments at site to create awareness at every level. IFFCO Phulpur has won number of safety awards from various agencies such as, FAI, Ministry of Labour, etc.

Details of Energy Saving Projects Carried out during 2003-04

PHULPUR-I

1. LT Shift Converter and Methanator outlet modification:

LT shift Converter and Methanator vessels outlet has been modified in Ammonia-I plant to reduce the pressure drop of gas with which compression energy in Synthesis gas Compressor has reduced. Pressure drop reduction due to LT Shift Converter outlet modification is 0.2 kg/cm2.g and pressure drop reduction due to Methanator outlet modification is 0.19 kg/cm2.g. Estimated energy saving due to above modification in Ammonia-I is 0.03 Gcal/MT of Ammonia. It is to be noted here that outlet modification of these vessels has been carried out in-house innovatively.

Cost of modification of outlet of above two vessels = Rs. 2.0 lakhs.
Estimated cost savings per year = Rs. 31.2 lakhs.
Pay back period = < 1 month.

2. Replacement of Catalysts for Secondary Reformer , LTS Converter, Methanator and Synthesis Converter.

In order to reduce the energy consumption in Ammonia-I, Catalysts of following vessels have been replaced. Following table shows cost-benefit analysis of catalysts replacement.

Item description	Quantity, M^3	Benefit	Energy saving, Gcal/MT
Catalysts Make			
1. Secondary Reformer (CDR-66B, PDIL, India)	26.3	Pressure drop reduction, 0.8 kg/cm2	0.04
2. LT Shift Converter (CD-LT-21B, PDIL India)	60	Reduction in CO slip by 0.1 mol %	0.02
3. Methanator (C-13-4, UCIL, Idia)	26.6	Pressure drop reduction, 0.5 kg/cm2	0.025
4. Ammonia Synthesis Converter			
i. KM-1R (Topsoe)	8.2	Increase in Ammonia outlet concentration by 1.0 mol %	0.10
ii. KM-1 (Topsoe)	61.8		
iii. Ammox-10H (sud chemie)	0.49		
iv. S6-10 (BASF)	1.39		

Total energy saving per year = 59645.9 Gcal
Total cost of above catalysts = Rs. 649.8 lakhs.
Estimated cost savings per year = Rs. 630 lakhs.
Pay back period of the scheme = < 1 year.

3. Power reduction in R.O. Product water transfer by rerouting the pipe lines

Reverse Osmosis plant permeate of design capacity 150 m3/hr was collected in a Product Water Storage Tank (PWT) and pumped to Softening plants with the help of transfer pump at 5.5 kg/cm2 discharge pressure connected to 45 kW motor. The piping route in the pipe rake and available head between RO permeate line and end point discharge at softening plant has been studied to check the possibility of direct transfer of R.O. permeate without pumping up to softening plant. It was found that by rerouting & bringing down the pipeline elevation at few places, pumping can be avoided to facilitate direct transfer. Pipeline rerouting has been done by changing the elevation at few places to allow direct transfer without pumping. Power saving obtained is 40 kW per hour.

Yearly Power savings = 3.17 lakh kWH.
Yearly Cost savings = Rs. 12.7 lakhs.
Cost of 8" piping modification = Rs. 2.0 lakhs.
Simple pay back period = 2 months.

4. Upgradation of Ammonia-I Cooling Tower

Cooling Tower of Ammonia-I was of Paharpur make cross-flow type Cooling tower having wooden lath fills & 2 pass Herringbone type wooden drift eliminators. Design Cooling water flow of the tower is 13600 m3/hour. In order to improve the tower performance and to reduce the cooling water temperature which will reduce the energy of Ammonia, Cooling tower upgradation job has been done. Old wooden lath fills have been replaced by more efficient PVC 'V' bar fills. Old 2-pass Herring bone type wooden drift eliminator has been replaced by more efficient PVC drift eliminators (Model TUV 15X). This modification resulted in 0.5 deg.C reduction in Cooling water temperature.

Cost of modification of Cooling tower = Rs. 35.2 lakhs.
Estimated savings per year due to energy reduction = Rs. 10.4 lakhs.
Pay back period of the scheme = 3.4 years.

5. Replacement of Gland packings by Mech. Seal & Suction vanes repair in Urea-I Cooling water Pumps

There are three Cooling water pumps in Urea-I having capacity of 3800 m3/hr each connected to 720 HP motors. During the inspection of the Cooling water pumps of Urea-I, it was found that suction vanes of two pumps were eroded badly resulting in poor efficiency. Suction vanes were repaired by filling and machining and also gland packings were replaced by Meachnical seals. This modification resulted in 5 amperes reduction in each pump. Power supply to these pumps is 3300 V.

Yearly Power savings = 3.62 lakh kWH.
Yearly Cost savings = Rs. 14.5 lakhs.
Cost of 8" piping modification = Rs. 2.3 lakhs.
Simple pay back period = 2 months.

6. Ammonia Condenser tubes & CW Pump impeller replacement by SS :

Ammonia Condenser in Ammonia-I plant (127 CA/CB) having CS tubes were replaced by Stainless Steel to reduce the pressure drop of Cooling water so that pumping energy will be saved. Cost of SS tubes with fabrication & erection is Rs. 59.2 lakhs. Also worn out CS impeller in one of the Cooling water pumps having capacity 6800 m3/hr is replaced by Stainless steel impeller costing Rs. 7.35 lakhs. After this modification Cooling water pressure has come down from 3.5 kg/cm2 to 3.0 kg/cm2. Total cooling water flow is 14000 m3/hr.

Yearly Cost savings = Rs. 47.9 lakhs
Cost of modification = Rs. 66.5 lakhs
Simple pay back period = 1.4 years

7. Hot & Cold Insulation at various locations of the plant:

Hot insulation material LRB mattresses of thickness ranging from 40 mm to 150 mm has been replaced at various locations of plant covering pipe lines & Turbine insulation. Total area done for Hot insulation is 4077 square meters. Cold insulation having PU foam / Polystyrene has been replaced at various locations. Total area done for Cold insulation is 141 square meters. Total cost of insulation work for the year 2003-04 is Rs. 15.8 lakhs Savings are not quantified as savings are marginal.

8. Installation of Energy efficient CFL lamps:

Total 50 number of street lighting sets having 2 X 40 W have been replaced with more efficient CFL lamps of capacity 2 X 11 W (Bajaj make). Also, 12 number of 100 W incandescent lamps in Guest House have been replaced with more efficient 15 W CFL lamps (Lintex make).

Yearly Power savings	**= 0.56 lakh kWH.**
Yearly Cost savings	**= Rs. 2.3 lakhs.**
Cost of CFL lamps	**= Rs. 0.60 lakhs.**
Simple pay back period	**= 3 months.**

Details of Energy Saving Projects Carried out during 2003-04

PHULPUR UNIT-II

1. **Energy Savings By Replacement of HT Coil in Reformer WHS :**

The Convection Section of the Primary Reformer in the Ammonia Plant has a number of heat recovery coils which recover useful heat from the hot flue gases. The High Temperature (HT) and Low Temperature (LT) Steam Superheater Modules are placed one above the other and are used to superheat high pressure steam to its final temperature of 515 deg. C utilizing the energy of hot flue gases which in turn get cooled before being vented to the atmosphere through an elevated stack.

The HT super heater coil consist of a total 180 nos. of 4" ,11.12 mm thick, SS-321 H tubes distributed equally in 10 rows of 18 tubes each. Top and bottom rows are connected to outlet and inlet headers respectively. In the old arrangement there were six rows of bare tubes (108 nos.) and four rows of finned tubes (72 nos.).

During inspection of the convection zone in annual turnaround, it was observed that both the intermediate tube sheets of HT- super heater coil have broken into several pieces and the whole coil assembly had sagged and was practically resting on the LT coil just below. It has also been observed that there was slight by-passing of the flue gases across the H.T. Steam Superheater Coil and the final superheat temperature was far below the desired temperature of 515 deg. C.

Innovative study carried out by a team of Maintenance & technical engineers for its replacement to get maximum heat recovery with minimum cost. After this revamp there are five rows each of bare and finned tubes. Following table shows the operating parameters before & after replacement of HT steam superheater coil and its savings.

SL.	Description	Before	After

No.		Replacement	Replacement
1.0	HP steam generation in front end RG boiler and Syn Loop boiler	256.8 t/h	247.8 t/h
2.0	Steam Superheater (E-3208) out temperature	386.5 deg C	383.4 deg C
3.0	HT coil out HP steam temperature	498.6 deg C	503 deg C

Additional heat recovery **=0.012Gcal/MT of Ammonia.**
Equivalent Naphtha saved per year **= 570.2 tonnes**
Cost savings per year **= Rs. 87.7 lakhs**
Cost of replacement of HT superheater coil **= Rs. 240 lakhs**
Simple Pay back period of the scheme **= 2.7 years**

2. Savings due to relocation of PCV in HP steam line :

Steam generation plant comprises of 3 No. coal fired boilers having design pressure & temperature of 108 ata, 465 deg C and one LSHS fired boiler No. 4 to produce steam at 116 ata, 515 deg C. Practice of using more steam from coal fired boilers was followed in order to save costly liquid hydrocarbon fuel i.e. LSHS in boiler No. 4.

However, boiler No. 4 has to be operated at lower pressure for allowing flow of HP steam from coal fired boilers to the steam network of plant-II consisting of Ammonia-II/Urea-II and TG-2. Lowering of HP steam pressure causes significant impact on the operating pressure of A-II as well as U-II leading to higher specific steam consumption.

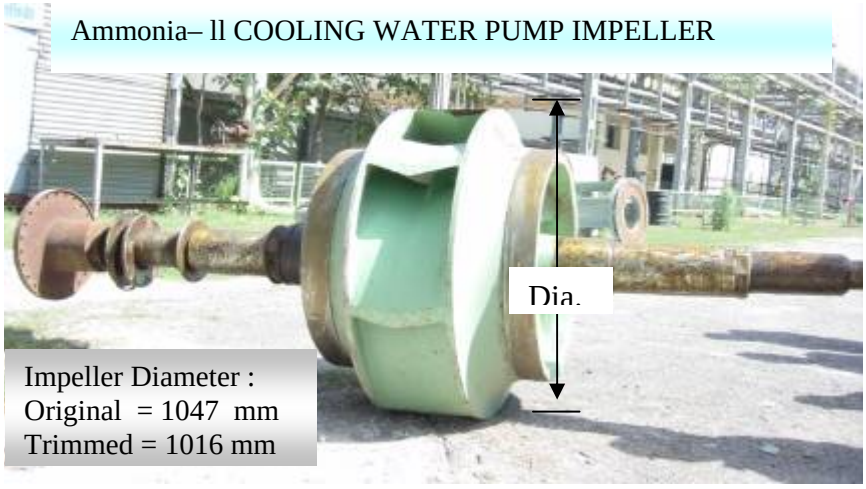
In order to increase the HP steam pressure going to Ammonia-II & Urea-II, existing HP steam control valve PCV-5505B, originally intended to be used for import of HP steam from P-I to P-II, had been shifted to new location as shown in Fig.1**.** This scheme helped in making use of HP steam optimally from coal fired boilers and LSHS fired boiler. After the implementation of this modification HP steam specific consumption in Urea-II has been reduced from 1.025 to 0.990 MT/MT.

Cost of piping modification & Relocation of Control Valves = Rs. 5 lakhs.
Savings obtained per year **= Rs. 410 lakhs**
Simple pay back period **= 5 days**

3. Trimming of Motor driven CW pump in Ammonia-II

There are two Turbine driven and one Motor driven Cooling water pumps in Ammonia-II for cooling water supply system. During the operation of motor driven CW pump (P-3801/C), it has been observed that discharge valve is throttled to the extent of 50 % due to the fear of tripping its motor as running amperes is about 105 against the tripping amperes of 108 on 11 kV system. For flexible operation & to reduce the wastage of power in throttling operation, impeller trimming has been carried for this pump. Above table shows the extent of trimming done and power savings.

Parameter	Before trimming	After trimming
Impeller dia, mm	1047	1016
Flow, m3/hr	10500	10500
Head, m	44	40
Pump input Power, kW	1360	1250
Power savings, kW	-	110



Estimated Yearly Power savings = 8.71 lakh KWH
Equivalent saving per year = Rs. 34.8 lakhs
Cost incurred for impeller trimming = Rs. 0.25 lakhs
Simple Pay back period of the scheme = 3 days

4. Installation of Magnetic Resonators in FO fired boiler Burners:

The magnetic resonators were installed in the F.O. Fired Boiler, after studying the technology of magnetic resonators. The magnetic resonator utilises the resonance to affect the Molecular Dynamics. The affects of resonance on the dynamics of heavy oil are in the breaking up of their hydrocarbon chains. This in turn produces a more complete and cleaner burning combustion thus achieving more effective and efficient utilisation of energy. There are six (6) burners for this boiler and we have installed six numbers of Magnetic resonators. The magnetic resonator brought down the specific fuel consumption by 0.89 %**.**

Estimated yearly reduction in Fuel oil = 141.5 MT per annum.
Equivalent Savings per year = Rs. 19.0 lakhs
The cost of Magnetic Resonators = Rs. 3.0 lakhs
The pay back period of the scheme works out to be comes out to be 2 months only.

5. Hot & Cold Insulation at various locations of the plant:

Hot insulation material LRB mattresses of thickness ranging from 25 mm to 150 mm has been replaced at various locations of plant covering pipe lines & Turbine insulation. Total area done for Hot insulation is 2985 square meters. Cold insulation having PU foam / Polystyrene has been replaced at various locations. Total area done for Cold insulation is 284 square meters. Total cost of insulation work for the year 2003-04 is Rs. 14.1 lakhs Savings are not quantified as savings are marginal.

HIGHLIGHTS

PHULPUR COMPLEX:

There is a substantial reduction in Energy & Consumption of major inputs in last three years at IFFCO-Phulpur complex which are highlighted as under :

- Specific Energy Consumption (SEC) per MT Urea has been reduced by **11.8 %** during the period 2001-2004.

- Consumption of major inputs have been reduced substantially during the period 2001-2004 for Urea production.

- Savings achieved during 2003-04 based on input norms reduction is as under:

  - **Naphtha : 15736 MT**
  - **Fuel Oil : 20084 MT**
  - **Coal : 65099 MT**
  - **HSD : 108 MT**
  - **Purchase Power : 5420635 KWH**

The unit-wise Energy & Consumption of major inputs reduction is highlighted below :

PHULPUR-I

- Specific Energy Consumption (SEC) per MT Urea has been reduced by **7.7 %** during the period 2001-2004.

- Consumption of major inputs reduction during the period 2003-04 based on input norms reduction is as under:

  - **Naphtha : 9950 MT**
  - **Fuel Oil : 3407 MT**
  - **Coal : 65099 MT**
  - **HSD : 108 MT**
  - **Purchase Power : 47912 KWH**

PHULPUR-II

- Specific Energy Consumption (SEC) per MT Urea has been reduced by **14.8 %** during the period 2001-2004.

- Consumption of major inputs reduction during the period 2003-04 based on input norms reduction is as under:

  - **Naphtha : 5786 MT**
  - **Fuel Oil : 16677 MT**
  - **Purchase Power : 5372724 KWH**

(i) Reduction of Water Consumption in the Plant :

Best efforts have been made to reduce specific raw water consumption in the plant and township. Several raw water conservation measures have been adopted. Strict monitoring of raw water usage at each source is being done to optimize the water consumption, which includes monitoring of water wastes e.g. over flows from tanks, leakages from the pipe lines / system etc. With our great endeavour towards water conservation we have achieved specific raw water consumption of 6.68 M3/ Te of Urea during year 2003 –04 against 12 M3/ Te of Urea as prescribed for Naphtha based Fertiliser Plant by Ministry of Environment & Forests, Govt. of India under CREP.

A reduction of 0.14 M3 / Te of urea has been achieved in raw water consumption during 2003 – 04 as compared to previous year.

Total investment in 2003 – 04 :	Rs. 3.0 Lakh for laying 500 M long pipe line for reuse of effluent water. Pay back period for this scheme is less than two years.
Total money saving in 2003-04 :	Approx. Rs.1.94 Lakh has been saved due to reduction in raw water consumption.

(j) Recycling of Material :

- **Water and Effluents** :

IFFCO Phulpur is very conscious and careful in utilization of effluent water. Several water conservation schemes have been adopted right since inception of the plant for careful utilization of the precious commodity i.e. water. The entire effluent generated in the factory is recycled / reused in plant process and irrigation after adequate treatment. Thus neither the industrial effluent water nor the domestic sewage water is discharged out from the premises. By reusing / recycling various effluent streams, the fresh water consumption has been reduced to 6.68 M3 per Ton of Urea(2003–04) from 19.236 M3 per Ton of Urea over the years.

A brief description of water conservation measure adopted at IFFCO Phulpur are given below :

I. Treatment and Reuse of Regeneration Effluent from D.M. Plant and Polisher Unit.

About 1600 M3/ day of regeneration effluent of D.M. Plant and Polisher Unit is segregated into lean effluent and strong effluent. The lean effluent having less TDS is treated in effluent treatment plant based on latest Reverse Osmosis Technology. The treated water is reused in process as cooling water make up. The strong effluent is collected in impervious FRP lined RCC Pit and utilized for dust suppression in Coal yard area.

II. Reduction in the Quantity of Cooling Water Blow Down, Its Treatment and Reuse.

Initially the cooling water blow down from cooling towers was quite high, with the use of good quality of make up water & adoption of non chromate treatment system, the cycle of concentration of these cooling towers have been increased to 8 cycles. Presently, the quantity of blow down from all the six towers of Unit-I & II is only 1400 M3/day. This blow down water is treated in R.O. Plant along-with other effluents and reused in process as Cooling Tower make up.

III. Treatment and Reuse of Process Condensate and Turbine Condensate from Ammonia Plant.

In Ammonia Plants, process condensate of about 2980 M3/day is treated in the stripper for removal of its ammoniacal content. Further it is allowed to pass through a polisher unit to remove all dissolved salts contained in the process condensate. The polished condensate is pumped to plant and reused as boiler feed water.

Turbine condensate from Ammonia Plant is also sent to condensate polisher unit of D.M. Plant for polishing in Ion Exchange Unit. The treated water is recycled and reused as boiler feed water for steam generation.

IV. Reuse of Waste Water of Urea Plants (Deep Urea Hydrolyser)

The process condensate of Urea Plant-I & II are treated in deep Urea Hydrolyser system. The hydrolysed condensate contains only 3-5 ppm Ammoniacal Nitrogen and Urea in traces. This water (about 2200 M3/day) is polished by Ion Exchange resin in condensate polisher unit and recycled to steam generation plant, where it is reused as boiler feed water.

V. Reuse of Steam Condensate from Urea Plant.

About 950 M3/day of steam condensate from surface condenser of turbo driven CO2 compressor system and approximately 2100 M3/day of steam condensate from process of Urea Plant - I & II are recycled to steam generation plant as a make up to boiler feed water.

VI. Treatment and Reuse of Off Spec. Ammoniacal & Deolied Effluent

The oily waste water is treated in disc oil separator and gravity oil separator installed in Urea and Ammonia Plants. About 700 M3 / day (Max.) Off Spec. Ammonical effluent and deolied water from Ammonia and Urea plant is treated in Ammonia stripper of effluent treatment plant. This treated effluent water is recycled and reused in water softening plant.

VII. Reduction in Water Consumption in Ash Handling.

Deashing of coal ash generated in boilers of Power Plant was initially carried out by wet system i.e. hydro-vactor system. This required huge quantity of water. To reduce the water requirement for ash slurry formation and to retain the pozzolana quality of fly ash a dry ash collection system i.e. Dense phased pneumatic fly ash conveying system has been installed in year 2000 and in operation efficiently. This saves substantial quantity of raw water.

VIII. Quench Water / Cooling water from I.G. Plant (1200 M3/day) is directly pumped to water softening plant. This saves equal quantity of raw water.

IX. About 180 M3 / day of jacket cooling water of Ammonia Plant-I is recycled into Ammonia cooling tower as cooling water make-up.

X. About 100 M3/day of flash tank condensate which comes out from Power Plant-I is pumped into Ammonia Cooling Tower as cooling water make-up.

XI. About 150 M3/day pump house ejector discharge is presently being recycled into water softening plant.

XII. About 270 M3/day R.V. sealing water of Ammonia Plant-I is recycled in to Ammonia Cooling Tower -I.

XIII. About 350 M3/day Blow down water from boilers is recycled into Power Cooling Tower.

XIV. Total Recycle of Effluent Through Reverse Osmosis Effluent Treatment Plant.

We have installed and operating an effluent treatment plant (Capcity-3000 M3/day) based on Reverse Osmosis Technology to treat the Industrial effluent. This is a unique and pioneer effluent treatment plant in Indian Fertiliser Industry to treat the Industrial liquid effluent e.g. regeneration effluent of D.M. Plant. Cooling water blow down and surplus effluent water of Guard Pond. The product water is reused in process as cooling water make up. This plant is first of its kind in the country and its Technology has been provided by M/s Hydranautics, California, U.S.A one of the leading organisations of the Reverse Osmosis Technology. The plant has been supplied by M/s Ion Exchange (India) Limited at a cost of Rs. 88o Lakhs.

XV. Treatment and Reuse of Domestic Sewage Effluent.

We have installed a sewage treatment cum recycle plant of 3000 M3/day capacity for processing of township sewage water which is generated from our residential township. The cost of the plant was worth 151 Lakh in the year 1997 when it was commissioned. Treated sewage water is reused in plant process as cooling water make-up through water softening plant / for irrigation of farm land. This saves an equal quantity of raw water.

Table–1 & 2 given below shows the reduction in specific raw water consumption and specific effluent discharge over the years.

Table No. - 1 : Specific Raw Water Consumption

Year	Raw Water Use M3/Te of Urea
1989-1990	19.24
1990-1991	15.83
1991-1992	18.02
1992-1993	14.89
1993-1994	13.95
1994-1995	10.81
1995-1996	10.14
1996-1997	10.13
1997-1998	10.10
1998-1999	8.50
1999-2000	7.80
2000-2001	7.40

2001-2002	7.0
2002-2003	6.82
2003-2004	**6.68**

Note : The above reduction in Raw Water consumption has been achieved inspite of the fact that our captive power generation is based on coal.

Table No. - 2 : Specific Effluent Discharge

Year	Effluent Discharge M3/Te of Urea
1989-1990	6.310
1990-1991	4.305
1991-1992	2.940
1992-1993	1.890
1993-1994	1.823
1994-1995	ZERO
1995-1996	ZERO
1996-1997	ZERO
1997-1998	ZERO
1998-1999	ZERO
1999-2000	ZERO
2000-2001	ZERO
2001-2002	ZERO
2002-2003	ZERO
2003-2004	**ZERO**

Total investment in 2003-04

01.Recurring investment : Rs. 98 Lakh per year (for operation of Sewage Treatment Cun Recycle Plant & Reverse Osmosis ETP Cum Recycle Plant) .

The above cost does not includes money incurred on operation of water recycle pumps installed at Guard Pond.

02.Capital Investment : Rs. 3.0 Lakh for laying 500 M long pipe line for reuse of effluent water.

Total money saving in 2003 - 04

The above schemes have been implemented for environmental benefit and to ensure ecological balance, which can not be quantified in terms of money. However, approx. 25.0 Lakh per year is saved because of recycle / reuse of water.

Production rejects :
Utilisation of Waste :

01. Utilisation of Coal ash generated from Power Plant :

We are having three coal fired boilers in our steam generation plant. Fly ash generated from coal fired boiler is being utilised as useful material in following area.

(a) Disposal to cement industries for manufacture of Portland Pozzolana Cement.
(b) Manufacture of fly ash bricks
(c) Usar land reclamation
(d) Back – filling of low lying areas.

During the year 2003 –04 total 3.30 lakh tones of ash has been utilized against generation of about 1.14 lakh MT which is 290% of total ash generation.

Total investment in 2003–04 : Rs.8.0 Lakh (for operation & maintenance of dry fly ash collection system & ash ponds.)

Total money saving in 2003–04 : The economic benefit of above was not taken into consideration. The main stress has been on waste utilization and reducing environmental impact. Disposal of fly ash is a national problem of gigantic nature. Its gainful utilization would avoid the need of ash ponds for storing ash. Fly ash is provided free of cost to the farmers for its utilization as Usar recalimant . The application of fly ash increases the agriculture output .

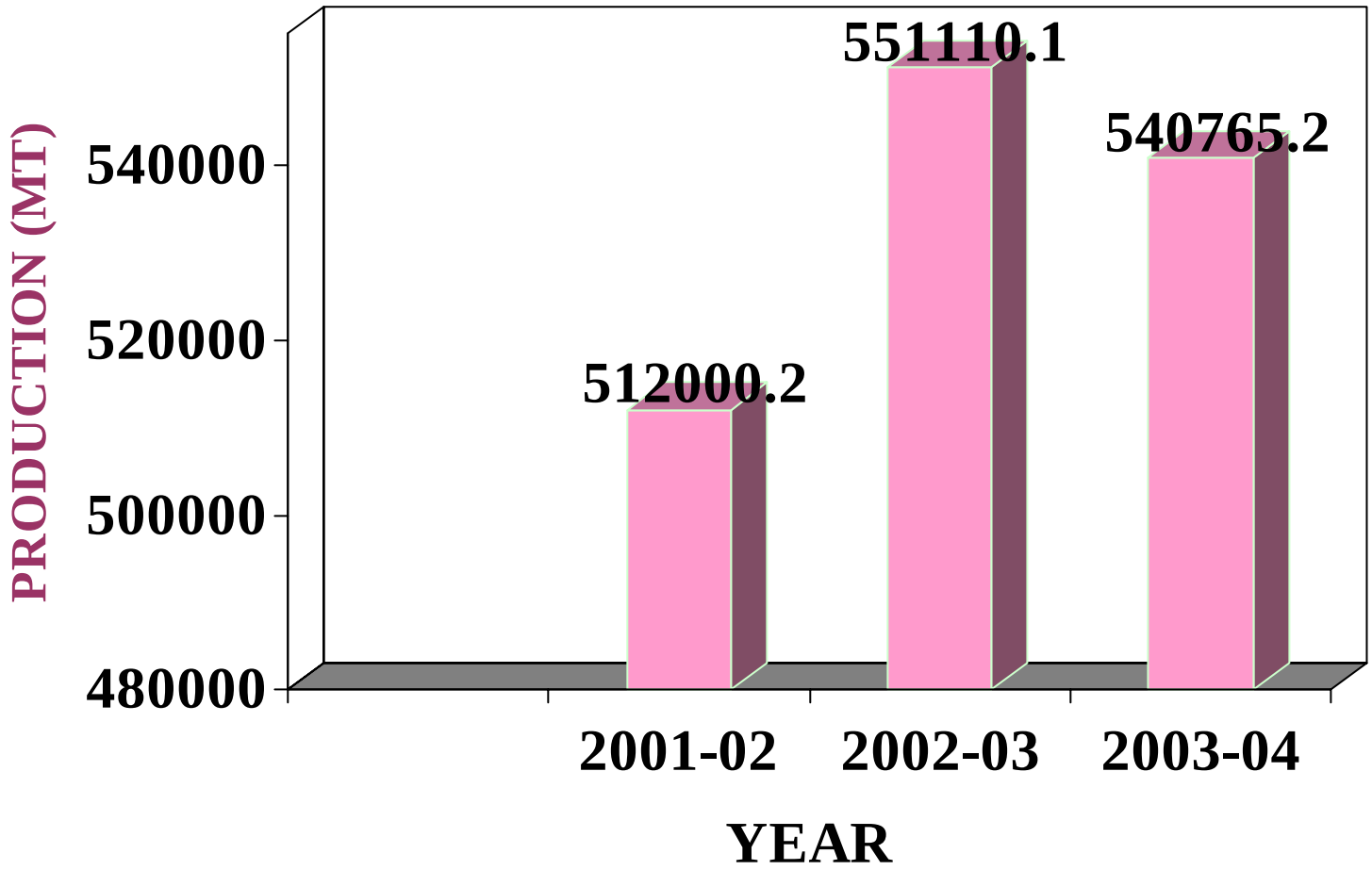
02. Gainful utilization of Spent Zinc Catalyst in Agriculture

Various catalysts are used in fertilizer industry for ammonia production. Zinc Oxide catalyst is used in fertilizer industries and refineries for sulphur removal from the hydrocarbons. After adsorption of sulphur, Zinc oxide is converted into zinc sulphide which is generally a problem of disposal for the users as Zinc based catalyst has been categorized as hazardous waste. To

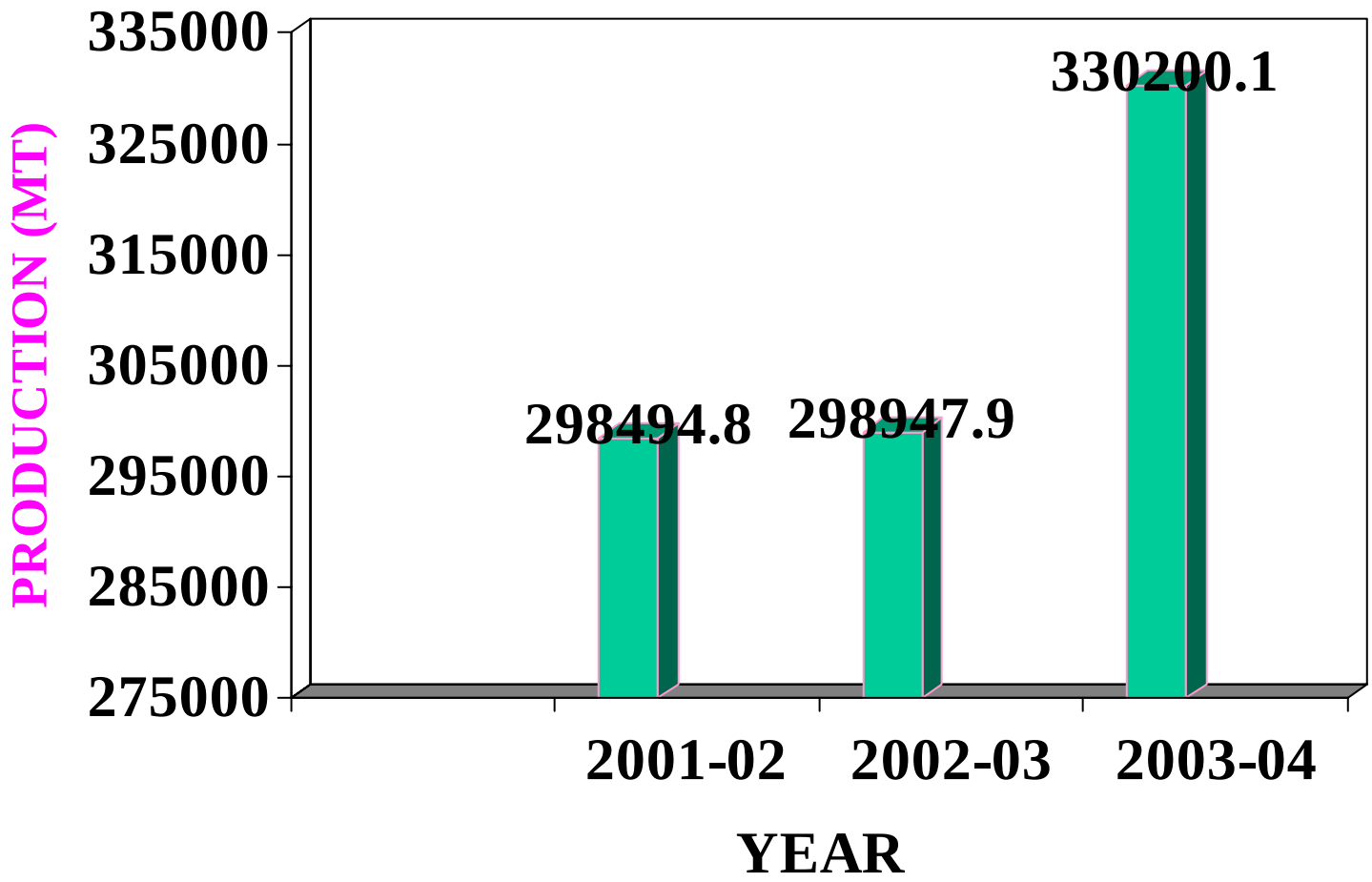
explore its utilisation in agriculture as a supplement of Zn and S, a R & D project was undertaken. As an out come of the study, it is proved that spent catalyst releases Zinc and Sulphur when applied with different organic manures in soil making availability of the nutrients to plants.

Investment in 2003 – 04 :	NIL, However, an amount of Rs.3.30 lakhs was spent on the project during April 2000 to July 2002.
Total money saving 2003-04:	Demonstration project of spent Zinc catalyst is going on in our Moti Lal Nehru Farmers training Institute. Benefit in form of increase in yield is estimated as around Rs. 6000 per Hectare per crop.

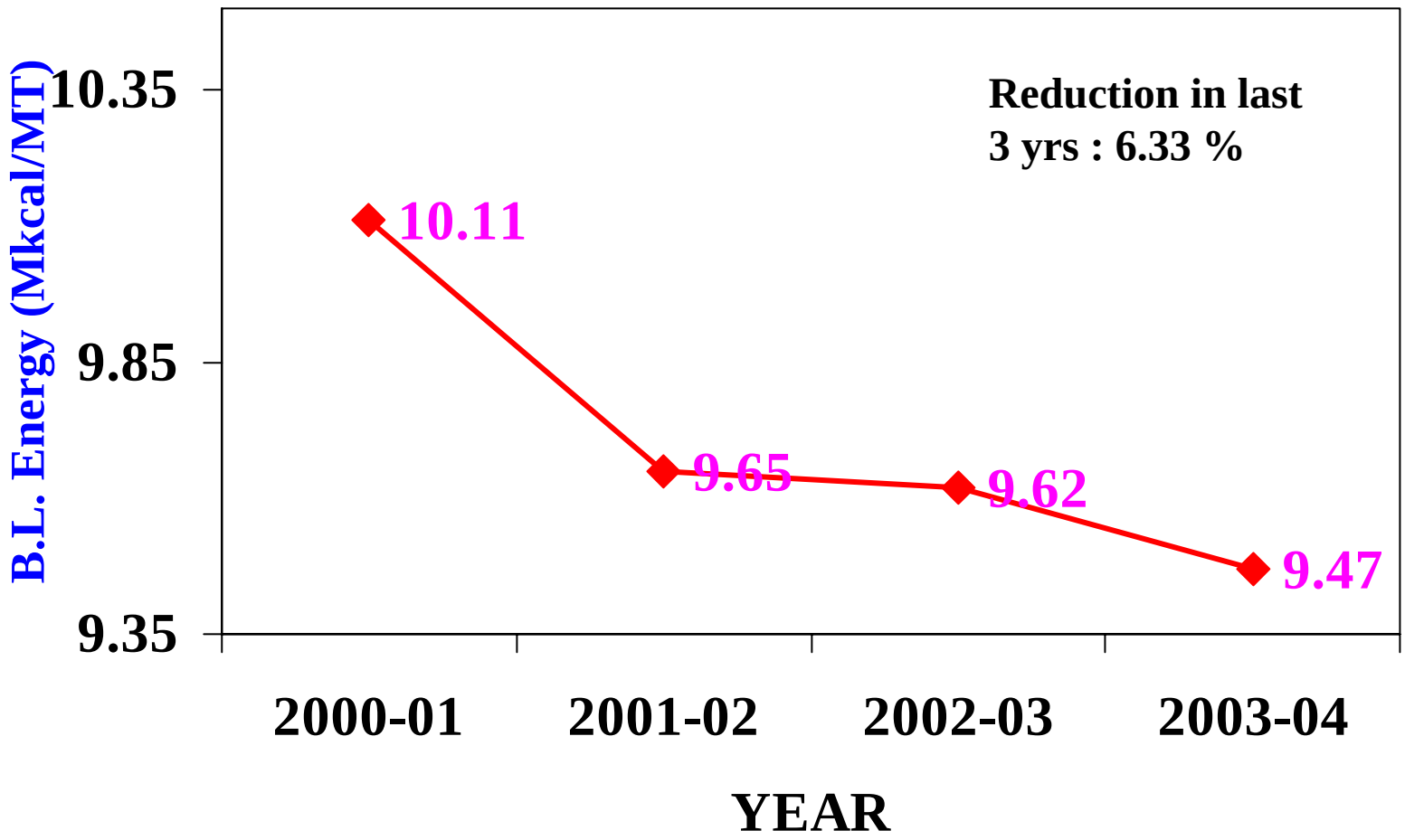
UREA-I PRODUCTION



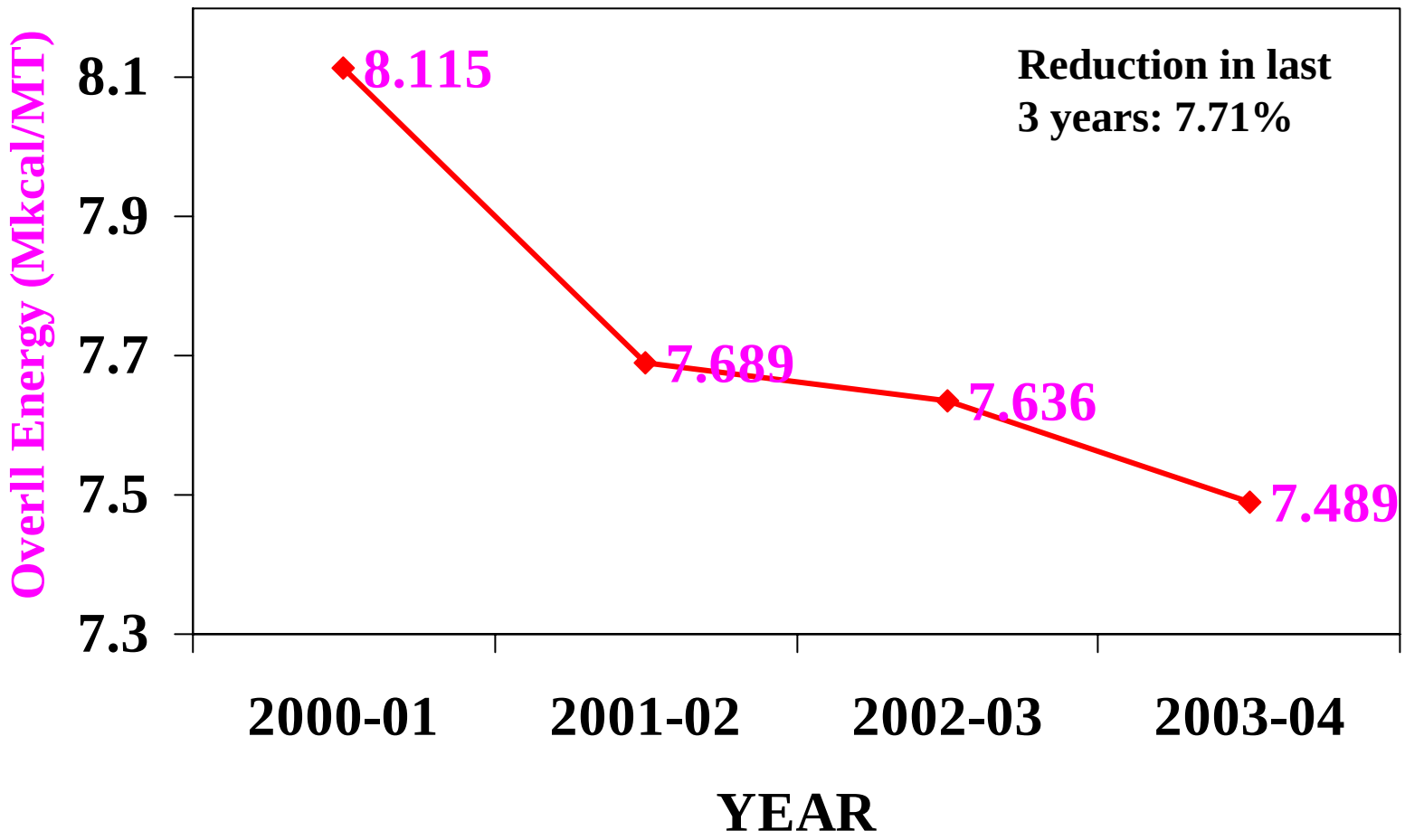
AMM- I PRODUCTION



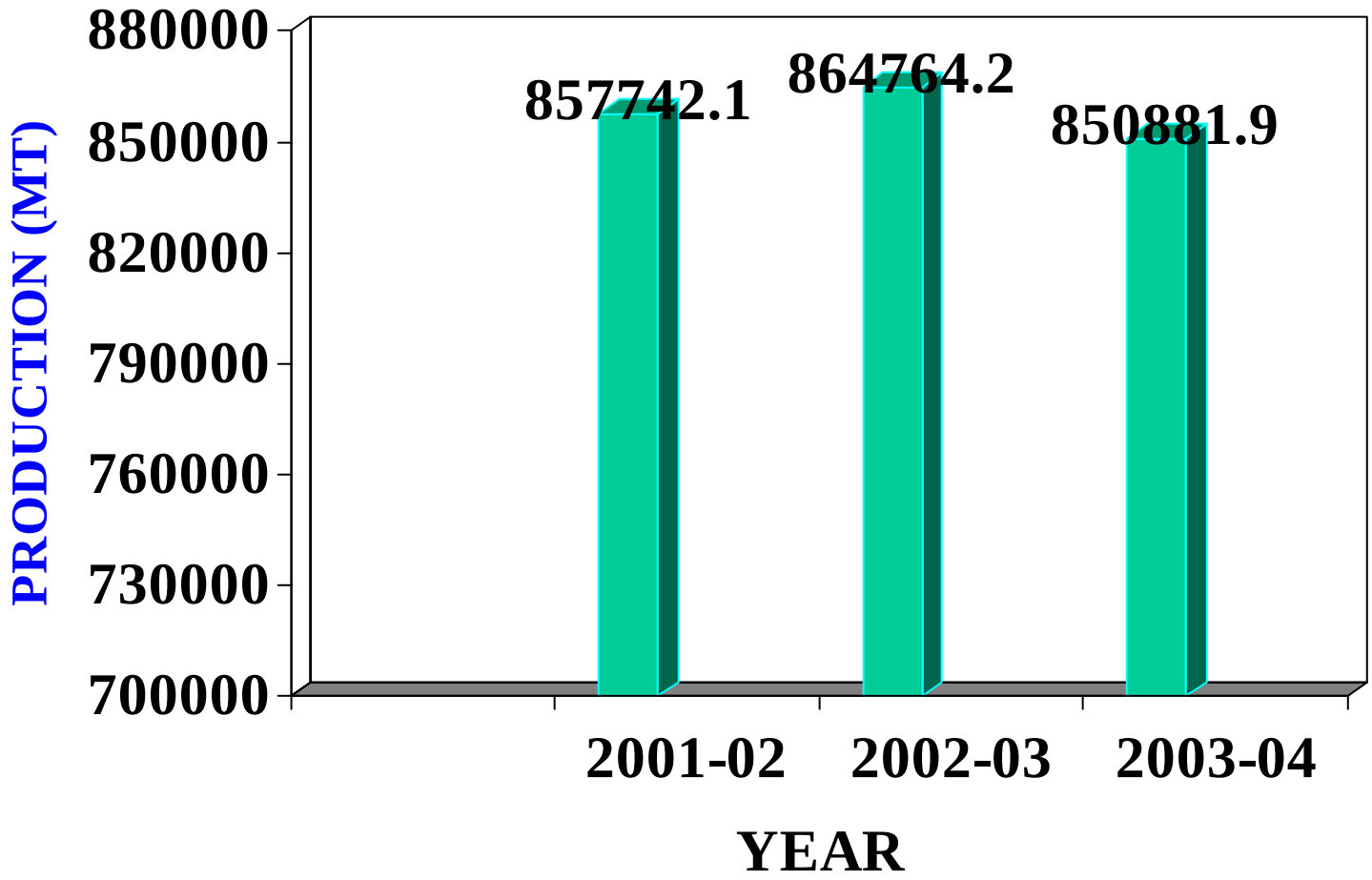
AMM - I ENERGY CONSUMPTION



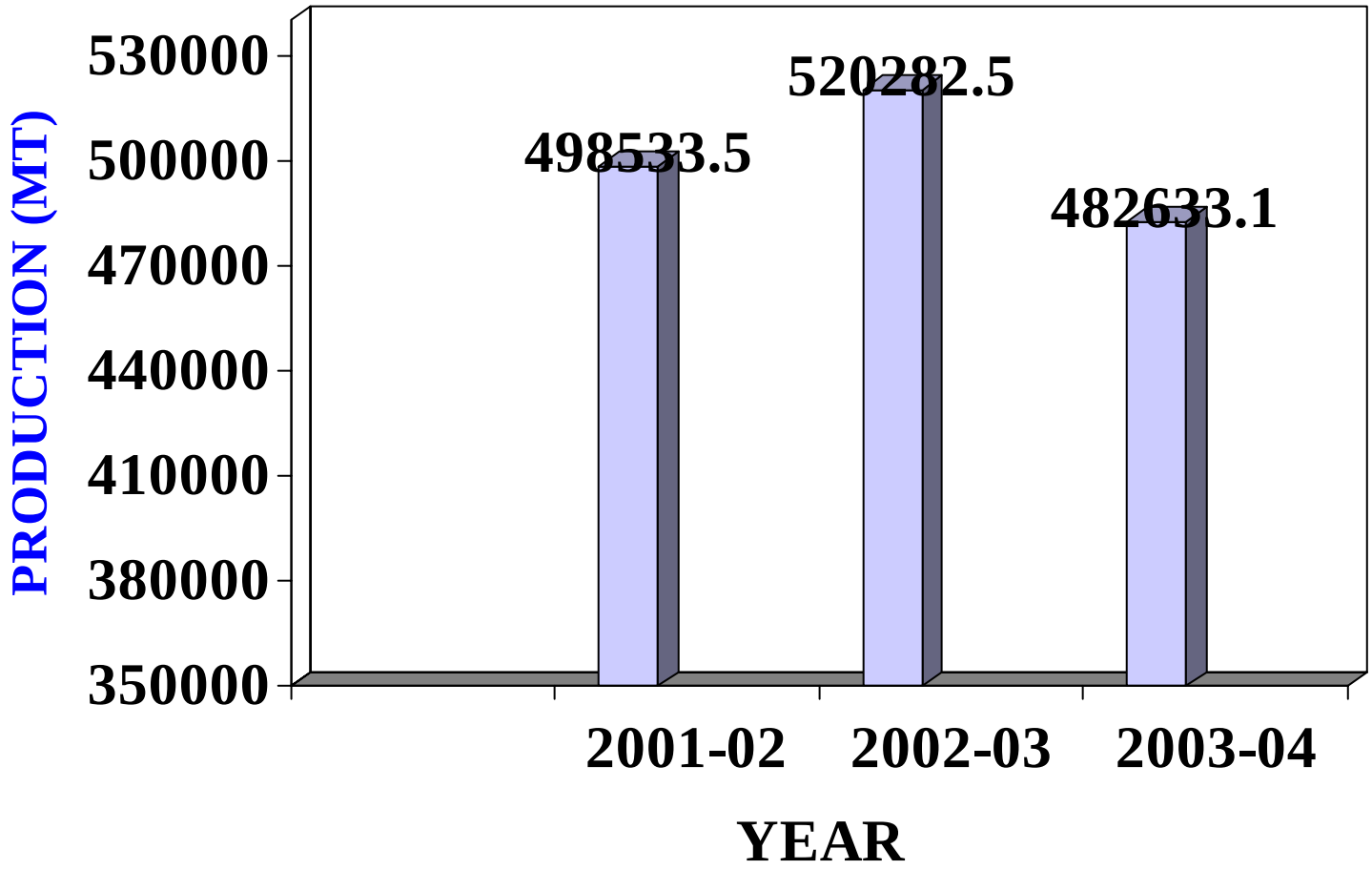
UREA - I ENERGY CONSUMPTION



UREA-II PRODUCTION



AMM - II PRODUCTION



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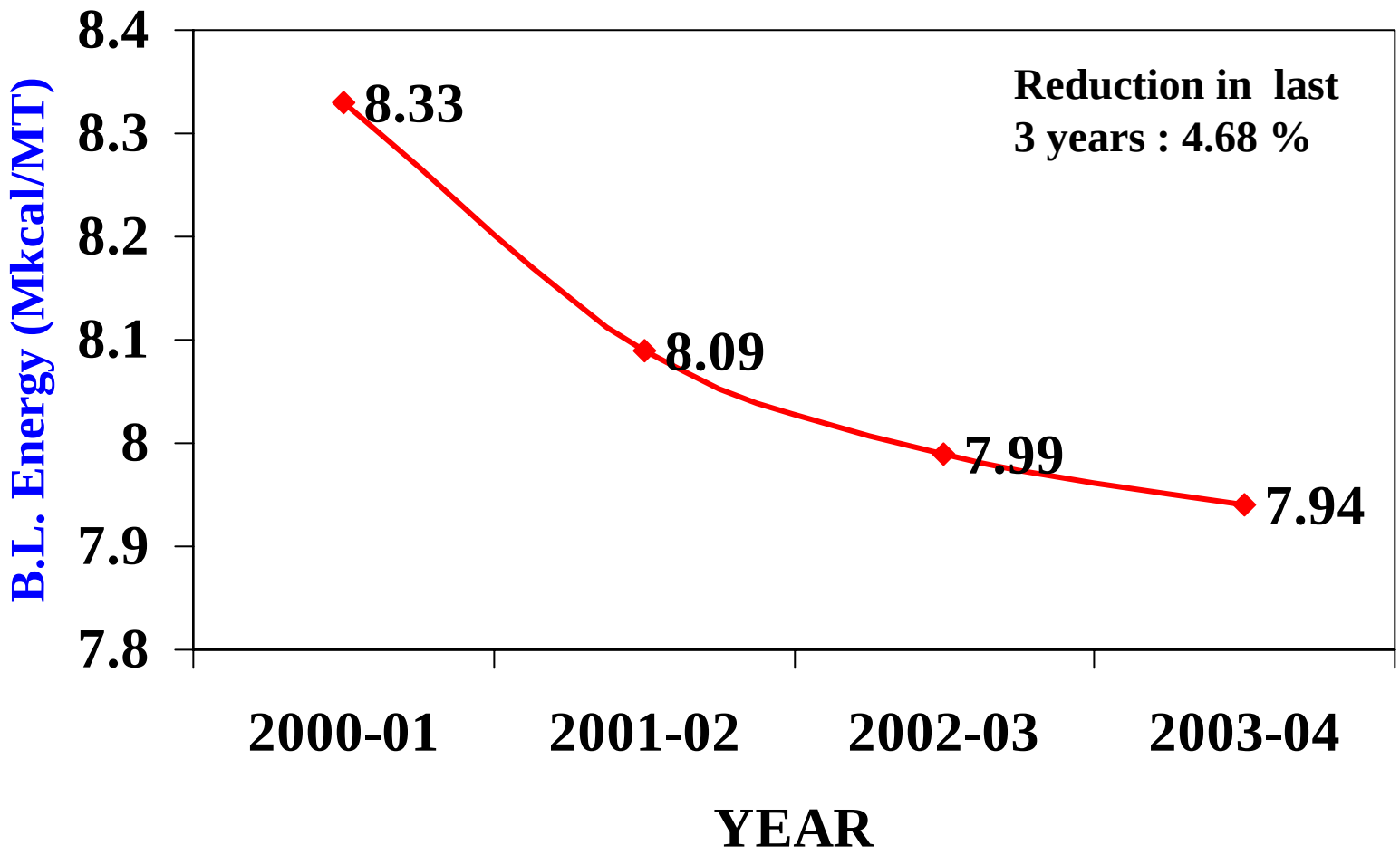
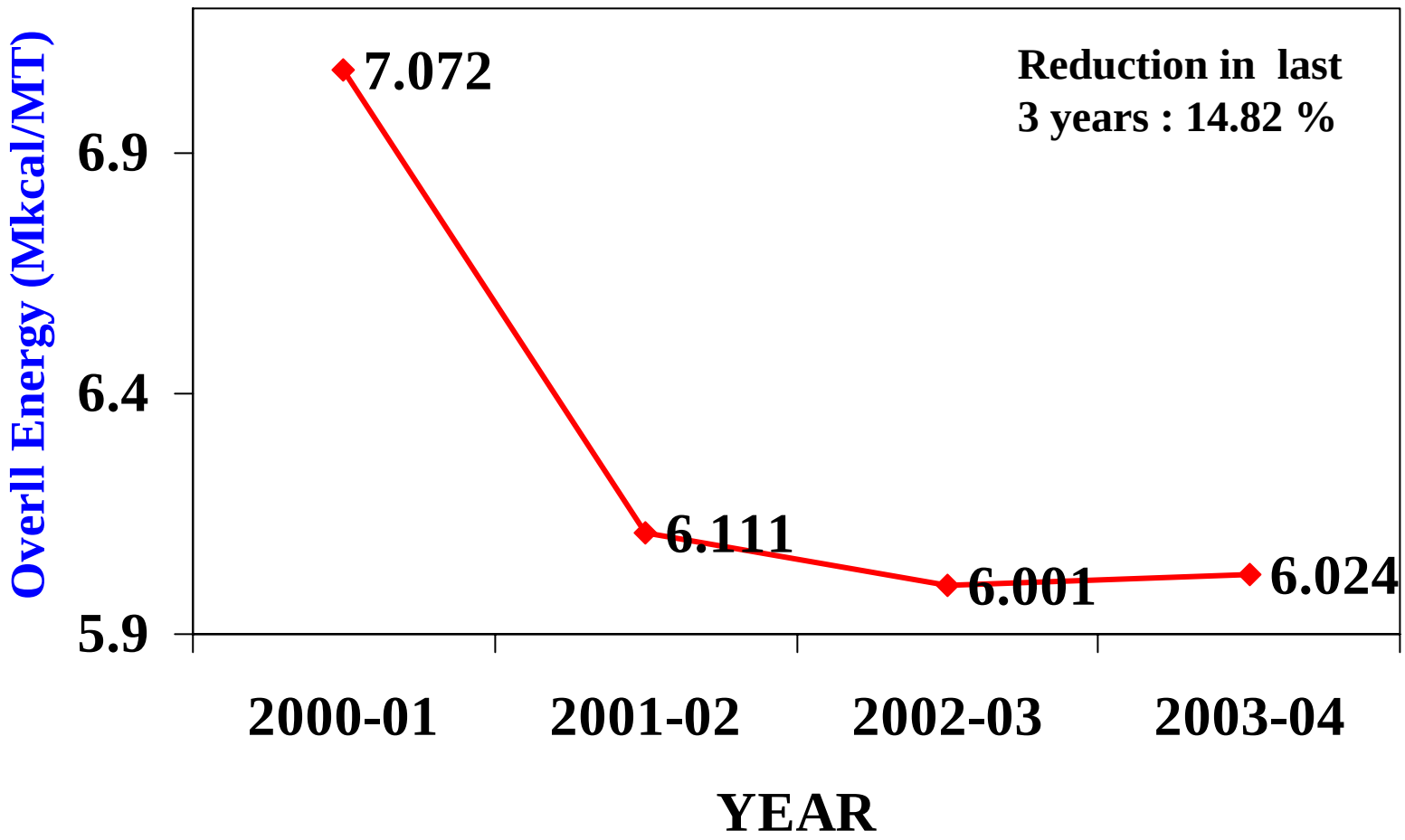
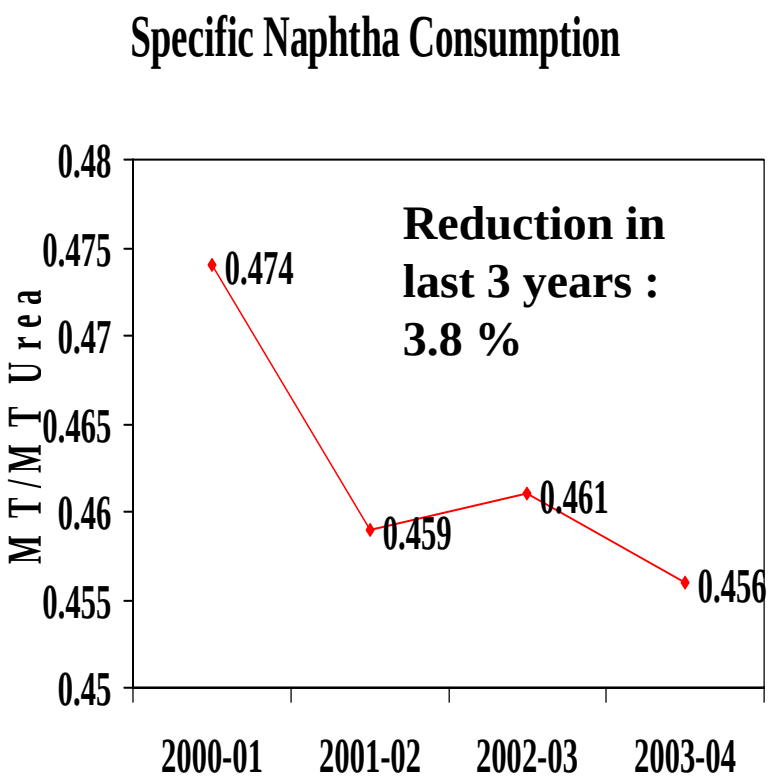
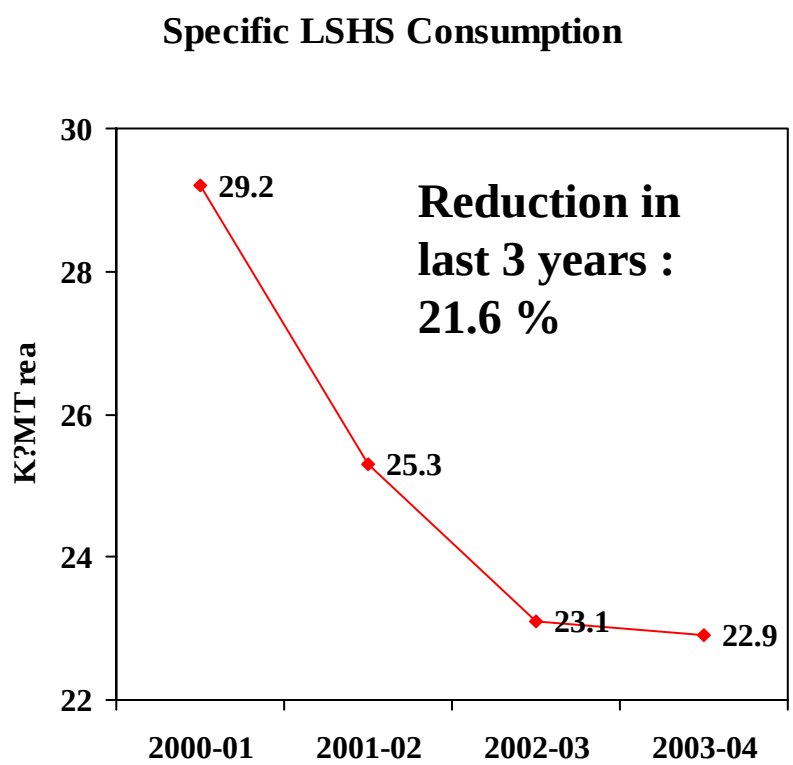


UREA - II ENERGY CONSUMPTION



PHULPUR-I : REDUCTION IN CONSUMPTION OF INPUTS





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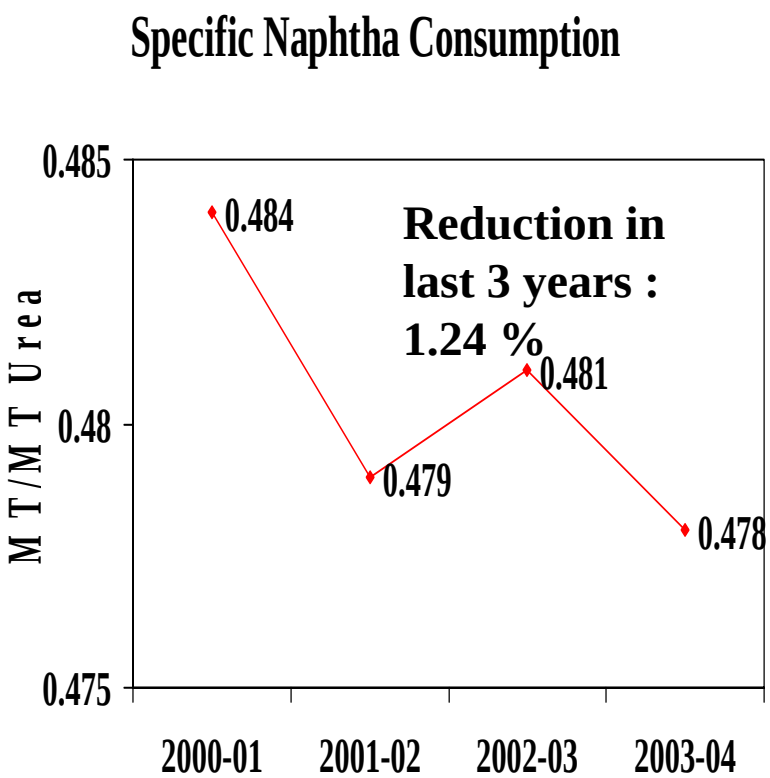
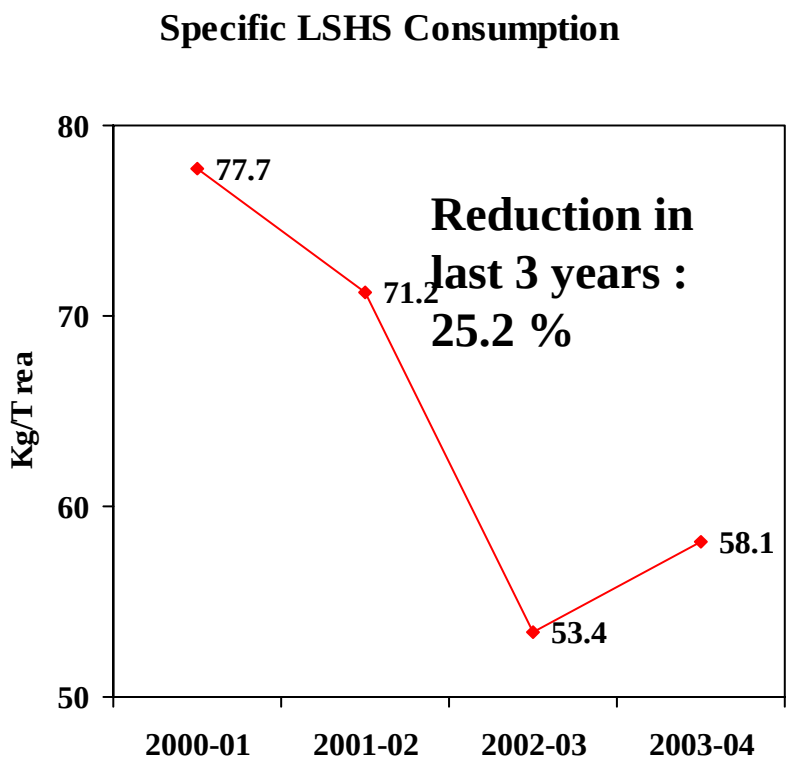
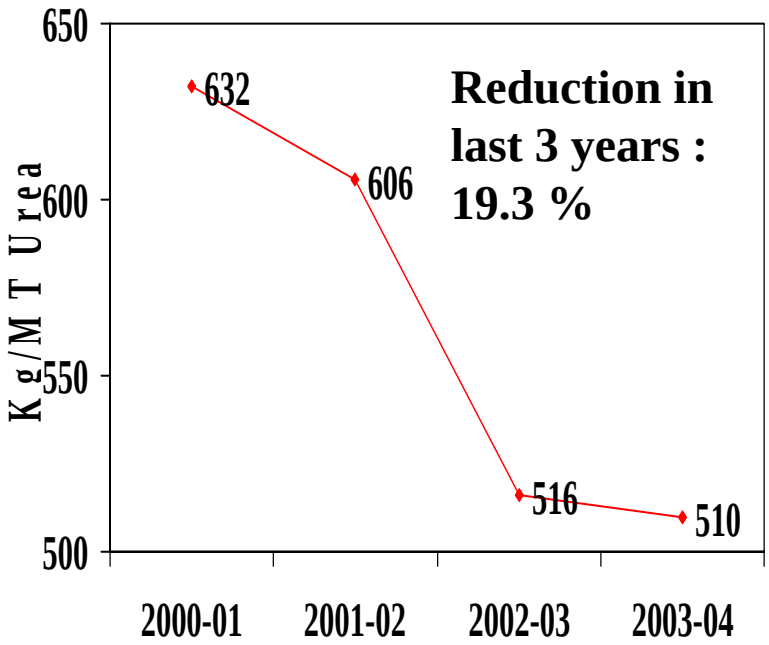


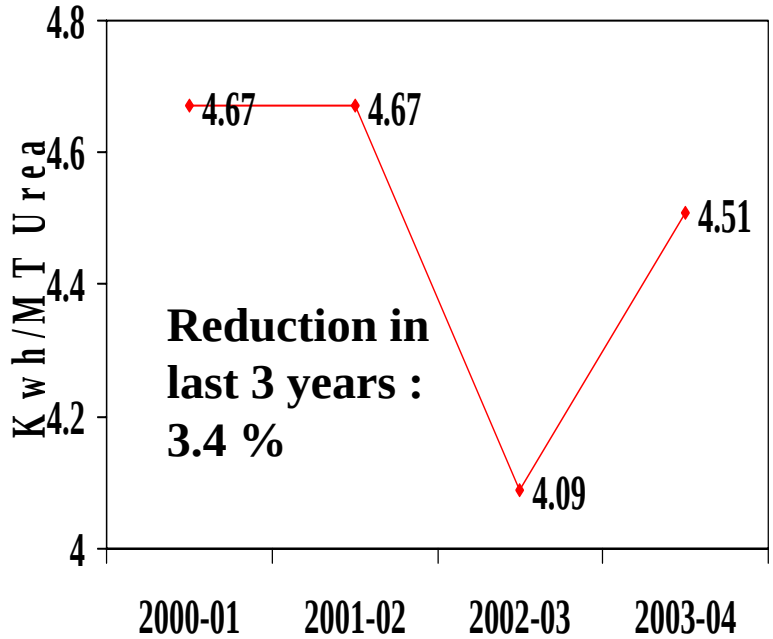


PHULPUR-I : REDUCTION IN CONSUMPTION OF INPUTS

Specific Coal Consumption



Specific Purchase Power Consumption



PHULPUR-I I: REDUCTION IN CONSUMPTION OF INPUTS

Specific Purch. Power Consumption