



1. COMPANY PROFILE

National Fertilizers Limited, a Govt. of India Undertaking, was incorporated on 23rd August 1974. It is the second largest producer of nitrogenous fertilizer in the country and has four operating fertilizer units located at Nangal, Bhatinda, Panipat and Vijaipur with a total installed capacity of 32.083 lakh tones Urea.

The Vijaipur unit, which is a ISO 9001:2000 & 14001 certified unit, comprises of two streams- Vijaipur-I and Vijaipur-II, which went into commercial production in July, 1988 and March, 1997 respectively. Both the streams are based on “*Steam reforming process*” of Haldor Topsoe (Denmark) for Ammonia plants and “*Ammonia stripping process*” of Snam Progetti (Italy) for Urea plants. Vijaipur II is more energy efficient than Vijaipur-I Plant due to incorporation of energy saving Equipments & processes at the design stage itself. It is also having provision of mixed feed (Natural Gas + Naphtha) thus giving more flexibility of operation. Both the plants have consistently achieved high levels of capacity utilization.

2. ENERGY CONSUMPTION

The details of various energy inputs and specific energy consumption during the last three years are highlighted in the table below.

DESCRIPTION	UNIT	2001-02	2002-03	2003-04
Annual Urea Production	Lakh MT	8.53411	8.64676	8.83699
Total Electric Energy consumption	Thousand MWH	97.508	93.43	100.966
Total Thermal Energy consumption	GCal	1318416.02	1274958.2	1223918.72
Total Energy consumption (Electrical+Thermal+Raw material)	GCal	5338085.80	5331592.21	5327821.27
Total Sp. Energy Cons. (Electrical+Thermal+Raw material)	Gcal/MT	6.255	6.166	6.029
Total Manufacturing Cost	Lakhs Rs.	39471.09	41610.06	41344.01
Total Energy Cost	Lakhs Rs.	33631.25	34526.83	35584.56
Total Energy Cost (Electricity + Thermal)	Lakhs Rs.	15593.27	16450.35	17175.18
Total Energy cost as %age of Manufacturing Cost	%	85.20	82.97	86.06
Energy cost (Elect+Thermal) as %age of Manufacturing cost	%	39.50	39.53	41.54

- Total Energy cost is more in 2003-04 due to use of more costly fuel, Naphtha, on account of limitations in Natural gas availability from M/s. GAIL.

3. ENERGY CONSERVATION COMMITMENT, POLICY AND SET UP

NFL, Vijapur is very much committed to Energy Management. It has established its own Energy Conservation Cell. Energy Manager for the unit has been designated for monitoring the day-to-day activities of the cell & for liaison with outside agencies.

The basic objectives of this energy cell are:

- ❖ Monitoring daily and monthly energy consumption data from each plant.
- ❖ Evaluation of energy performance by Steam and Material balance of each plant
- ❖ Preparation of Checklist of defective steam traps, insulation, leakages, and vent valve passing.
- ❖ Calculation of efficiency of rotating machines, heat exchangers etc.
- ❖ Evaluation of Process parameters and catalyst performance.

In addition to the monthly energy audit based on inputs, detailed plant wise energy audit is carried out by in-house energy cell or selected technical audit team. Energy audit is also got done by external agencies at appropriate interval of time. Long term plans, implementation of energy saving schemes are highlighted in these audits.

The functioning of Energy Management is from the top. The head of the unit holds regular weekly meetings to discuss the status of energy consumption levels & action taken on Encon options. The middle management, consisting of departmental in charges, reviews the Encon options identified by the Energy Cell or the Audit Group for implementation. Encon options/ schemes, requiring higher investment are put up to the top management (Head of unit, CMD, Directors) for approval of budget & implementation.

In addition, the Energy cell also provides regular training & awareness on the importance of energy saving, various schemes implemented etc. to the working group. Further, suggestion scheme system for workers is in vogue in the unit. Energy saving suggestions are given utmost priority for implementation & are suitably rewarded. Energy saving modifications from plant are also given top priority for early implementation.

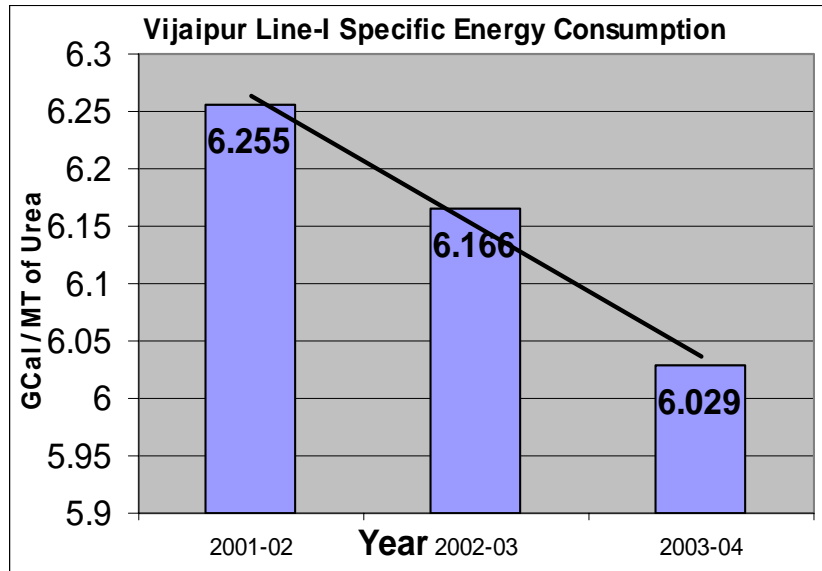
In a nutshell, the following broad strategy has been the guidelines for management of energy at NFL, Vijapur.

- ⇒ Increase capacity utilization & On-stream efficiency
- ⇒ Improve operation and maintenance practices
- ⇒ Implementation of major modifications and retrofits
- ⇒ Maximum utilization of waste and by products
- ⇒ Training and Motivation on energy conservation.

4. ENERGY CONSERVATION ACHIEVEMENTS

The specific energy consumption for the last three years are highlighted below.

Year	Overall specific energy consumption (Gcal/MT of Urea)	% reduction in energy consumption (base year 2001-2002)	Monetary saving effected (base year 2001-2002) in Rs. lakhs
2001-2002	6.255	-	-
2002-2003	6.166	1.423	219.33
2003-2004	6.029	3.613	569.19



PERFORMANCE OF VIJAIPUR-I

ITEM	UNIT	2001-02	2002-03	2003-04
<u>AMMONIA</u>				
AMMONIA PRODUCTION	MT	493982	499416	518262
CAPACITY UTILIZATION	%	98.48	99.56	103.32
ON STREAM DAYS	DAYS	352.44	328.24	347.73
ONSTREAM EFFICIENCY	%	96.56	89.93	95.01
AVG. PLANT LOAD	MTPD	1402	1521	1490
NO. OF INTERRUPTIONS	NOS.	9	6	6
SPECIFIC ENERGY CONS.	Gcal/MT	8.150	8.114	8.019
<u>UREA</u>				
UREA PRODUCTION	MT	853411	864676	883699
CAPACITY UTILIZATION	%	98.71	100.01	102.21
ONSTREAM DAYS	DAYS	343.19	327.89	339.62
AVERAGE PLANT LOAD	MTPD	2487	2637	2602
ONSTREAM EFFICIENCY	%	94.02	89.83	92.79
SPECIFIC ENERGY CONS.	Gcal/MT	6.255	6.166	6.029

THE VARIOUS ENERGY SAVING SCHEMES IMPLEMENTED DURING 2003-2004 ARE HIGHLIGHTED BELOW.

The energy cost for running condensing turbine is much higher than energy required in motor for running the same pump as cost of power generation is much lower in Vijaipur due to cogeneration mode power plant. To save on energy cost, condensing turbines are being replaced with motor or standby motors are taken in line.

Incremental energy for producing power and steam from cogeneration is listed below:

105 ata steam = 0.758 Gcal/MT steam
 40 ata steam = 0.705 Gcal/MT steam
 3.5 ata steam = 0.600 Gcal/MT steam
 Power = 1020 kcal/kWh
 = 1.020 Gcal/MWh

1. REPLACEMENT CONDENSING TURBINE OF COOLING WATER PUMPS IN AMMONIA-I PLANT TO MOTOR.

- The energy cost for running condensing turbine to pump cooling water is much higher than energy required in motor for running the same cooling water pump as cost of power generation is much lower in Vijaipur due to cogeneration mode power plant.
- The scheme has been implemented & motor is in line since 24/11/2003. Actual energy saving is to the tune of around 0.034 GCal / MT Urea
- PAYBACK: Annual savings : Rs. 450.00 lakhs
 Investment : Rs. 84 lakh
 Payback : Around 2.5 month



2. HEAT RECOVERY FROM PC BY INSTALLING DM WATER PREHEATER IN AMMONIA-I PLANT

- The treated process condensate is cooled by CW in final cooler from about 90°C to 40°C. It is proposed to recover the available heat of PC by exchanging heat with DM water in plate heat exchanger. The pressure of PC stripper raised to 1.5-2.0 kg/cm²g to make heat recovery possible.
- PAYBACK: Annual savings : Rs. 680.00 lakhs
 Investment : Rs. 60.00 lakhs
 Payback : About 1 months



3. IMPROVEMENT IN POWER OUTPUT FROM HYDRAULIC TURBINE IN AMMONIA I PLANT

- Due to limitation in operation of inlet guide vanes of Benfield hydraulic turbine, the power output was limited to 300 KW only. Major part of the solution was being let down through control valve which was a wastage of energy. With suitable minor modifications in the guide vane & flushing system, the output could be increased to 650 KW.
- PAYBACK: Annual savings : Rs. 15.00 lakhs
 Investment : Nominal
 Payback : Immediate.

4. CONVERSION OF DELTA CONNECTION OF MOTORS TO STAR CONNECTION

- Connection to 20 nos. Induction motors were changed from delta to star connection. This resulted in reduction in power consumption in the motors.
- PAYBACK: Annual savings : Rs. 3.00 lakhs
Investment : Nominal
Payback : Immediate.

5. ENERGY CONSERVATION PLANS AND TARGETS

On the basis of Internal Energy Audit carried out in 2003-04 & other audits, the unit has the following future action plan in the pipeline for conservation of energy.

Sl. No.	Plan	Implementation (Year)	Annual Savings	
			Energy, GCal	Lakh, Rs.
1	Import of Process Air in Ammonia-1 from Ammonia-2	2004-05	3026	21
2	Installation Of Additional Trays in Urea Reactor in all streams of Urea Plant	2004-05	17292	121
3	Installation of Purge gas heater in Ammonia plant	2004-05	484	3.4
5	Installation of Pre-concentrator in both streams of Line-I Plant	2005-06	84730	605

6. ENVIRONMENTS AND SAFETY

6.1. ENVIRONMENT

National Fertilizers Limited has its own corporate Environment Management Policy, which gives utmost importance to 'Environment Protection' in and around the complex. **N.F.L., Vijapur is an ISO-14001 unit certified by M/s. KPMG, Netherlands** based on the procedures & targets laid down. The unit has been constantly upgrading the concept of conservation, recycle & reuse for optimum utilization of inputs. This has also helped in reducing waste discharges thus preventing pollution. The unit has bagged many prestigious awards for efficient environment control.

A cell called "Environment Monitoring & Control Cell" is constituted which exclusively looks after environmental aspects in & around the factory. They are responsible for the monitoring & control of environmental pollution, liaison with authorities as well as impart awareness & training to employees.

Water Pollution Control

- Hydrolysers in Urea & Strippers in Ammonia plant are provided to treat the process condensate from respective plants. All condensate from plant is processed, recycled & reused in the process.
- Non chromate based Cooling water treatment poses no problem for pollution
- Full fledged Effluent treatment plant to treat acidic/alkaline waste. All treated water is used for horticulture purposes in factory & surrounding areas.
- Full capacity Sewage Treatment plant is provided in to treat the sewage water from township. The treated water is used for watering purposes in township kitchen garden.
- With the above facilities, NFL, Vijapur is able to adopt the concept of Zero Effluent discharge.

Air pollution control

- Natural gas or Naphtha is used as fuel in all the furnaces at NFL, Vijapur. Emissions normally remain within limit. Analysers are provided in stacks in line II for continuous monitoring of emissions. Monthly monitoring of all stacks done by laboratory.
- The generation of dust in Urea Prilling Tower is kept well within the stipulated limits by using a rotary bucket for prilling.

- Dust extraction systems have been installed on conveyor belt stations & bagging plant to reduce urea dust emissions.
- Ambient air monitoring stations are provided at four different locations in the plant as well as in township.

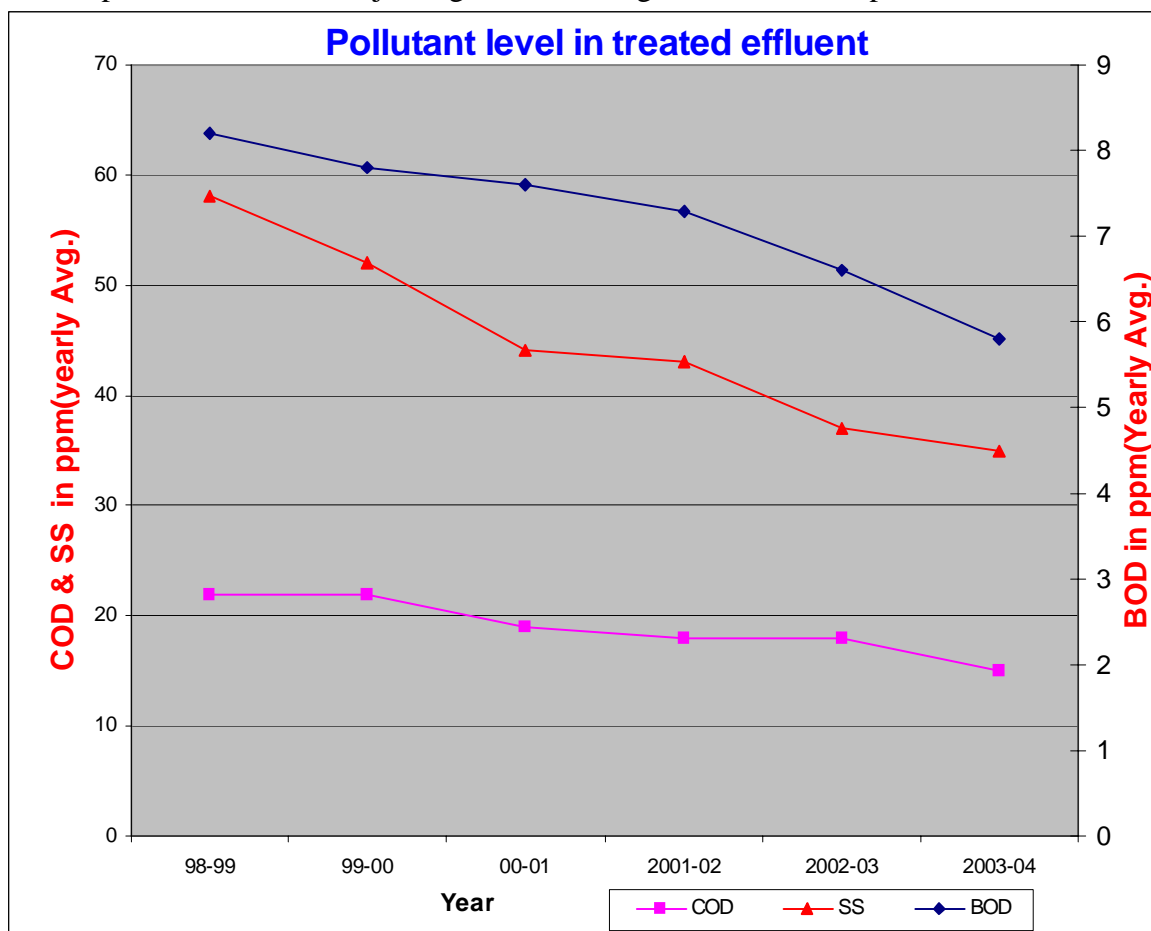
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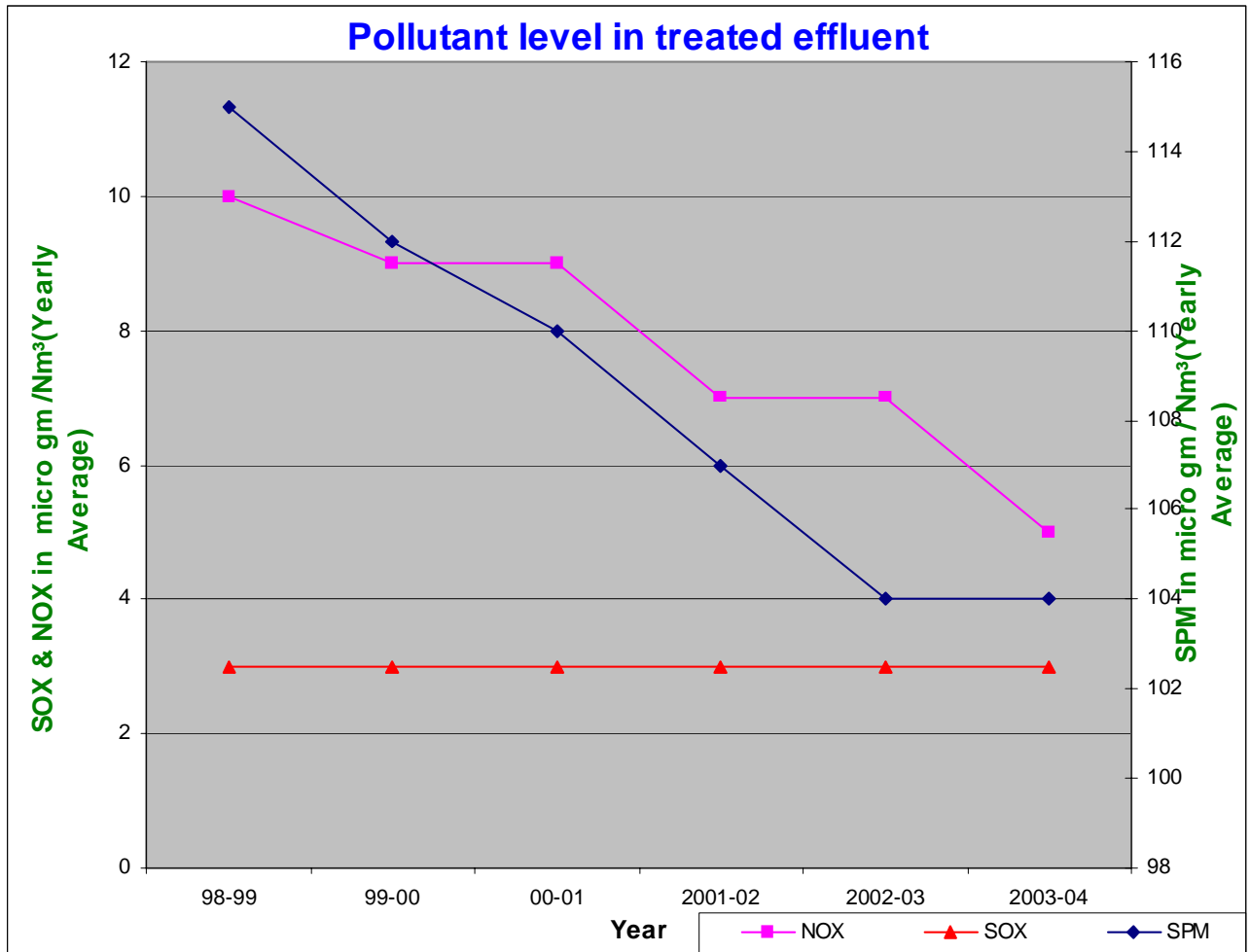
- All solid waste like spent catalyst, spent oil etc. are stored in drums on solid platform & under roof to prevent pollution. These are disposed as per guidelines of Pollution Control Board.
- Incinerator system has been provided in the Hospital for safe disposal of hospital waste.

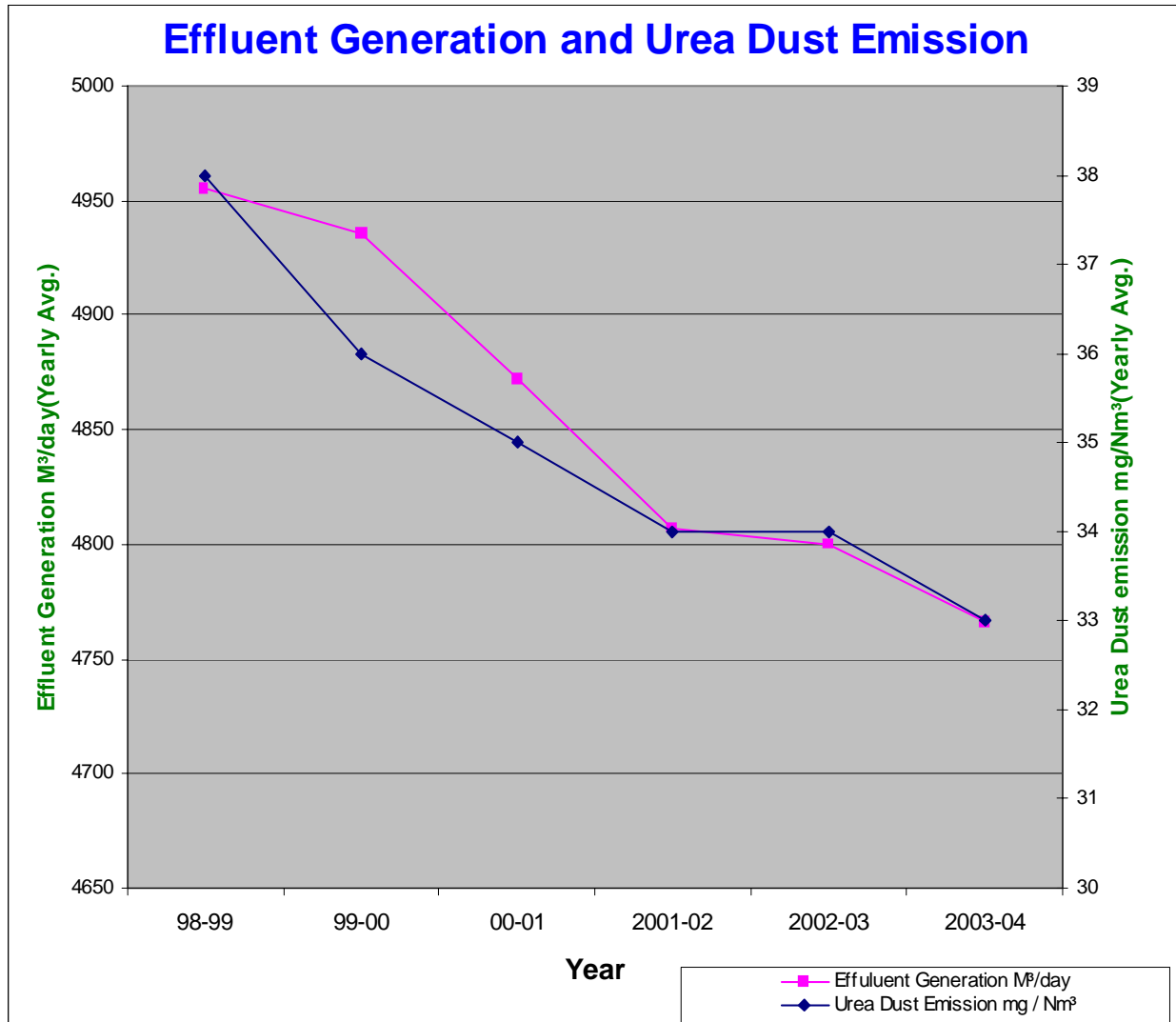
Green Belt Development

To improve the ecological balance of environment an extensive programme has been taken up for tree plantation in and around the NFL Complex.

- About 2,00,000 trees of 86 different species have been planted so far by NFL Management covering approx. 206 hectares of land.
- A target plantation of 10,000 saplings every year is maintained.
- Tree plantation work in adjoining areas & villages is also taken up.







6.SAFETY

National Fertilizers Limited, Vijaipur has its own Safety policy. It aims at creating safe working conditions & habits in order to eliminate Industrial Accidents. National Fertilizers Limited, Vijaipur has adopted several measures to achieve this goal.

- Integration of safety with various departments, familiarization of the employees with the general and special safety practices like Safe Work Permit and enforcing them in their work place,
- Deputation of employees in various in house as well as external programmes, celebration of National Safety day.
- Safety audit is conducted every year by external agencies. M/s Chemical Design Company, Hyderabad, conducted safety audit for the year 2003-2004. Recommendations were implemented.
- Plant level & Central Safety Committees are set up who suggest safe practices for implementation.
- Combined Risk Analysis report of Hazardous Plant i.e. M/s GAIL, IOCL and NFL at Vijaipur was carried out by M/s PDIL Sindri. Onsite Emergency plan (Rev.03) and safety report revised accordingly. Based on combined Risk analysis report Offsite emergency plan is being revised by M/s NFL Vijaipur on behalf of Collector Guna, Madhya Pradesh.
- Mock drills of Onsite Emergency plan for leakage of Chlorine toner valve leakage done on 28/11/2003.
- Mutual Aid Agreement with M/s GAIL , Vijaipur.



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2. ENERGY CONSUMPTION OF VIJAIPUR-II PLANT

The details of various energy inputs and specific energy consumption during the last three years are highlighted in the table below.

DESCRIPTION	UNIT	2001-02	2002-03	2003-04
Annual Urea Production	Lakh MT	8.53412	8.66919	8.64788
Total Electric Energy consumption	Thousand MWH	82.425	85.978	86.512
Total Thermal Energy consumption	GCal	978931.1	939468.63	880089.9
Total Energy consumption (Electrical+Thermal+Raw material)	GCal	4875542.75	4972647.38	4867026.86
Total Sp. Energy Cons. (Electrical+Thermal+Raw material)	Gcal/MT	5.713	5.736	5.628
Total Manufacturing Cost	Lakhs Rs.	36156.11	42615.1	51524.85
Total Energy Cost	Lakhs Rs.	27113.32	34288.88	37968.89
Total Energy Cost (Electricity + Thermal)	Lakhs Rs.	8607.13	10107.75	11074.69
Total Energy cost as %age of Manufacturing Cost	%	74.99	80.46	73.69
Energy cost (Elect+Thermal) as %age of Manufacturing cost	%	23.81	23.72	21.49

- Total Energy cost is more in 2003-04 due to use of more costly fuel, Naphtha, on account of limitations in Natural gas availability from M/s. GAIL.

3. ENERGY CONSERVATION COMMITMENT, POLICY AND SET UP

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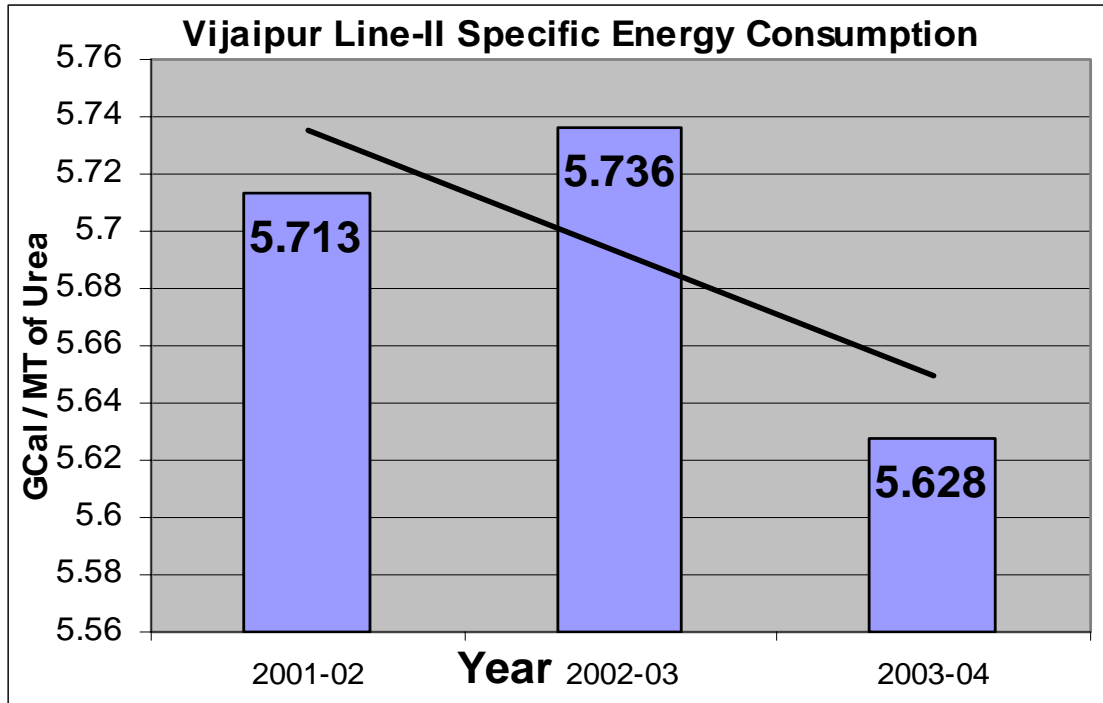
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2001-2002	5.713	-	-
2002-2003	5.736	-0.403	-56.83
2003-2004	5.628	1.488	209.49



PERFORMANCE OF VIJAIPUR-I

ITEM	UNIT	2001-02	2002-03	2003-04
<u>AMMONIA</u>				
AMMONIA PRODUCTION	MT	495092	503119	495613
CAPACITY UTILIZATION	%	98.70	100.30	98.81
ON STREAM DAYS	DAYS	339.71	348.44	333.48
ONSTREAM EFFICIENCY	%	93.07	95.46	95.46
AVG. PLANT LOAD	MTPD	1457	1444	1486
NO. OF INTERRUPTIONS	NOS.	4	6	6
SPECIFIC ENERGY CONS.	Gcal/MT	7.816	7.848	7.777
<u>UREA</u>				
UREA PRODUCTION	MT	853412	866919	864788
CAPACITY UTILIZATION	%	98.71	100.27	100.02
ONSTREAM DAYS	DAYS	324.59	338.46	328.95
ONSTREAM EFFICIENCY	%	88.93	92.73	89.88
AVG. PLANT LOAD	MTPD	2629	2561	2629
SPECIFIC ENERGY CONS.	Gcal/MT	5.713	5.736	5.628

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 40 ata steam = 0.705 Gcal/MT steam
 3.5 ata steam = 0.600 Gcal/MT steam
 Power = 1020 kcal/kWh
 = 1.020 Gcal/MWh

1. REPLACEMENT OF TURBINE OF P-3322/3323 PUMPS WITH MOTOR.

- Turbines of these pumps were kept stand by and as such steam was required to keep turbine in hot condition. Turbines were replaced with motors. Motors were arranged from in-house.
- In Ammonia II plant, two nos. HP condensate pumps driven by back pressure turbines are available & remain as standby. Frequent problems were encountered with the turbines. Moreover the steam losses were heavy. In order to save on steam losses & to utilize cheaper power, these turbines were replaced with suitable motors available in house. It has resulted in saving of about 2 MT/hr of steam.
- The scheme has been implemented. Energy saving is to the tune of around 0.0012 GCal / MT Urea.
- PAYBACK: Annual savings : Rs 15.50 Lakhs
 Investment : NIL

2. RUNNING OF STAND BY HT MOTORS IN VIJAIPUR-II PLANT

- Standby motor in Ammonia / Urea Cooling tower (MP-3801C / MP-4801C) were taken in line and one condensing turbine each was stopped. In GV section stand by motor (MP-3301C) for semi lean solution was taken in line and one of the two running condensing turbine was stopped.
- In GV section stand by motor (MP-3301C) for semi lean solution was taken in line and one of the two running condensing turbine was stopped As per original operation philosophy, both semi lean pumps are to be run with condensing steam turbines & motor drive to be kept as standby. Steam was being imported from offsite. Steam generation being costlier, motor driven pump was taken in line & one of the turbine driven pumps was stopped. This resulted in saving of condensing steam & import from offsite.
- Suitable modifications were done in load management system.
- Energy saving is to the tune of around 0.082 GCal / MT of Urea.
- PAYBACK: Annual savings : Rs. 1045.00 lakhs
 Investment : NIL



Replacement of Condensing Turbine in Urea-II Cooling Tower



Running of Standby motor in Amm-II CT and stopping of One condensing turbine



P-3323B Turbine Replaced with Motor



Running of Standby GV Solution Pump Motor And stopping of one condensing turbine.

3 FUEL GAS PRESSURE CONTROL DURING REFORMER HEATING

- During cold start up of Primary Reformer, slow heating is done which requires very low flow of fuel. The control valve cannot handle such low flow & pressure fluctuates. To maintain pressure, high flow of gas is maintained & part of it is vented out. To avoid this wastage, a smaller valve was provided parallel to existing valve. This will save NG equivalent to Rs.0.75 lakh per start up.
- Material was arranged in-house.

5 ENERGY CONSERVATION PLANS AND TARGETS

On the basis of Internal Energy Audit carried out in 2003-04 & other audits, the unit has the following future action plan in the pipeline for conservation of energy.

Sl. No.	Plan	Implementation (Year)	Annual Savings	
			Energy, GCal	Lakh, Rs.
1	Import of Process Air in Ammonia-1 from Ammonia-2	2004-05	3026	21
2	Replacement of Condensing steam turbine of one CW Pump in Urea II plant with motor	2004-05	25930	164

6 ENVIRONMENTS AND SAFETY

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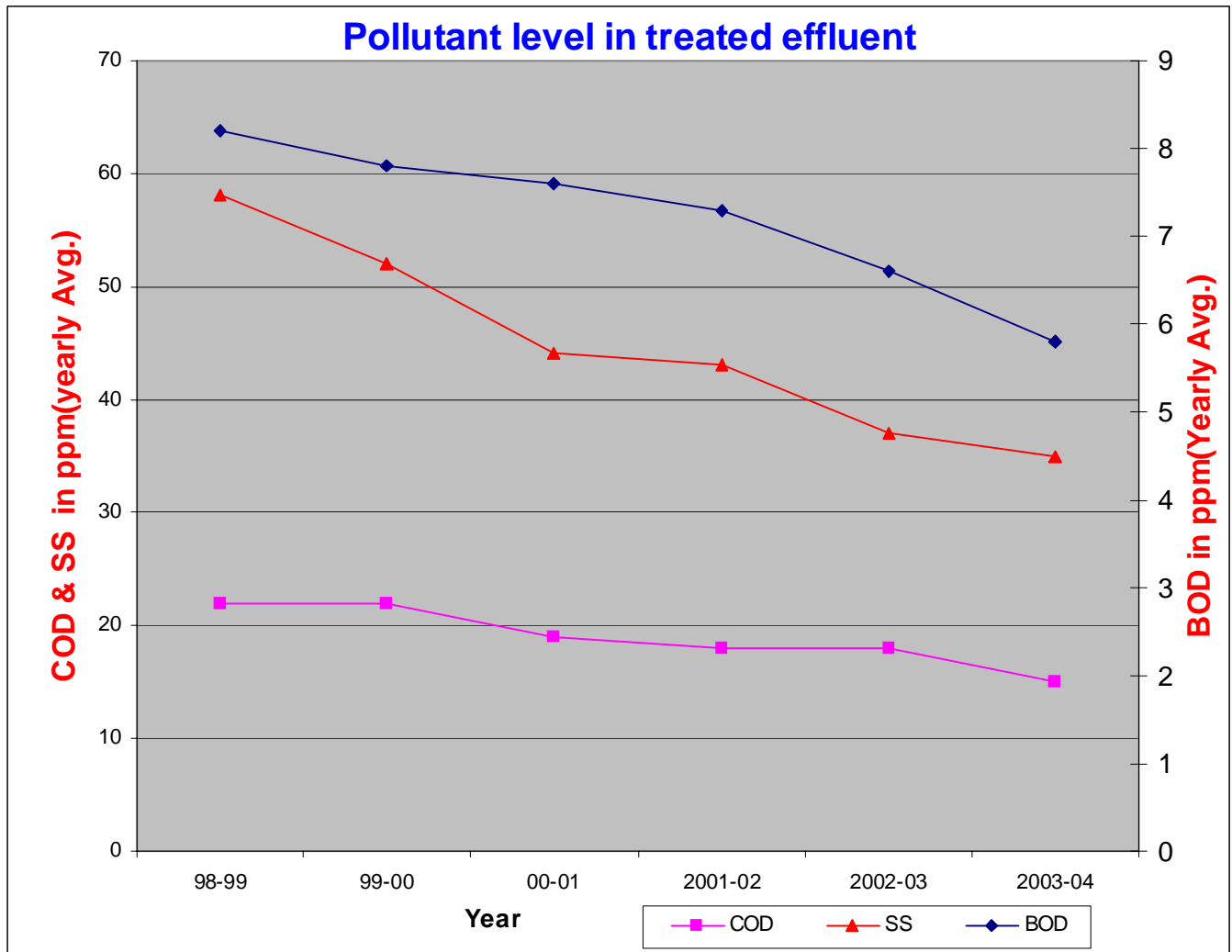
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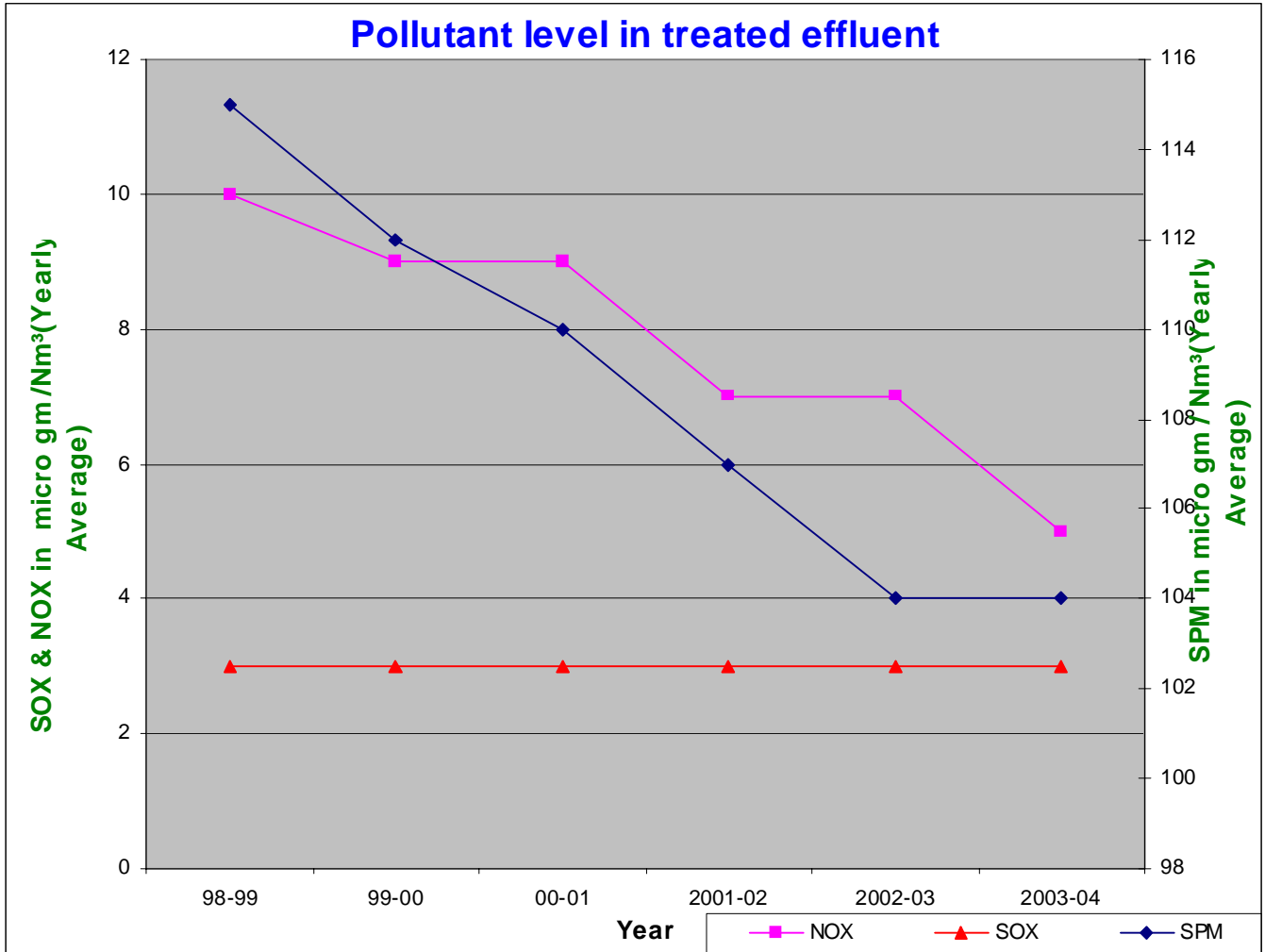
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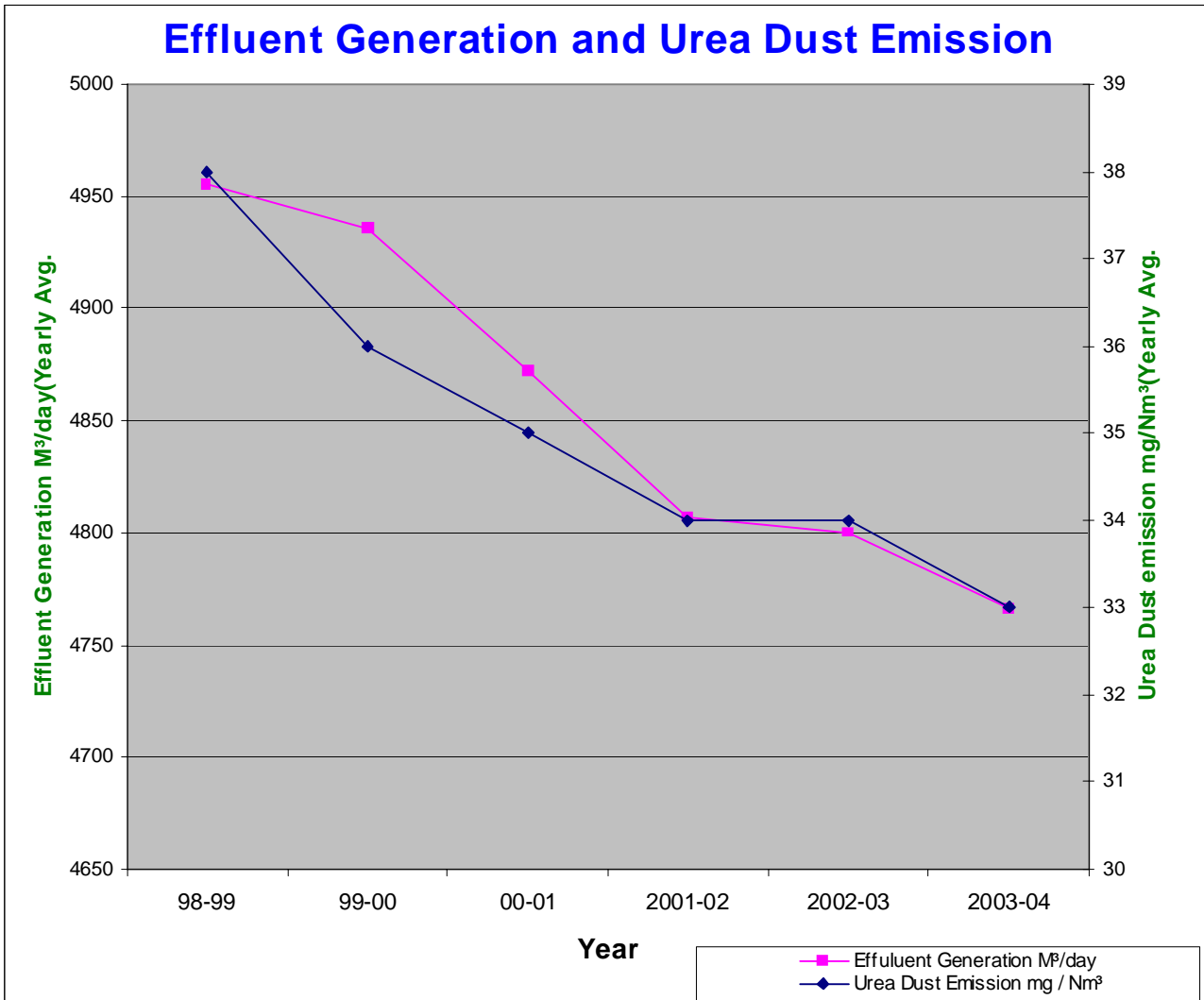
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