

Indian Farmers Fertiliser Cooperative Limited., Aonla

(i) Unit profile:

Towards increasing the fertiliser production the overall national planning for utilisation of natural gas available from Bombay high, Indian Farmers Fertiliser Cooperative Ltd. (IFFCO) was entrusted for setting up a urea fertiliser complex with annual capacity of 8.646 lakh tonnes of urea at Aonla, Bareilly. The site at Aonla is about 28 KM south west of Bareilly on Bareilly-Aonla road. In the year 1996 the production capacity was doubled with the commissioning of Aonla-II having urea production capacity of 8.646 lakh tonnes.

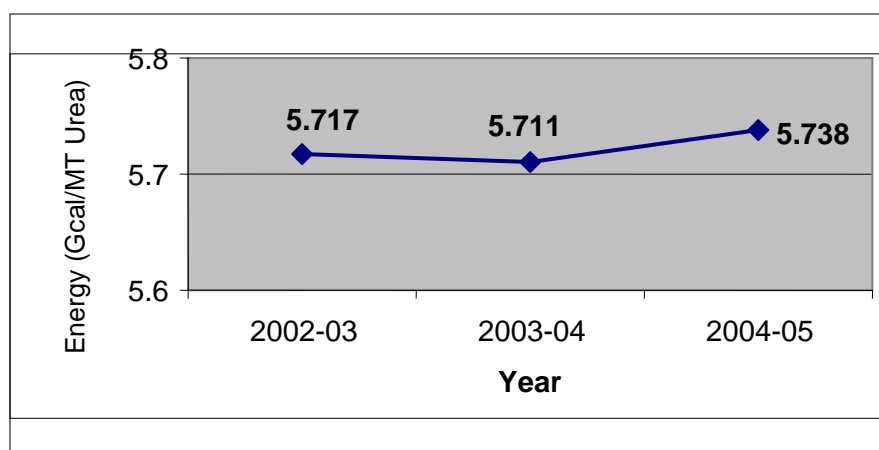
Aonla-I is IFFCO's fourth giant fertiliser complex having a 1520 MT per day ammonia plant and two urea plants with a total capacity of 2620 MT per day. Steam and power generation units, inert gas generation plant, water treatment plant, cooling towers, product handling plant, ammonia storage, urea silo etc. are the other auxiliary units of the fertiliser complex.

Right from the inception of the project, IFFCO-Aonla-I has achieved several milestones in record time. Aonla-I project was completed in a record time of 36 months and started commercial production in 42 months from the zero date. The implementation of Aonla-I project has been taken as a model for future fertiliser projects by Government of India. IFFCO Aonla-I has also bagged two prestigious national awards – one for best project implementation (second prize) from Ministry of Programme implementation, Govt. of India and other for technical film “New Horizons – Aonla project” from Fertiliser Association of India (FAI) in the year 1989.

IFFCO-Aonla has received following recognitions/awards till date:

- 1) Implementation of Aonla-I project has been taken as a model for future projects by Government of India.
- 2) IFFCO Aonla-I has bagged two prestigious national awards – one for best project implementation (second prize) by Ministry of Programme implementation, Govt. of India and other for technical film “New Horizons – Aonla project ” by FAI.
- 3) ASCI, Hyderabad has adopted implementation of Aonla-I project as a model case study for their general management level courses.
- 4) Doordarshan, Lucknow and Delhi in its national network presented the story of the Aonla-I project highlighting project completion and its other social activities.
- 5) Adjudged first in the country for excellence in energy conservation and management by Ministry of Power (Fertiliser sector), Govt. of India for the year 1993.
- 6) IFFCO – Aonla-I has received commendation certificate in appreciation of the efforts made in the field of energy conservation in fertilisers sector for the year 1995 from Ministry of Power, Govt. of India.
- 7) National productivity council has presented a certificate of merit to IFFCO Aonla-I in the year 1995 in recognition of the performance in productivity during the year 1993-94.
- 8) IFFCO Aonla unit has been certified for ISO-9002 & ISO-14001 by M/s KPMG & M/s BVQI respectively.
- 9) IFFCO Aonla unit has won the FAI award for excellence in safety for the year 2001-2002.
- 10) IFFCO A onla unit has won the NSCI safety award-2000 (Prasansa Puraskar) from National Safety Council of India.
- 11) IFFCO Aonla unit-I has been selected for National Energy Conservation Award, 2002 (Certificate of Merit) in fertiliser sector by Ministry of Power, Government of India.
- 12) Fertiliser Association of India has awarded the Best Article Award (3rd prize) for the article Maintenance and Inspection of a Modern Fertiliser Plant.
- 13) National Energy conservation Award-2003 (Certificate of Merit)
- 14) NSCI Safety Award-2002 (Prashansa Patra)
- 15) IFFCO Aonla has bagged Corporate Environment Award 2002-03 (certificate of participation) from TERI in recognition of the efforts made towards environment management and sustainable initiative.
- 16) IFFCO Aonla unit has won Golden Peacock Environment Management Award – 2005 (certification of commendation).
- 17) IFFCO Aonla has won National Safety Award – 2004 (Runner under scheme-II).

ii) Energy consumption



IFFCO Aonla-I commenced ammonia production on 15th May, 1988, urea production on 18th May, 1988 and went into commercial production on 16th July, 1988. Since then IFFCO-Aonla-I has completed fifteen years of its operation and has attained number of achievements and records to its credit. In the very first year (1988-89) of its operation, Aonla-I performed creditably by achieving a capacity utilisation of 94% and 98% for ammonia and urea plant respectively and the performance of Aonla-I has improved steadily over the years.

During 2002-2003, Aonla-I produced 8.66 lakh MT of urea against installed capacity of 8.646 lakh MT and 5.13 lakh MT of ammonia against installed capacity of 5.016 lakh MT. Ammonia plant achieved yearly average energy consumption (B.L) is 7.83 GCal/MT ammonia with capacity utilisation of 102.3%. **Lowest , till date, yearly overall specific energy consumption of 5.717 GCal/MT urea was achieved during this year.** Capacity utilisation of urea plant was 102.3%.

In the year (2003-2004), ammonia plant produced 5.19 lakh tonnes of ammonia with a capacity utilisation of 103.44%. Yearly B.L. energy consumption of 7.8480 GCal/MT ammonia and on-stream efficiency of 96.46% were achieved during the year. Urea plant also performed very well during this year. The plant achieved production of 8.65 lakh MT of urea. **Ever lowest yearly overall specific energy consumption of 5.7112 GCal/MT urea was achieved during the year.**, Capacity utilisation of urea plant was 100.02% .

During the year 2004-2005, Aonla-I produced 8.647 lakh MT of urea against installed capacity of 8.646 lakh MT and 5.125 lakh MT of ammonia against installed capacity of 5.016 lakh MT. Ammonia plant achieved yearly average energy consumption (B. L.) of 7.9707 GCal/MT ammonia with a capacity utilisation of 102.18%. Yearly average energy consumption achieved in urea plant was 5.7381 GCal/MT with a capacity utilisation of 100.01%. **Lowest monthly B.L. specific energy consumption of 7.579 Gcal/MT for Ammonia has been achieved in the month of May, 2004. Lowest monthly overall specific energy consumption of 5.483 Gcal/MT for Urea has been achieved in the month of May, 2004.**

(iii) Energy conservation commitment, policy organisational and set-up:

Energy conservation is a major corporate objective for IFFCO as such, and more so, for Aonla unit. Joint General Manager (Technical Services) coordinates the activities of energy conservation and cost reduction at IFFCO Aonla unit. Five different energy auditing, plant health and performance monitoring cells have been formed one each for ammonia, urea, product handling, offsites and power plant. Each cell consists of one person each from technical, respective production, maintenance and instrumentation sections with the person from technical as the coordinator of the cell. Persons selected for these cells are from middle management level having experience of about 15 years. These cells directly report Executive Director. These cells have been made responsible for coordinating the various activities and its implementation so that no snowballing takes place for purpose of implementation.

Energy conservation & cost reduction measures have been classified broadly into three categories viz :

- I) Change in operating practices without any investment.
- II) Minor process modifications involving small investments.

III) Incorporation of major energy saving retrofits involving large investments.

In addition to this, a number of plant performance and energy reports are prepared on daily, weekly, monthly and yearly basis by this group depicting the specific consumption of inputs, plantwise specific energy consumption etc. And their deviations from design figures are circulated among the plant operating personnel which help to a great extent in monitoring and optimising the plant performance. Equipments performance evaluation, steam balance etc. Are also done periodically to find out the inefficiency in any section of plant and to take corrective action in advance.

The salient features of the strategy being followed at Aonla to reduce energy consumption are:

- A) Incorporation of proven energy conservation schemes involving large investments.
- B) In-house minor modifications for energy conservation schemes involving small investments.
- C) Utilisation of excess steam from one plant to another.
- D) Continuous efforts to reduce steam consumption of condensing turbines, thereby reducing heat loss to C.W. which is a major heat sink.
- E) Measures to reduce unproductive energy consumption during start up.
- F) Modifying some of the operational procedures to reduce energy consumption.
- G) Trimmed operation of cooling towers to achieve most optimum cooling water temperature.
- H) Good house keeping.
- I) Above all, sincere efforts to remove the bottlenecks which do not permit the operation of plant at design load on a continuous and sustained basis by way of minor modification or modifying operating practices.

(iv) **Energy conservation achievements- This portion should include one paragraph write-up on each major energy conservation project implemented during the year 2004-2005 only.**

No major energy conservation scheme has been implemented in the year 2004-2005. However, energy conservation schemes as mentioned under Point No. (v) are under implementation.

(v) **Energy conservation plans and targets:**

(vi) **Environment and safety :**

Safety aspect

Aonla unit has not lagged behind on safety front also. Several safety features are in built in the design of the plant. Longest continuous accident free running figure of 947 days has been achieved which is equivalent to 15.6 million man-hours. A detailed disaster management action plan has been prepared to overcome any unforeseen occurrence. Fire alarm system network has been installed and commissioned throughout the factory, consisting of automatic fire detection system and manual call alarm system. IFFCO Aonla unit has been certified for OHSAS- 18001:1999 (Amendment-I 2002) by M/s NQA-QSR, New-Delhi. IFFCO Aonla has won National Safety Award – 2004 (Runner under scheme-II).

Environment management

To keep pace with the stringent environmental regulations and to maintain ecological balance, zero effluent technology for Ammonia and Urea plants has been selected at the outset of plant inception. An expenditure of Rs.13 crores has been incurred on various effluent treatment schemes to meet statutory requirements. The quality of liquid effluents discharged from the factory is monitored continuously and always remains much lower than the norms prescribed by the U.P. Pollution Control Board. The lagoons constructed to store the treated effluent attract a large number of migratory birds specially during winter seasons which speaks of high quality of the effluents. The air quality is also constantly monitored by providing high volume samples at different locations around the factory campus. 80 meters wide green belt (total area 440 hectares) has been developed around the factory to keep the environment clean. Efforts are being made to achieve zero liquid effluent discharge from plant. A 10 Km pipeline has been laid around plant & township for using the effluent water for irrigation of green belt. IFFCO Aonla unit is certified for ISO 1401-1996 by M/s BVQI, U.K. IFFCO Aonla unit is also certified for ISO 9001:2000 by M/s NQA-QSR. During the year 2004-2005, Aonla Unit has bagged Corporate Environment Award 2002-03 (Certificate of Participation) from TERI in recognition of the efforts made towards Environment Management and sustainable initiatives. IFFCO Aonla won Golden Peacock Environment Award – 2005 (certificate of commendation). IFFCO Aonla has won National Safety Award – 2004

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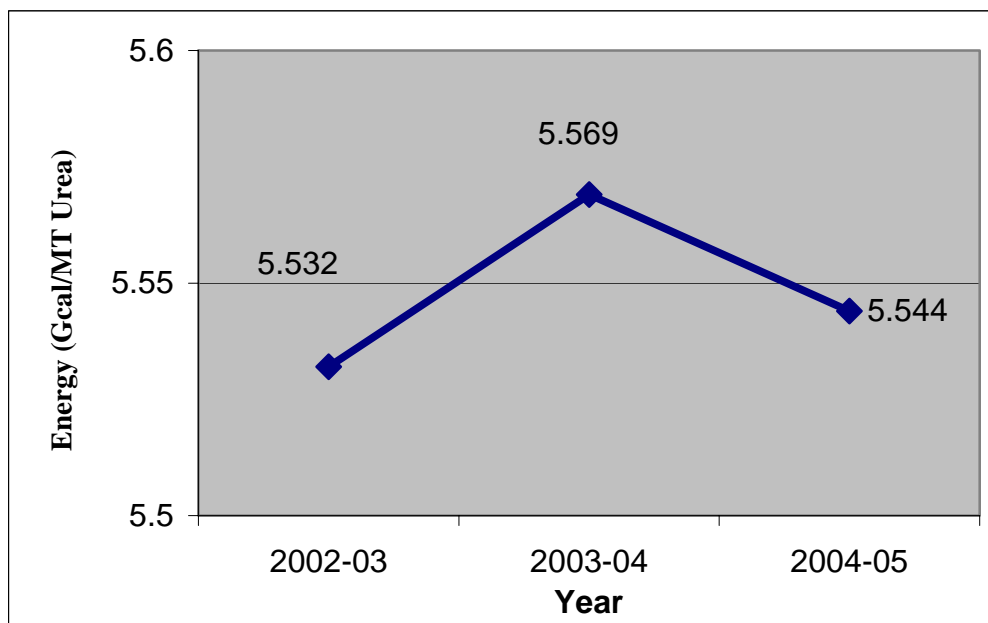
Towards increasing the fertiliser production the overall national planning for utilisation of natural gas available from Bombay high, Indian Farmers Fertiliser Cooperative Ltd. (IFFCO) was entrusted for setting up a Urea fertiliser complex with annual capacity of 8.646 lakh tonnes of Urea at Anola, Bareilly. The site at Anola is about 28 KM south west of Bareilly on Bareilly-Anola road. In the year 1996 the production capacity was doubled with the commissioning of Aonla-II having Urea production capacity of 8.646 lakh tonnes.

Aonla-II is having a 1520 MT per day Ammonia plant and two Urea plants with a total capacity of 2620 MT per day. Steam and power generation units, inert gas generation plant, water treatment plant, cooling towers, product handling plant, Ammonia storage, Urea silo etc., are the other auxilliary units of the fertiliser complex.

Right from the inception of the project, Aonla-II has achieved several milestones . Aonla-II project was completed in 38 months and the commercial production was started in 39 months from the zero date. The project was completed well ahead of schedule and saved around Rs. 5 crores compared to budgeted cost.

IFFCO Aonla-II has been certified for **ISO-9001: 2000, ISO-14001:1996 and OHSAS-18001:1999.**

(ii) Energy consumption



IFFCO Aonla-II commenced Ammonia production on 13th Dec., 1996, Urea production on 18th Dec., 1996 and went into commercial production on 25th Dec., 1996. Since then IFFCO Aonla-II unit has completed four years of its operation and has attained number of achievements and records to its credit. In the very first full year (1997-98) of its operation, Aonla-II performed creditably by achieving a capacity utilisation of 105.29% and 114.45% for Ammonia and Urea plants respectively and the performance of Aonla-II has improved steadily over the years.

During 2002-2003, Aonla-II unit produced 8.65 lakh MT of Urea against installed capacity of 8.646 lakh MT and 5.03 lakh MT of Ammonia against installed capacity of 5.016 lakh MT. Ammonia plant achieved yearly average energy consumption (B.L.) of 7.6835 GCal/MT Ammonia with a capacity utilisation of 100.3%. Yearly average energy consumption achieved in Urea plant was 5.5315 GCal/MT with a capacity utilisation of 100%.

During 2003-2004, Aonla-II produced 8.65 lakh MT of Urea and 5.12 lakh MT of Ammonia with a capacity utilisation of 100.01% & 102.14% respectively. Yearly specific energy consumption of 7.6869 Gcal/MT ammonia and 5.5693 Gcal/MT urea were achieved during this year. Mile-stones of 6 million Mt Urea production and 6 million MT Urea despatch were achieved in this year. **Ammonia plant achieved lowest monthly average sp. energy consumption (battery limit) of 7.5327 GCal/MT Ammonia.**

In the year (2004-2005), Ammonia plant produced 5.130 lakh tonnes of Ammonia with a capacity utilisation of 102.27 % and 8.65 lakh tonnes of Urea with capacity utilisation of 100.1%. Yearly B.L. specific energy consumption of 7.336 GCal/MT Ammonia was achieved. Yearly overall specific energy consumption of 5.5439 GCal/MT Urea was achieved. Urea plant achieved on-stream efficiency of 92.50 % and capacity utilisation of 100.08 %.

(iii) Energy conservation commitment, policy and set-up:

Energy conservation is a major corporate objective for IFFCO as such, and more so, for Aonla-II unit. Joint General Manager (Technical Services) coordinates the activities of energy conservation and cost reduction at IFFCO Aonla unit. Five different energy auditing, plant health and performance monitoring cells have been formed one each for Ammonia, Urea, product handling, offsites and power plant. Each cell consists of one person each from technical, respective production, maintenance and instrumentation sections with the person from technical as the coordinator of the cell. Persons selected for these cells are from middle management level having experience of about 15 years. These cells directly report to Executive Director. These cells have been made responsible for coordinating the various activities and its implementation so that no snowballing takes place for purpose of implementation.

Energy conservation & cost reduction measures have been classified broadly into three categories viz :

- IV) Change in operating practices without any investment.
- V) Minor process modifications involving small investments.
- VI) Incorporation of major energy saving retrofits involving large investments.

In addition to this, a number of plant performance and energy reports are prepared on daily, weekly, monthly and yearly basis by this group depicting the specific consumption of inputs, plantwise specific energy consumption etc. And their deviations from design figures are circulated among the plant operating personnel which help to a great extent in monitoring and optimising the plant performance. Equipments performance evaluation, steam balance etc. Are also done periodically to find out the inefficiency in any section of plant and to take corrective action in advance.

The salient features of the strategy being followed at Aonla to reduce energy consumption are:

- J) Incorporation of proven energy conservation schemes involving large investments.
- K) In-house minor modifications for energy conservation schemes involving small investments.
- L) Utilisation of excess steam from one plant to another.
- M) Continuous efforts to reduce steam consumption of condensing turbines, thereby reducing heat loss to C.W. which is a major heat sink.
- N) Measures to reduce unproductive energy consumption during start up.
- O) Modifying some of the operational procedures to reduce energy consumption.
- P) Trimmed operation of cooling towers to achieve most optimum cooling water temperature.
- Q) Good house keeping.
- R) Above all, sincere efforts to remove the bottlenecks which do not permit the operation of plant at design load on a continuous and sustained basis by way of minor modification or modifying operating practices.

(iv) Energy conservation achievements- This portion should include one paragraph write-up on each major energy conservation project implemented during the year 2004-2005 only.

At IFFCO-Aonla sincere efforts are always made for conception & implementation of energy conservation projects. Presently Energy Saving Project is under implementation which will result in reduction in specific energy consumption by 0.169 Gcal/MT Ammonia.

The details of energy saving schemes which have been commissioned in Aonla-II in the year 2004-2005 are as given below:

Scheme-1 :

LTS Guard Reactor and BFW Preheater

Present System :

The reformed gas from secondary reformer flows through HT shift convector after cooling in HP waste heat boiler from 990°C to 370°C. The carbon monoxide content of the process gas is reduced from 12.98% to 3.15% in HT shift converter through shift reaction which takes place in the reactor in presence of Iron-chromia catalyst. Process gas temperature of around 430°C at the outlet of HT shift convector is reduced to around 200°C by heat recovery in a waste heat boiler and boiler feed water preheater.

The carbon monoxide (CO) content of 3.15% in the process gas is further reduced to 0.25% in LT shift converter through shift reaction which takes place in the reactor in presence of chromium based & copper zinc catalysts.

Description of the Scheme / Modification:

A new LT shift guard has been installed before LT shift converter in order to reduce the CO slippage from the section. The CO slip after LT shift converter, with the LT shift guard in line has become lower i.e 0.10 to 0.15% as against 0.25-0.30% without LT shift guard. Lower CO slip in turn, results in additional Ammonia production due to reduction in the consumption of Hydrogen in Methanator. A new BFW preheater has been installed at down stream of the new LT shift guard in order to control the inlet temperature to the LT shift converter.

Cost of the Scheme :

Rs. 352 lakhs.

Monetary Saving :

Rs. 119 lakhs / annum.

Pay Back Period:

3.0 years.

Scheme-2 :

Installation of motors in place of steam turbine drives for cooling water pumps.

Present System :

Three nos of cooling water pumps are provided in cooling towers of Ammonia-II and Urea-II each. In each cooling tower two pumps were steam turbine driven and one pump was motor driven. The steam turbine driven pumps were kept in normal operation and the motor driven pumps were kept as standby. Steam turbines of both cooling towers are of condensing type.

Description of the Scheme / Modification:

One condensing type steam turbine has been replaced with motor in Ammonia-II and Urea-II cooling towers each. The motor driven pumps (2 nos in each cooling tower) are kept in line in normal operation and turbine driven pumps are kept as standby.

Cost of the Scheme :

Rs. 136 lakhs.

Monetary Saving :

Rs. 290 lakhs / annum.

Pay Back Period:

0.5 years.

At IFFCO-Aonla-II following efforts have been made right from conception & for conservation of energy:

- A) Gas turbine drive for process air compressor for the first time in the country with heat recovery unit connected to the gas turbine for generating high pressure steam to meet requirements of Urea plants.
- B) Medium pressure process condensate stripper.
- C) More efficient CO₂ removal system.

During plant operation also all efforts are made for reducing the specific energy specific energy consumption over last three years as shown in the table given below:

Description	2002-2003	2003-2004	2004-2005
Specific energy consumption per tonne of Ammonia (GCal/MT)	7.684	7.687	7.734
Specific energy consumption per tonne of Urea (GCal/MT)	5.547	5.569	5.544

(v) Energy conservation plans and targets:

Energy Saving Project

IFFCO, the premier fertiliser organisation on national scenario, has always emphasized on efficiency and productivity. Since its inception, IFFCO has thrived upon plant capacity utilisation and reducing energy consumption which has always been hallmark of success story of IFFCO thereby growth of grassroot cooperatives and farmer community at large.

Need for energy saving schemes at IFFCO Units

The Government of India has implemented New Group Pricing Scheme for the Urea Fertiliser Industry, which has come into force w.e.f. April, 2003. In view of the stringent provisions of the policy, it has become necessary to reduce the cost of production by reducing energy consumption in Ammonia-Urea Plants in Aonla-I and Aonla-II. The total scope of work for revamping comprises of:

- a. Feasibility Study for each plant separately and identify the energy saving schemes with pay back period preferably not exceeding four years.
- b. Basic Design Engineering packages (BDEPs) for the proposed schemes.
- c. Detailed Engineering.
- d. Procurement, erection, commissioning and guarantee test run of the schemes.

To carry out the above work, M/s. Haldor Topsoe, Denmark (HTAS) were appointed as Consultant in January 2003 to conduct a feasibility study to identify the Techno-Economic feasible energy saving schemes. HTAS carried out a feasibility study and submitted its Final Report in October 2003. After reviewing the report, it has been decided by the Society to implement certain energy saving schemes, which are found Techno-Economically feasible.

The order for Basic Engineering work under Phase-I & II has been placed at M/s Haldor Topsoe, Denmark. For Detailed Engineering work and, wherever necessary, procurement assistance, inspection and expediting services, supervision & assistance during construction and commissioning services etc. the order has been placed at M/s PDIL.

In order to implement the Project at the earliest and also to facilitate hooking-up the new schemes with the Plants during plant turnarounds without affecting the normal operations, it has been decided to split the proposed schemes in two phases as under:

a) Phase-I Project

The scheme involves installation of LTS Guard Bed with BFW pre-heater in Aonla-II. The Phase-I scheme of Aonla-II have been commissioned.

b) Phase-II Project

The schemes under Phase-II project cover installation of the following in Ammonia plant viz S-50 Converter & Boiler, Make-up Gas Chiller and Modification in WHS of Primary Reformer. The Phase-II of the project shall be commissioned during annual shutdown in March- April 2006.

The purpose of the project is to upgrade the existing plant technology with energy efficient technology and to reduce the specific energy consumption which would result in reduction of feed & fuel used in the plant. This will reduce CO2 emissions from the plant and lead to conservation of non-renewable resources. Thus the project aids in environmental well being. Hence the project shall contribute towards the reduction in demand for India's carbon intensive energy resources as well as adoption of energy efficient technology and resource conservation. The estimated reduction in carbondioxide emission due to the project is 75000 MT/year in Aonla-I and Aonla-II.

The total estimated cost of the Project, for Aonla unit, including taxes and duties works out to Rs 130.6 crores with a payback period of 3.04 years for Aonla-I and Aonla-II.

Energy Saving Schemes

All the energy saving schemes envisaged to be implemented are technically proven and already in operation. List of the schemes under installation in Ammonia-II is given below:

SI No.	Scheme	Estimated Cost (Rs. Crores)	Energy saving (Gcal/MT Ammonia)	Monetary saving (Rs. Crores)	Pay back period (Years)
1	S-50 converter with HP boiler	25.3	0.154	9.13	2.8
2	New Make up gas chiller				
3	Additional PC/PC exchanger				
4	New combustion air module in convection section of primary reformer				
5	Additional condenser over head 1 st regenerator				
6	Improvement in GV filtration system				

(vi) Environment and safety :

Safety aspect

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always remains much lower than the norms prescribed by the U.P. Pollution Control Board. The lagoons constructed to store the treated effluent attract a large number of migratory birds specially during winter seasons which speaks of high quality of the effluents. The air quality is also constantly monitored by providing high volume samples at different locations around the factory campus. 80 meters wide green belt (total area 440 hectares) has been developed around the factory to keep the environment clean. Efforts are being made to achieve zero liquid effluent discharge from plant. A 10 Km pipeline has been laid around plant & township for using the effluent water for irrigation of green belt. IFFCO Aonla unit is certified for ISO 1401-1996 by M/s BVQI, U.K. IFFCO Aonla unit is also certified for ISO 9001:2000 by M/s NQA-QSR. During the year 2004-2005, Aonla Unit has bagged Corporate Environment Award 2002-03 (Certificate of Participation) from TERI in recognition of the efforts made towards Environment Management and sustainable initiatives. IFFCO Aonla won Golden Peacock environment Award – 2005 (certificate of commendation).

Photograph of Motor installed in place of turbine for Cooling water pump



Photograph of LTS Guard Reactor installed in Ammonia-II

