"Energy Reduction, Environment Protection by CO_2 Reduction & Feed Stock Change-over at IFFCO Phulpur "

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INTRODUCTION

1st. Plant of Chem. Fertiliser for Super Phosphate at Ranipet (T.N.) : 1906.

Indian Fertiliser Industry is more than 100 years old.

Initial 50 years , usage of Fertiliser's almost NIL.

During '50's traditional agriculture practices with limited use of Fertilisers.

During early 60's marked jump in Fertliser's consumption, mainly thru' Imports.

Introduction of RPS in 1977 , leading to rapid growth of Fertiliser Industries in 80's and 90's.

India emerges as the Third Largest Global Producer and User of Chemical Fertilisers.

India becomes Self Sufficient in Food-Grain Production.

About IFFCO

- Indian Farmers Fertiliser Co-operative Limited (IFFCO) was registered on November 3, 1967 as a Multi-unit Co-operative Society.
- Initially commissioned Ammonia/Urea complex at Kalol and DAP/NPK complex at Kandla in 1975.
- Subsequently commissioned Ammonia / Urea complex at Phulpur and Aonla in 1981 and 1988 respectively.
- In 1993, IFFCO had drawn up a major expansion programme of all the four plants under overall aegis of IFFCO VISION 2000.
- Last year acquired DAP/NPK unit at Paradeep.
- Marketing of IFFCO products – channelised through 37,500 member co-operative societies and 158 Farmers Service Centers in over 28 States / Union Territories in India.
- Set up Oman India Fertiliser Company (OMIFCO) at Sur in Oman with annual capacity of producing 16.52 lakh tonne Urea other joint venture partner, Oman Oil India Company (OOC).
- Launched another company Indo-Egyptian Fertiliser Company (IEFC), a joint venture with El Nasr Mining Company (ENMC), for setting up a Phosphoric Acid Plant in Egypt.

IFFCO-PHULPUR UNIT
A Profile

Phulpur-I	Process Licensor	Annual Capacity
•Ammonia Plant	MW Kellog, U.S.A	322400 MT
•Urea Plant	Snamprogetti, Italy	551100 MT

FM 55252
(ISO 9001:2000 certified)

Phulpur-II	Process Licensor	Annual Capacity
•Ammonia Plant	HTAS, Denmark	501600 MT
•Urea Plant	Snamprogetti, Italy	864600 MT

EMS 57450
(ISO 14001 certified)

•Commercial Production

•Phulpur-I	Urea	Mar. 28, 1981
•Phulpur-II	Urea	Dec. 22, 1997

CHALLENGES FACED by FERTILISER INDUSTRY

- Steep rise in Cost of Inputs mainly Gas, Naphtha, FO/LSHS etc.
- Subsidy Burden.
- Late disbursement of Subsidy due to Insufficient Allocation in Budget.

STRATEGIES

- Consolidation of Operations to Compete.
- Reduction in Cost of Production by reducing Energy Consumption .
- Optimization in usage of Resources.
- Pooling of Catalyst and Spares.
- Use of Cheaper and Better Feed-Stock.
- Improving Reliability and Productivity of Ammonia and Urea Plants.

STRATEGIES (Cont.)

Use of Modern Process Technologies: Ammonia

- Addition of S-50 Converter.
- Better Catalyst in Reformer / Shift Reactors.
- Improving Performance of CO_2 Removal Section.
- Installation of Molecular Sieves of Ammonia Wash Unit for Purification of PG.
- Use of Installation of PGR Unit to recover H2 & NH_3 from Purge Gas .
- Change of MoC from CS to SS for critical Exchangers.
- Recovery of Waste Heat from flue gases of Reformer.

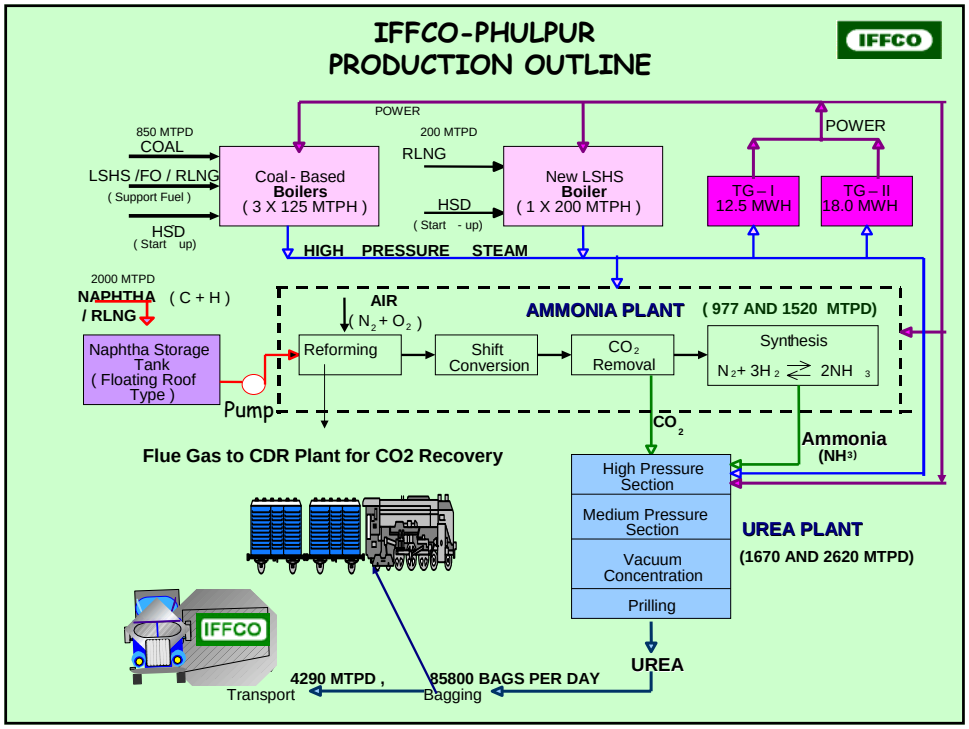
STRATEGIES (Cont.)

Use of Modern Process Technologies: Urea

- Increase CO_2 Feed temperature by recovering Heat from 3rd Stage discharge of Compressor.
- Replacement of old HP Stripper by New Bi-Metallic Stripper.
- Installation of Pre-Concentrator and MP Pre Decomposer.

Use of Modern Process Technologies: Others

- Installation of VSD in Electric Motors for Power Optimization.
- Installation of Energy Efficient Moving Machines mainly Compressors.
- Upgrading Instrumentation System by switching over to DCS.
- Capacity Enhancement through Modifications & Retrofit.



Energy Saving Project - Background

1. GOI implemented the New Group Pricing Schemes for Urea Fertilizer Industry w.e.f. April 2003.
2. Energy Norms were made more stringent.
3. Incentive were provided for Energy Efficient Plants.
4. No mopping of Energy Efficiency and no recognition of Capital Invested.

- In order to lower the Energy Consumption below the prescribed Norms Energy Saving Project was envisaged for all the five Ammonia Plants at Kalol, Phulpur-I, Phulpur-II, Aonla-I and Aonla-II Units.
- Project was bifurcated in two Phases viz. Phase-I and Phase-II Project for ease of implementation and to accrue the early benefits.

Energy Saving Project - Milestones

- Feasibility Study & Basic Engineering: HTAS Denmark
- Detailed Engineering : PDIL Noida

Project Zero Date

- Phase-I : September 2003
- Phase-II : October 2003

Project Completion Date

- Phase-I : Annual Turn Around in 2005
- Phase-II : Annual Turn Around in 2006

Project Cost

- Rs. 1500 million

Energy Saving Project

Various Energy Saving Schemes Implemented

Energy Saving Project at Phulpur-I

PHASE–I

- LTS Guard Bed System.
- Revamp of CO_2 Removal System to 2 stage GV System.
- Improvement in Shift Outlet System.

PHASE–II

- S-50 Synthesis Converter & MP boiler.
- Drying of Make-up Gas and Synthesis Loop Re-piping.
- Revamp of Synthesis Gas Compressor.
- Final Gas Chiller.

Energy Saving Project at Phulpur-I

IFFCO

L.T. Guard Bed System

CO Slip:

Before : 0.32 %

After : 0.14 %

Energy Saving Project at Phulpur-I

IFFCO

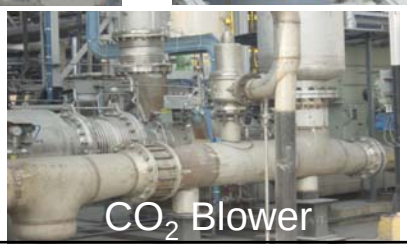
CO_2 Removal Section Revamp from 1-Stage to 2-Stage GV Process

Regeneration Energy

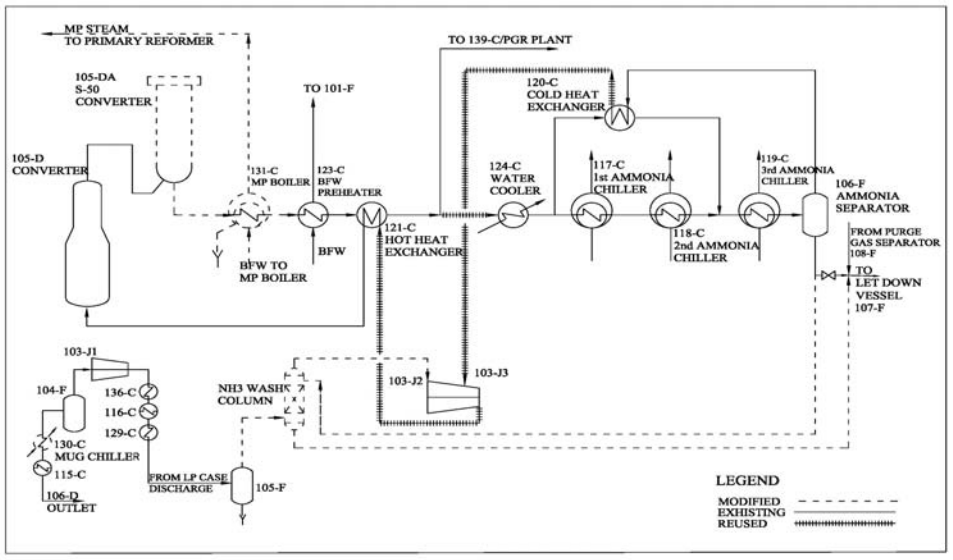
Before : 1049 kcal/NM3 CO_2

After : 760 kcal/NM3 CO_2

Savings : 289 Kcal/NM3 CO_2

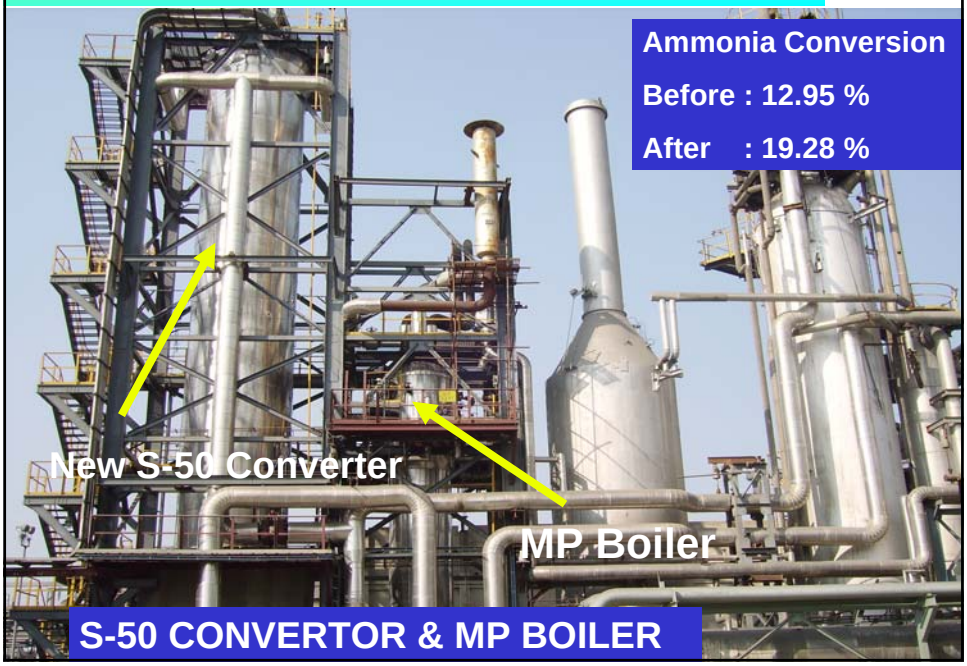


Energy Saving Project at Phulpur-I



Schematic Diagram of Modified Back-end of Ammonia Plant: Phulpur-I

Energy Saving Project at Phulpur-I



S-50 CONVERTOR & MP BOILER

Energy Saving Project at Phulpur-I

Ammonia Wash Unit

- To Remove the Oxides present in the Make-up Gas.
- This avoids Compression of Ammonia in the Synthesis Gas thus saves Compression Energy.

Energy Saving Project at Phulpur-II

PHASE–I

- LTS Guard Bed System.

PHASE–II

- S-50 Synthesis Converter & HP boiler.
- Final Gas Chiller.

Energy Saving Project at Phulpur-II

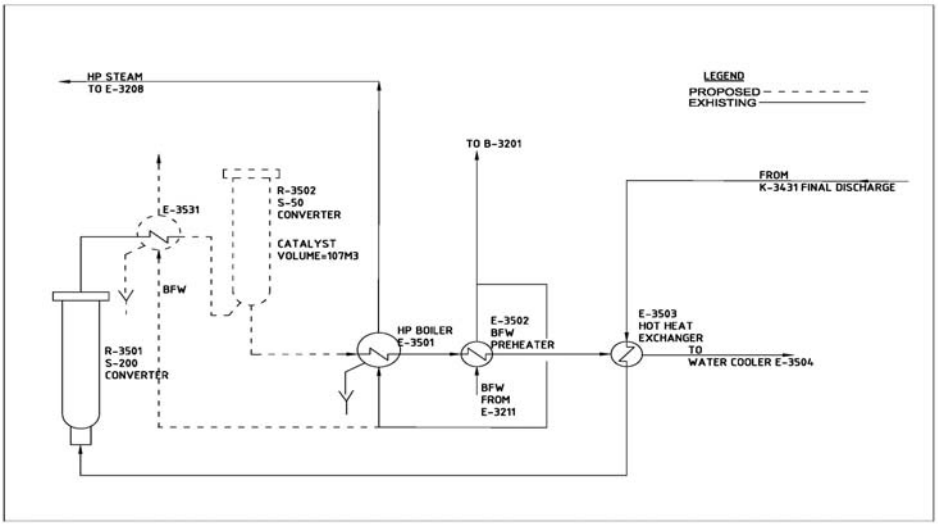
LT Shift Guard

CO Slip:

Before : 0.27 %

After : 0.13 %

Energy Saving Project at Phulpur-II



S-50 radial flow Synthesis Converter and HP Boiler

Energy Saving Project at Phulpur-II

New S-50 Converter

Ammonia Conversion

Before : 19.30 %

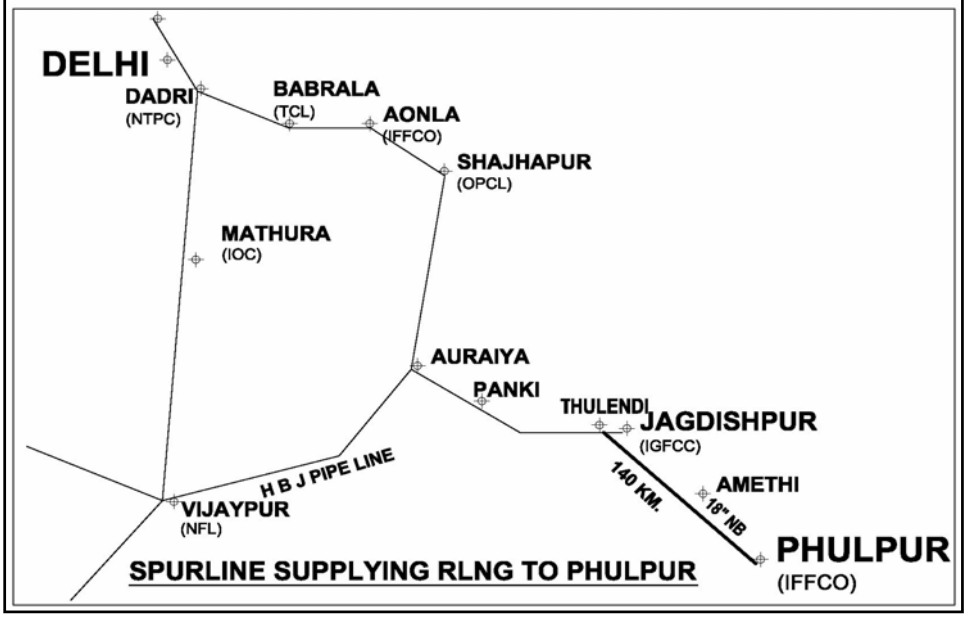
After : 24.33 %

HP Boiler

RLNG CONVERSION PROJECT

IFFCO: PHULPUR UNIT

RLNG CONVERSION PROJECT



Total Naphtha / LNG Requirement

Base Case

	Phulpur –I	Phulpur -II	Total
Naphtha Yearly (Lakh MT/ Year)	2.4	4.3	6.7

After Conversion to LNG (Million SM3/day):

	Phulpur –I	Phulpur -II	Total
At Reassessed Capacity	0.95	1.55	2.50
LNG in Boiler -4	-	0.35	0.35
Total LNG	**0.95**	**1.90**	**2.85**
With Enhanced capacities	1.10	1.73	2.83
LNG in Boiler -4	-	0.17	0.17
Total LNG	**1.10**	**1.90**	**3.00**

Major Activities – RLNG Conversion (Amm.-I)

- Complete Changeover to RLNG from Naphtha in both Feed Stock & Fuel.
- All liquid fuel burners in top arch (162 Nos.), tunnel (09 Nos.), hydrocarbon feed pre heater (04 Nos.) and auxiliary (05 Nos.) boiler, were replaced with new RLNG burners.
- RLNG pre heater coil was installed in between LT super heater and combustion air pre heater.
- New gas reforming catalyst, was loaded in primary reformer tubes.

LNG Control Station in Amm.- I Plant

Major Activities – RLNG Conversion (Amm.-II)

- Complete provision for online switching of feedstock from Naphtha to RLNG.
- Fit-up for converting Fuel of GT from Naphtha to RLNG.
- Existing Burners replaced with modified burners; Primary Reformer (H-3501). Total 288 burners replaced.
- Two RLNG heating coils were installed in waste heat section of Primary Reformer.
- Modification in HRU Burners and its Control system: Naphtha burners were modified to dual firing burners with facilities of on line change over.

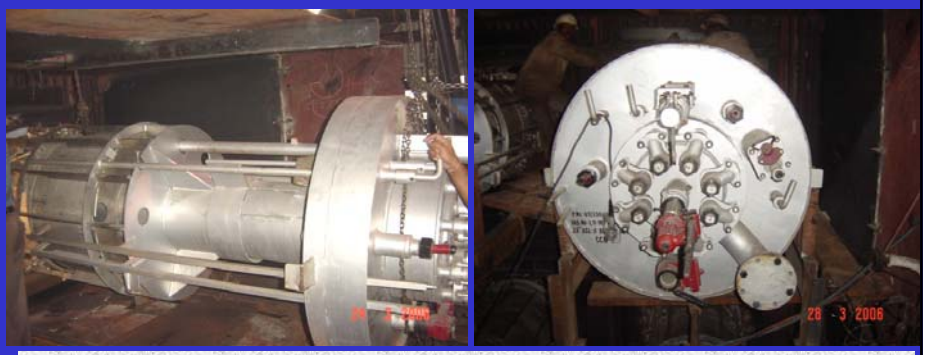
RLNG Fuel Skid (HRU)

RLNG Fuel Skid (GT)

RLNG Fuel Skid for HRU / GT in Ammonia-II

RLNG Conversion Activities : Yard Piping and SG Plant

- RLNG Yard Piping blowing with air from GT was done.
- In Boiler # 4 , Dual firing (RLNG & FO) burners installed successfully.
- In Coal based boiler provision made to use RLNG as support fuel in place of Fuel Oil.



View of Dual Firing Burners in Boiler # 4

CARBON-DIOXIDE RECOVERY PLANT

IFFCO: PHULPUR UNIT

C.D.R. PROJECT

IFFCO

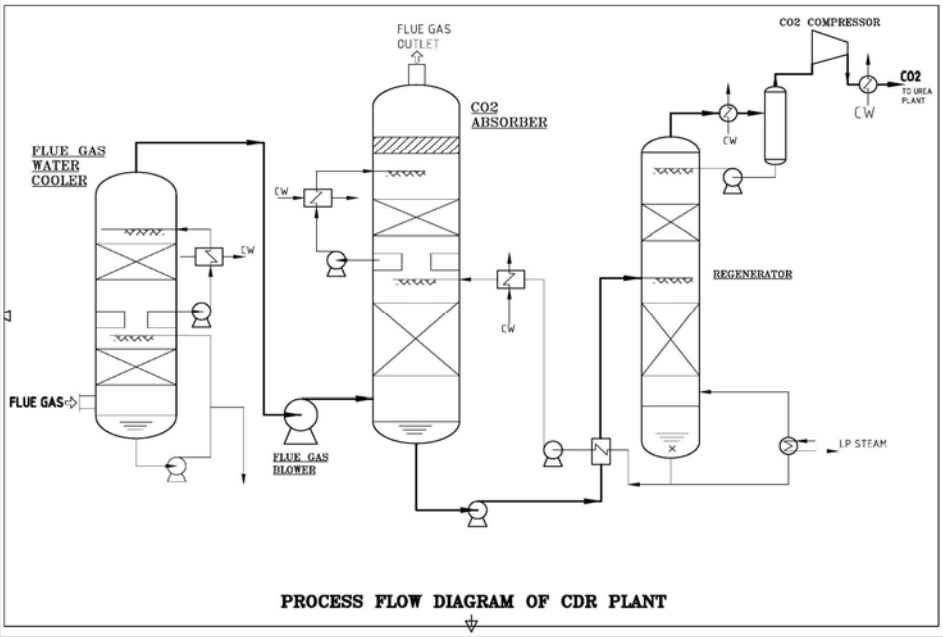
- Capacity : 450 MT of CO_2 per day
- CO_2 Recovery from : Primary Reformer flue gas of Ammonia-II
- Turnkey Project by : M/s Tecnimont ICB, Mumbai
- Process Consultant : M/s MHI, Japan
- Detailed Engg. & Execution : M/s Tecnimont ICB, Mumbai

Milestones

- Zero Date of project : March 25 , 2005
- Contractual date of completion : December 23 , 2006
- Actual Completion date : December 16 , 2006

C.D.R. PROJECT

IFFCO



PROCESS FLOW DIAGRAM OF CDR PLANT

C.D.R. PROJECT

Different Views of CDR Plant

Reduction in CO_2 Emission

- **Reduction Due to Energy Saving Project**
  - Reduction in Steam Consumption to a tune of 35 MT/hr.
  - Reduction in Coal/FO firing in Steam Generation facilities.
- **Reduction Due to LNG Change Over**
  - Gas being lean in Carbon lesser CO_2 is generated than Naphtha in Feed. Earlier CO_2 was vented to atmosphere.
  - Firing of gas in furnaces in Amm. Plant & SGP Plant in place of Naphtha & Fuel Oil.
- **Reduction Due to CDR Project**
  - CDR Plant recover CO_2 from Amm.-II plant Primary reformer stack.
  - Out of total flue gas flow of 182086 Nm3/hr, 128790 Nm3/hr routed to CDR Plant.

Estimated annual reduction in Emission: more than 0.6 million tonnes.

Future Action Plan

Capacity Enhancement Project

PLANT	EXISTING CAPACITY (MTPD)	REVISED CAPACITY (MTPD)
PHULPUR-I		
AMMONIA	977	1215
UREA	1670	2115
PHULPUR-II		
AMMONIA	1520	1740
UREA	2620	3030
TOTAL ANNUAL UREA CAPACITY (MT)	14,15,700	16,97,850
ANNUAL INCREASE IN UREA PRODUCTION (MT)		2,82,150
PERCENTAGE INCREASE		19.9

Targeted Completion of Schemes: Year 2007

Future Action Plan

Major Schemes : Capacity Enhancement Project

- **Ammonia Plants:**
  - Revamp of Process Air Compressor and Syn. Gas Compressor
  - Replacement of Few Exchangers
  - Modification in Primary & Secondary Reformer Burners
- **Urea Plants:**
  - Installation of Pre-Concentrator along with MP Pre-Decomposer
  - Installation of additional HP Ammonia Pump and Carbamate Pump
  - Additional Cooling Water Cell
  - Modification in Various Pumps
  - Replacement of Few Exchangers
  - Prill Cooling System

Recognition Received from Ministry of Power Govt. of India for Energy Efficiency initiatives

IFFCO

2005

2006

National Energy Conservation Award