

# **Indian Farmers Fertiliser Cooperative Limited, (IFFCO) Aonla-II Unit**



**Leading producer & marketer of fertilizer in India**



**No. of plant locations : 5**



Urea & DAP/NPK



Secondary Nutrient



Water Soluble



Bio-Fertiliser



Growth Promoter

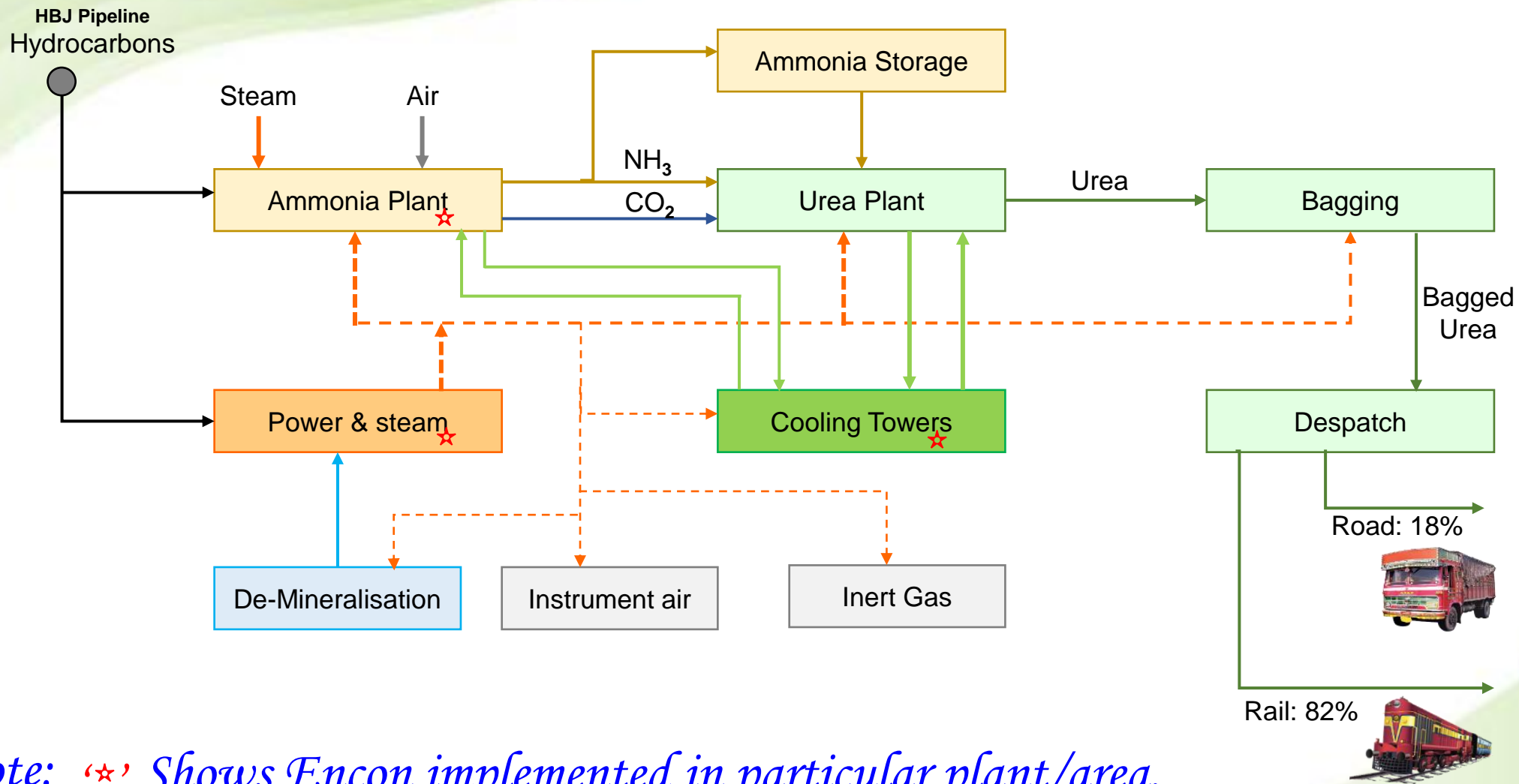
**Nano Urea**  
An initiative of IFFCO to provide eco-friendly solution to maintain soil health & increase crop productivity.

# Plant Description

IFFCO Aonla Unit, located in northern part of India, operates Two streams of Ammonia (1740 MTPD each) & 4 streams of Urea (1515 MTPD each) and is based on Natural Gas as feed & fuel.

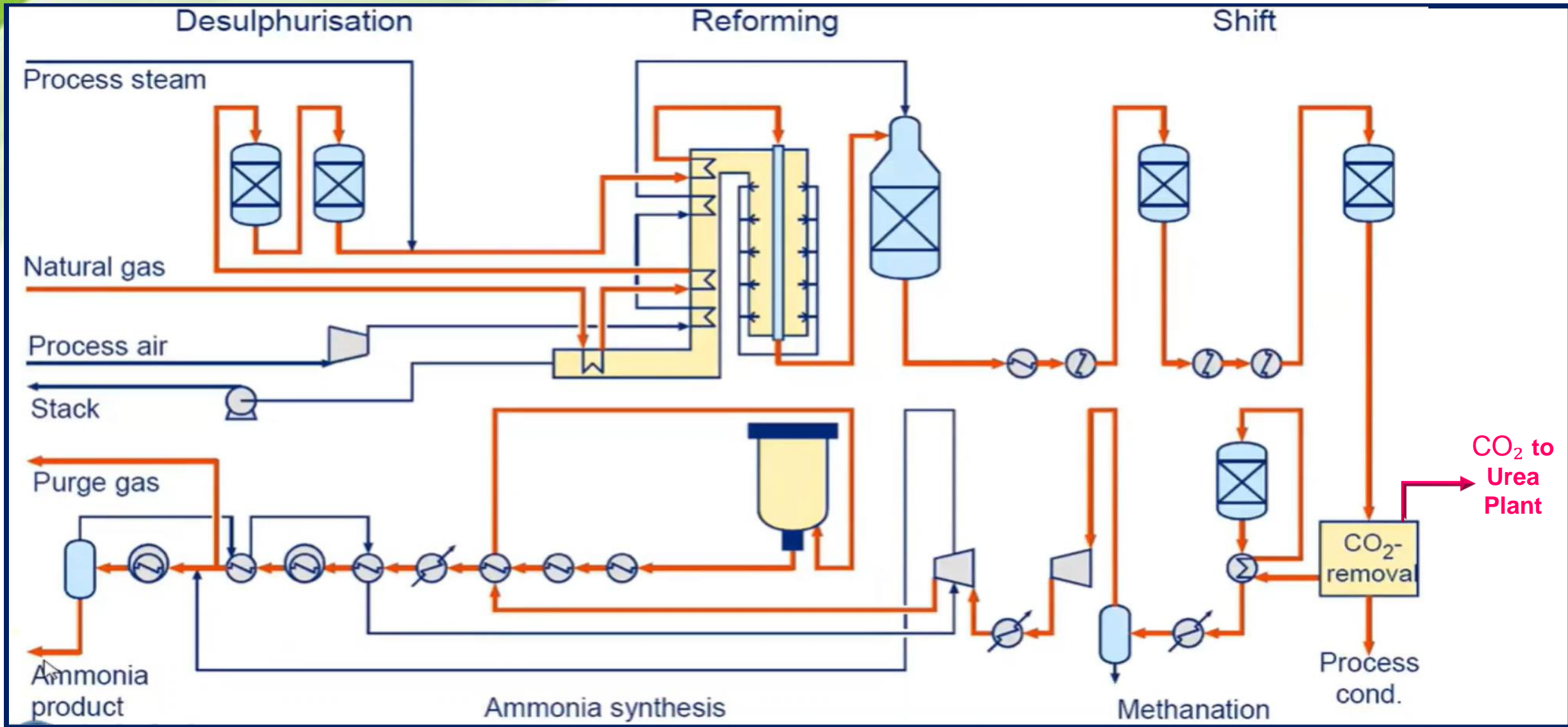
*Indian Farmers Fertiliser Cooperative Limited (Aonla-II Unit)*

# Urea Manufacturing Process



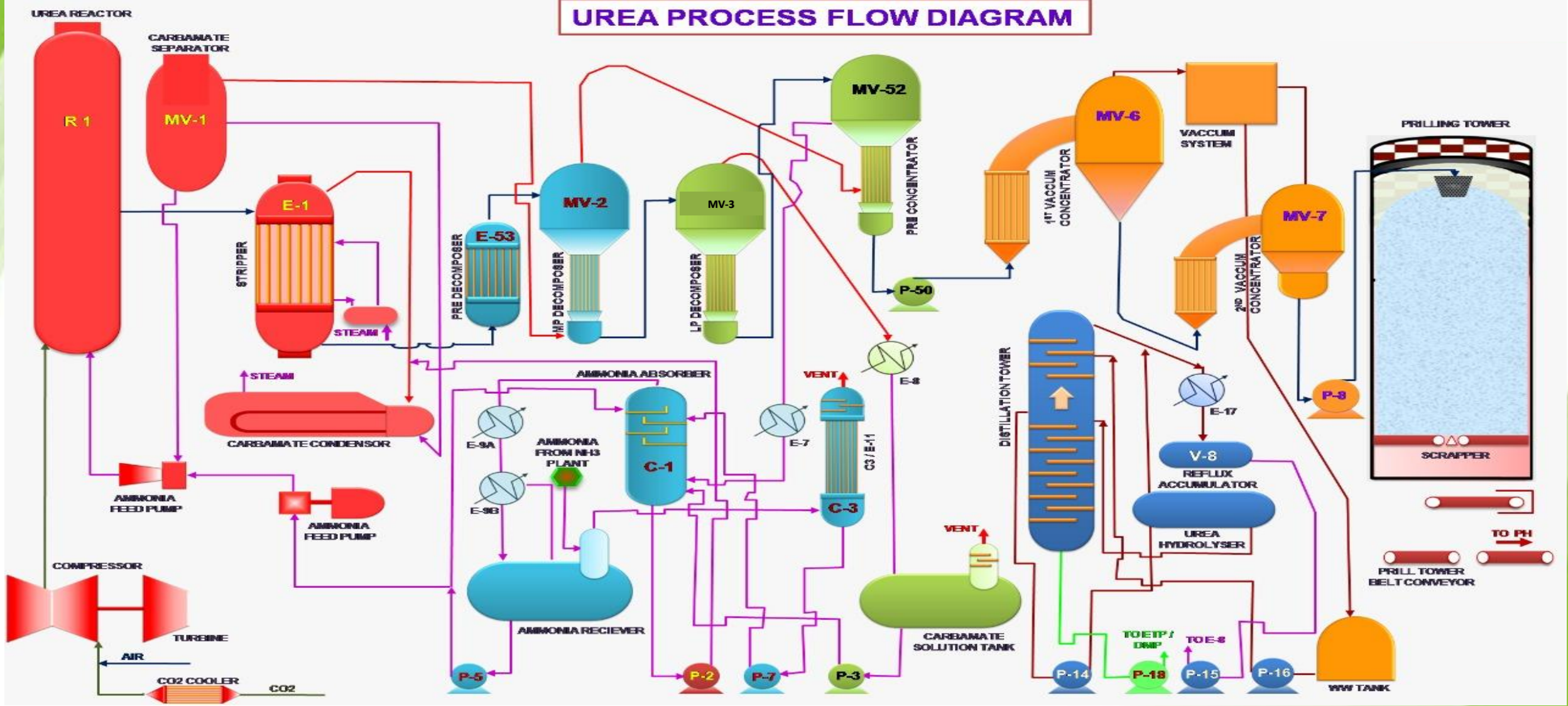
*Note: '☆' Shows Encon implemented in particular plant/area.*

# Ammonia Process in brief



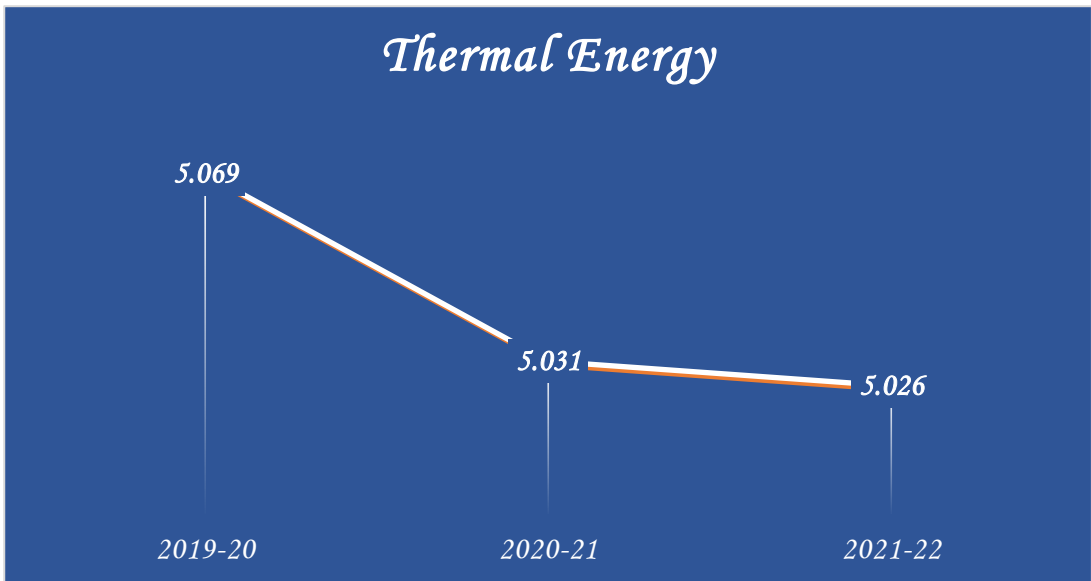
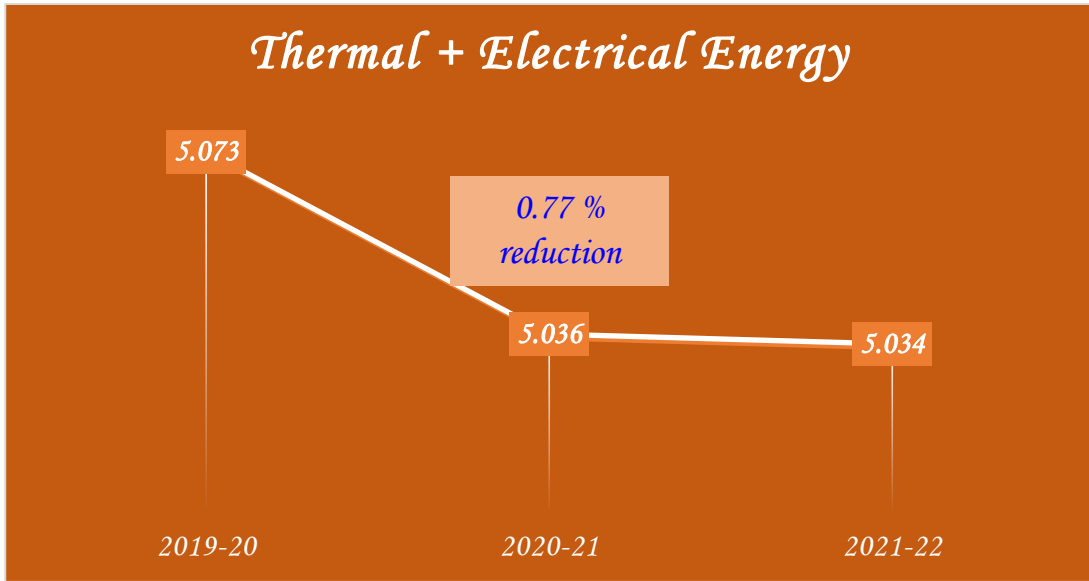
# Urea Process in brief

**UREA PROCESS FLOW DIAGRAM**



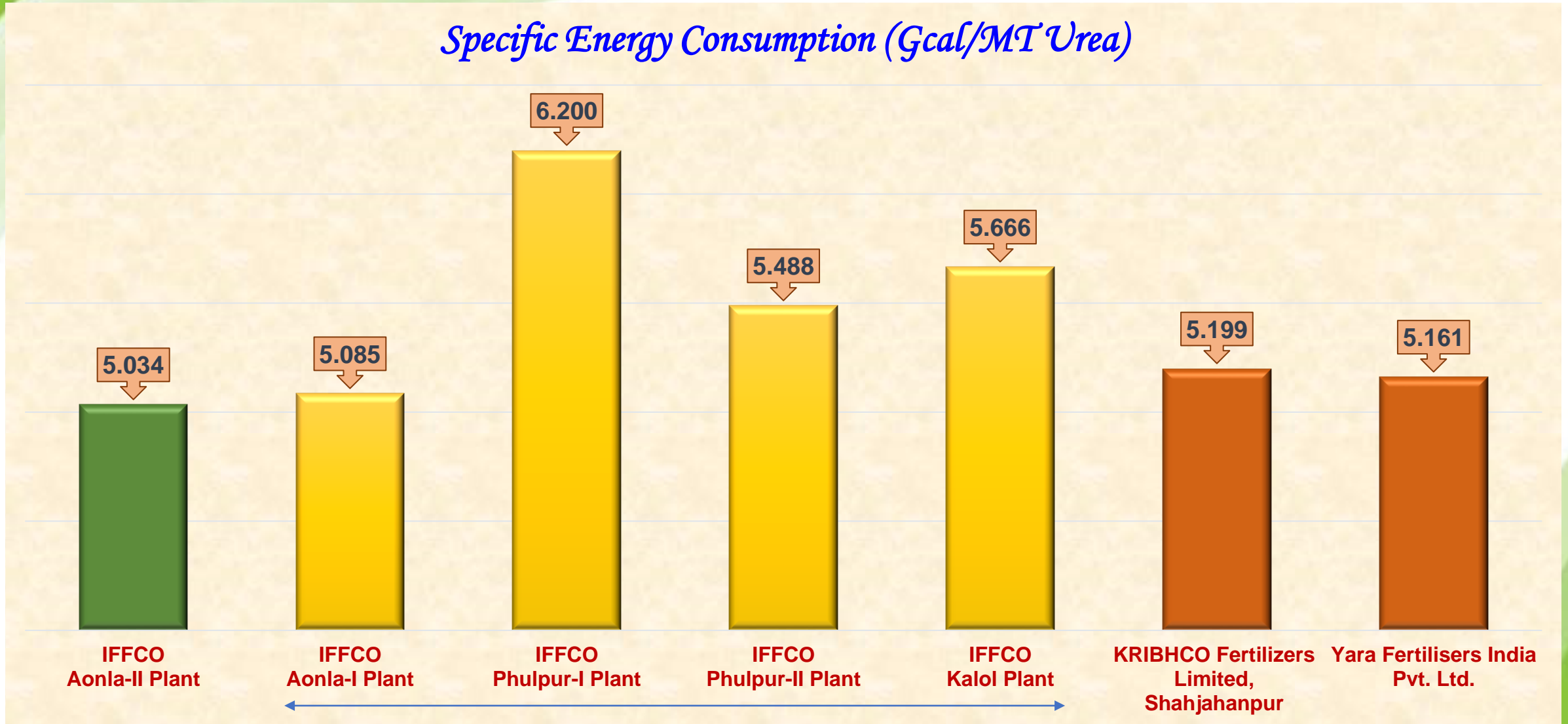
# Specific Energy Consumption

Particulars	Urea Production, Lakh MT	Sp. Energy Consumption, Gcal/MT Urea	% Reduction in Energy consumption
FY 2019-20	10.87	5.073	-
FY 2020-21	11.77	5.036	0.73 %
FY 2021-22	11.31	5.034	0.77 %



# Internal/ External Benchmarking

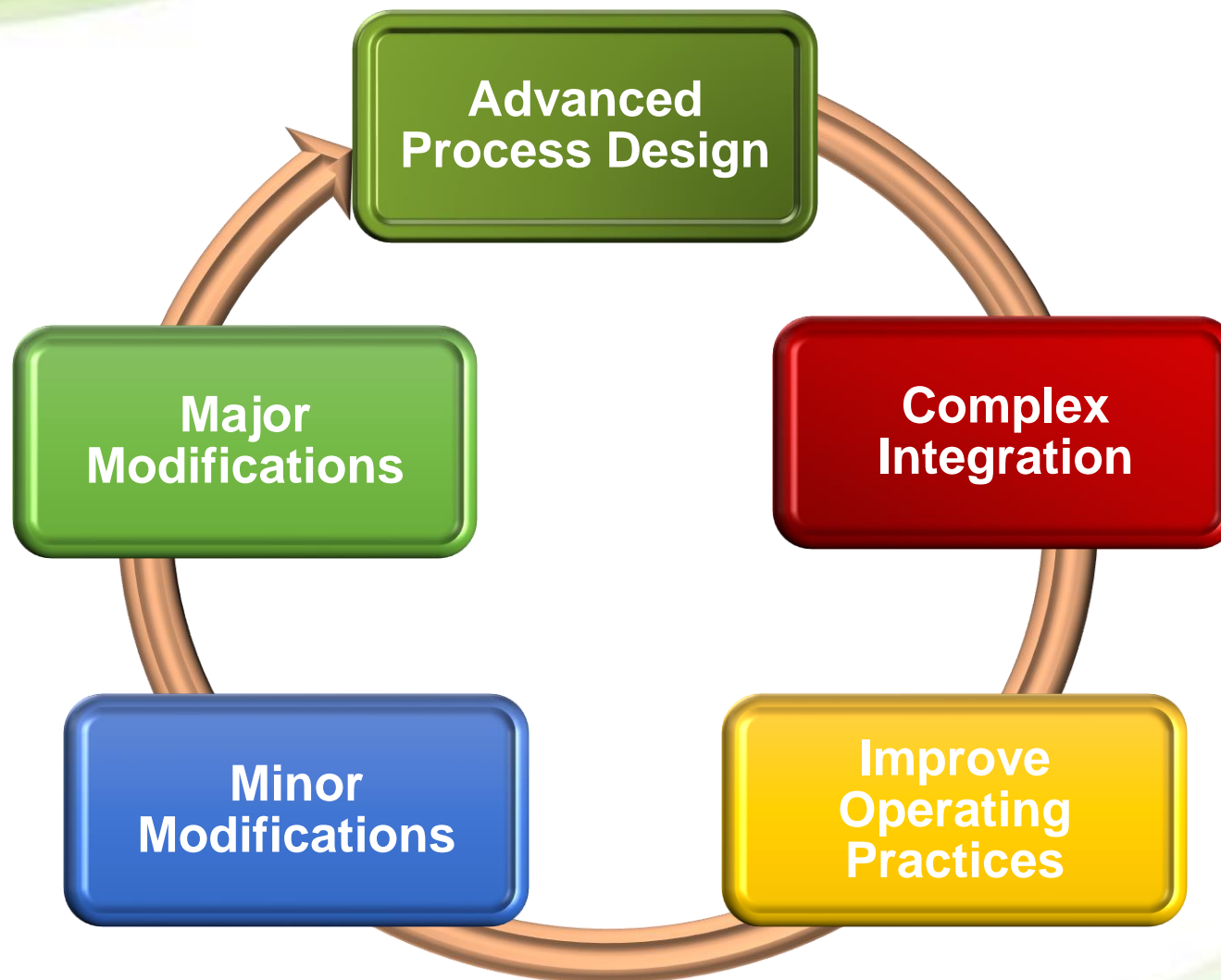
*Specific Energy Consumption (Gcal/MT Urea)*



*Indian Farmers Fertiliser Cooperative Limited (Aonla-II Unit)*



# Roadmap to achieve National & Global Benchmark



# List of Major Encon Project Planned (FY 2022-23)

1. Replacement of existing Bycast type Combustion Air Preheater with new Plate type Combustion Air Preheater in Primary Reformer convection section of Ammonia-II Plant.
2. Replacement of Urea Cooling Tower Fan with Energy efficiency CT Fans.
3. Installation of new Flue Gas Cooling Water Cooler (E-2101N) as standby for existing Flue Gas Cooling Water Cooler (E-2101) in CDR Unit
4. Provision of PHEs' in the discharge of 2nd wash water circulation pump (P-2108) & Flue gas wash water Pump (P-2110) in CDR Unit to decrease loss of KS-1 solution and increase in CO<sub>2</sub> generation.

5. Replacement of 1<sup>st</sup> & 2<sup>nd</sup> Inter-stage Separators (04 nos.) (31/41 MV-16 & 31/41 MV-17) of CO2 Compressors in Urea-II Plant.
6. Replacement of inefficient & aged motors with energy efficient motors in Raw water storage area, DM Plant and Urea-II Plant.
7. Installation of Vibro priller in Urea Plant for reduction in Urea Prill temperature.
8. New Centrifugal Air compressor for Aonla Complex.
9. Upgradation of Lighting Fixtures of Aonla-II Plant.

# Energy Saving Measures Implemented

Year	No. of Energy Saving Projects	Investments (INR Million)	Electrical Savings (Million kWh)	Thermal Savings (Million Kcal/ MTOE)	Savings (INR Million)	Impact on SEC (Electrical, Thermal)
<b>FY 2019-20</b>	7	7.92	0.989	-	7.91	0.002
<b>FY 2020-21</b>	8	2.81	0.486	-	3.65	0.001
<b>FY 2021-22</b>	14	18.94	1.727	34225	219.03	0.033

# INNOVATIVE PROJECTS



# Reduction of Inlet Guide Vane (IGV) opening from 84 to 75 degree for Gas Turbine Generator (GTG-II)

## Previous Operational Philosophy:

- ✓ Inlet Guide Vane (IGV) opening of GTG Air Compressor was around 84° to allow maximum air.
- ✓ Excessive air causing lower temperature of GT exhaust flue gas and resulting in higher NG consumption in Heat Recovery Steam Generation (HRSG).
- ✓ Excess air was resulting in more energy loss through the stack.

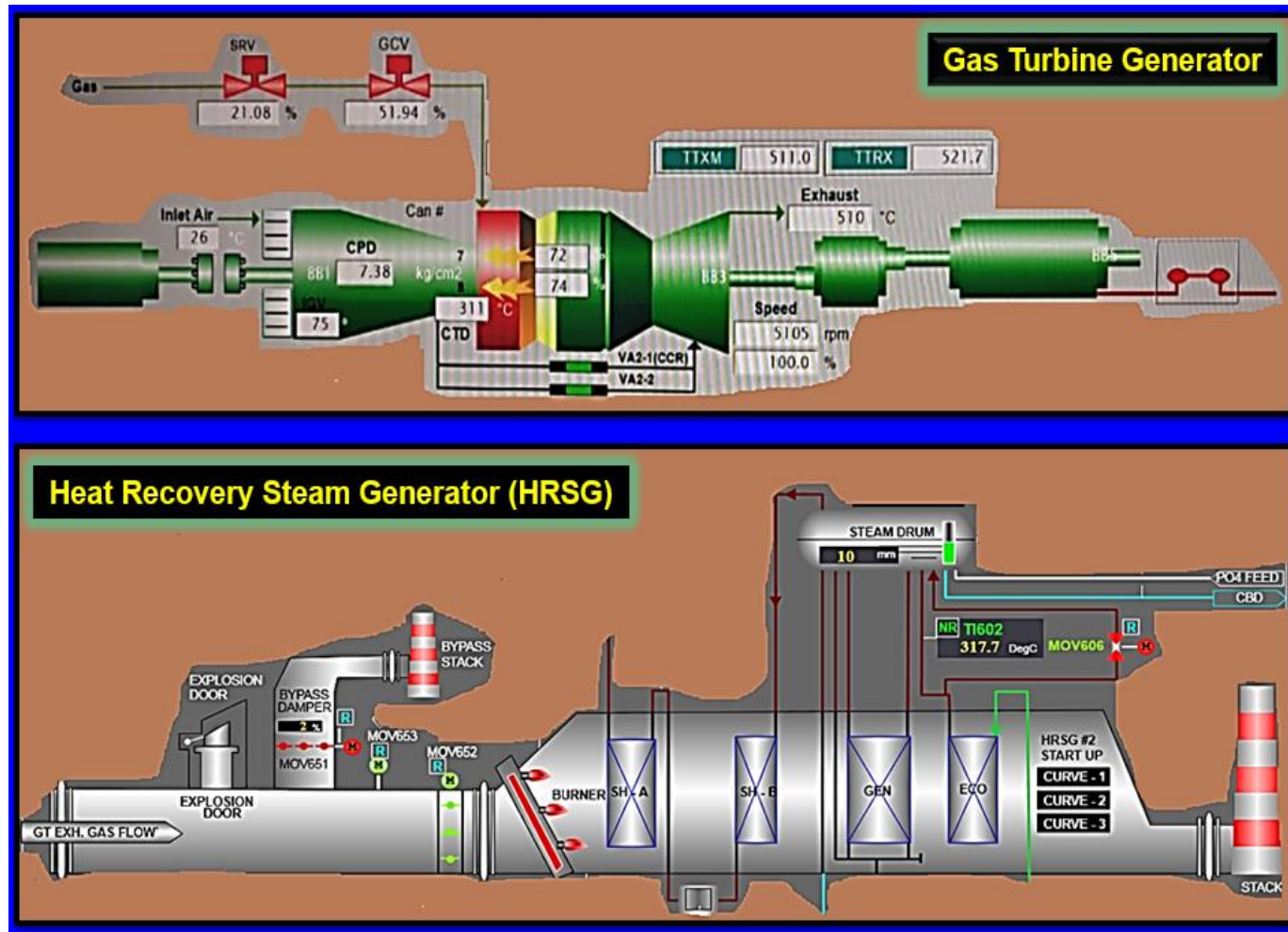
## Change in Operational Philosophy:

- To minimize the energy losses, IGV opening of GTG-II reduces from 84 deg to 75 deg with which GTG is capable of increasing power load of around 2 MW.

# Reduction of Inlet Guide Vane (IGV) opening from 84 to 75 degree for Gas Turbine Generator (GTG-II) (Contd...)

➤ This action resulted in following benefits:

- ✓ GT exhaust temperature increased from 455 degC to 475 degC.
- ✓ HRSG specific NG consumption reduced by about 2 sm<sup>3</sup>/MT steam at same power & steam load.
- ✓ Stack temperature reduced by 2.5 degC.
- ✓ Combined efficiency of GTG+HRSG improved from 74.8% to 77.5%.



# Reduction of Inlet Guide Vane (IGV) opening from 84 to 75 degree for Gas Turbine Generator (GTG-II) (Contd...)

## Saving & Payback

- ❖ Energy Saving achieved : 27245 Gcal/Annum
- ❖ Monetary saving : Rs. 17.0 Crores/Annum
- ❖ Investments : Nil
- ❖ Payback Period : -

## Replication Potential

*The modification has high replication potential in chemical industries where there is normal tendency to operate gas turbine with fixed opening of IGV. Operation of gas turbine at fixed opening of IGV may lead to energy loss if the excess air through IGV opening is more than the required quantity.*



# Replacement of existing 52” size Molecular Seal Assembly with 36” size Molecular Seal Assembly for Flare Stack of Ammonia-II Plant

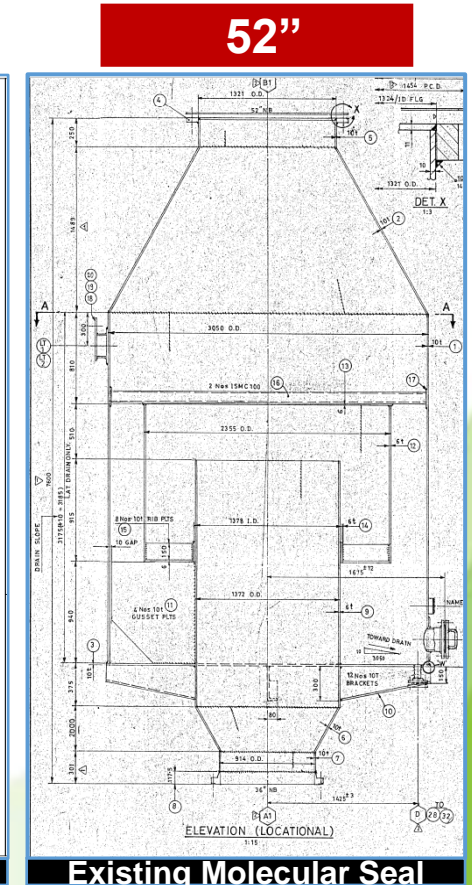
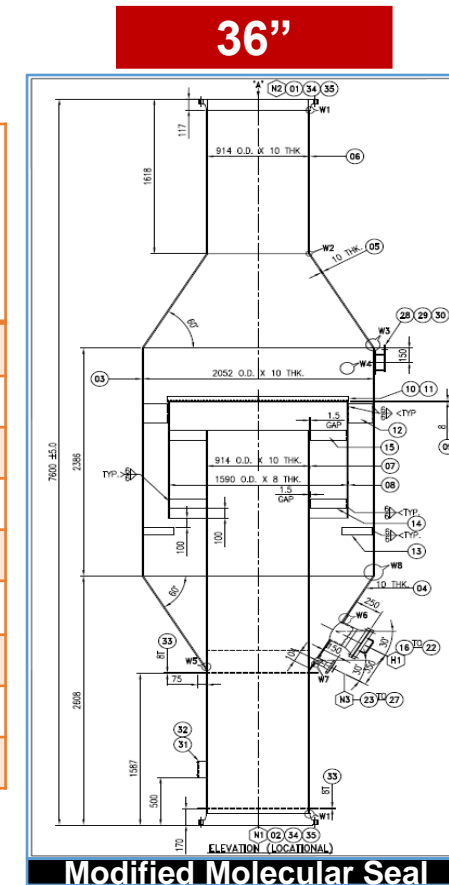
## Original System:

- In Ammonia-II Plant, Flare header was equipped with 52” size molecular seal and flare tip assembly having 4 nos. of pilot burners.
- Nominal amount of NG is supplied to these pilot burners and any venting gas is burnt with the help of these burners.
- Also a small amount of NG around 30 Nm<sup>3</sup>/hr is supplied to the flare header as sweeping gas to avoid air ingress.
- Due to larger diameter of molecular seal and flare tip, additional purge gas (Tail gas 300-400 Nm<sup>3</sup>/hr, LCV of 2800 kcal/NM<sup>3</sup>) was also required to be supplied continuously to flare header to maintain burn back temperature in the safe range of 50-100 degC.

## Modification Implemented:

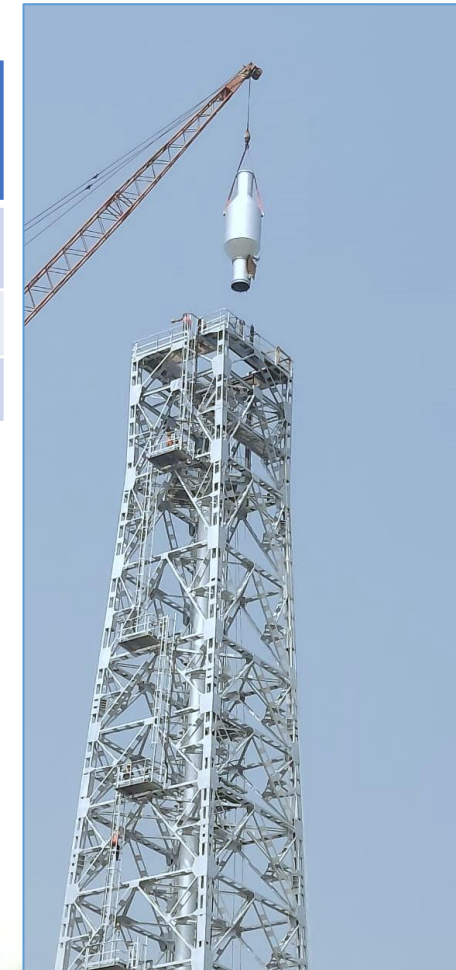
To enhance the safety, reducing the purge flow & to avoid burn back due to air ingress existing 52” molecular seal with flare tip assembly replaced with modified 36” molecular seal and flare tip assembly.

Particulars	New Molecular Seal and Flare Tip Assembly	Old Molecular Seal and Flare Tip Assembly
<b>Molecular Seal details</b>		
Outer shell diameter	2052 mm	3050 mm
Inverted shell diameter	1590 mm	2355 mm
Inner shell diameter	914 mm	1372 mm
Length	7.6 m	7.6 m
<b>Flare Tip details</b>		
Gas shell diameter	36 inch	52 inch
Length	3.66 m	3.66 m
No. of pilots	3	4



## The performance of Molecular Seal & Flare Tip before and after ATR :

Particulars	Units	With New Molecular Seal of 36” size	With old Molecular seal of 52” size
Flare Tip temperature (Burn Back sensing)	degC	63	57
NG flow to flare header	NM3/hr	15	30
Tail gas to flare header	NM3/hr	0	321



## Saving & Payback

- ❖ Energy Saving achieved : **6270 Gcal/ Annum**
- ❖ Monetary saving : **Rs. 2.8 Crores/ Annum**
- ❖ Investments : **Rs 1.0 Crores**
- ❖ Payback Period : **4 Months**

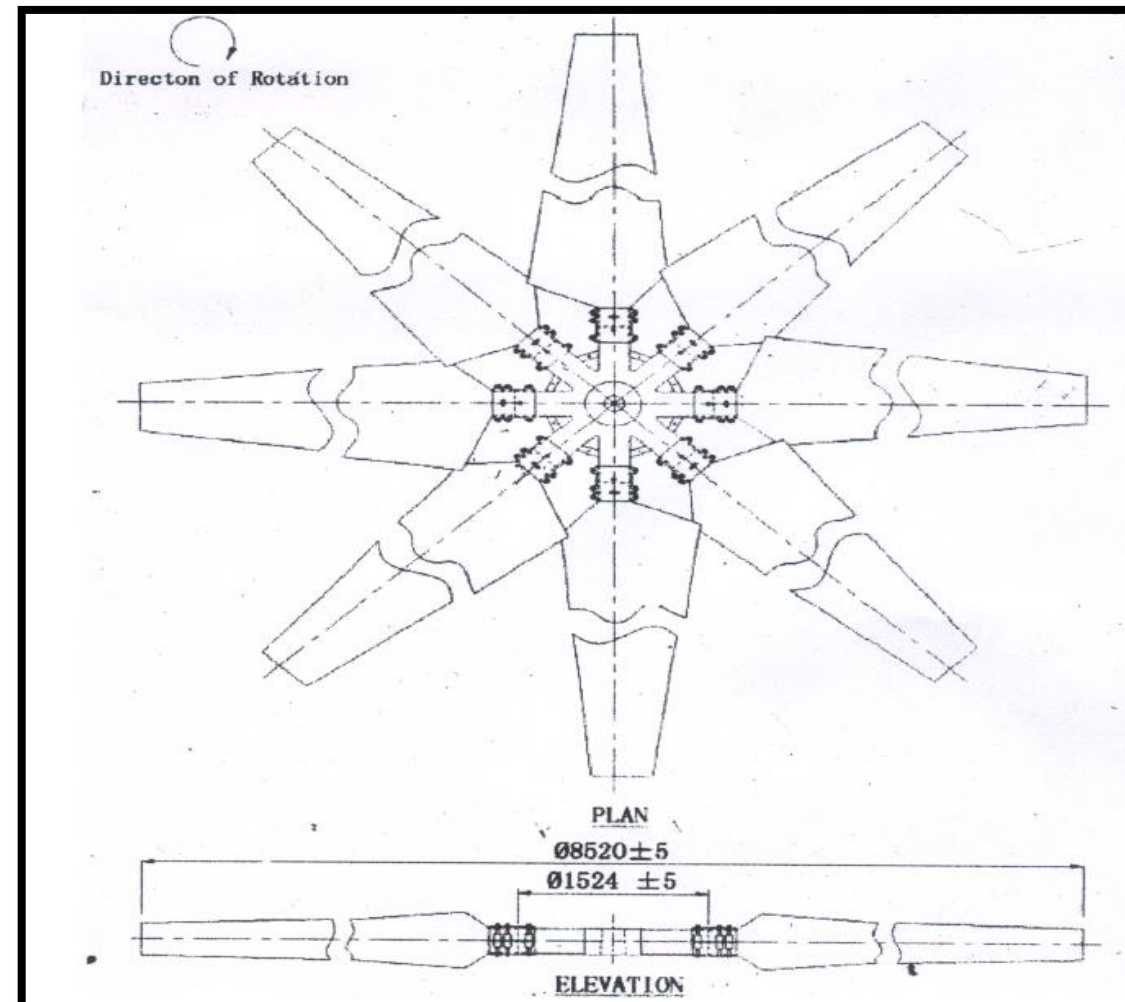
## Replication Potential

*The modification has high replication potential in any industry where there is such type of gas venting to flare stack is maintained to avoid back burn occurrence.*

# Replacement of Existing Solid FRP Fans with High Efficiency Hollow FRP Fans (6 Nos.) for Cooling Tower Cells of Ammonia-II Plant

## Original System:

- Ammonia-II cooling tower (CT) have total 6 nos. cells for cooling the return hot cooling water from ammonia plant.
- The fans of the cells are solid Fiber Glass Reinforced Plastic (FRP) fans.
- The required blade angle to meet out air flow requirement were on higher side (around 22-23 deg).
- During peak Summer and Rainy Season, limitation occurred in the performance of Cells of Ammonia-II Cooling Tower.



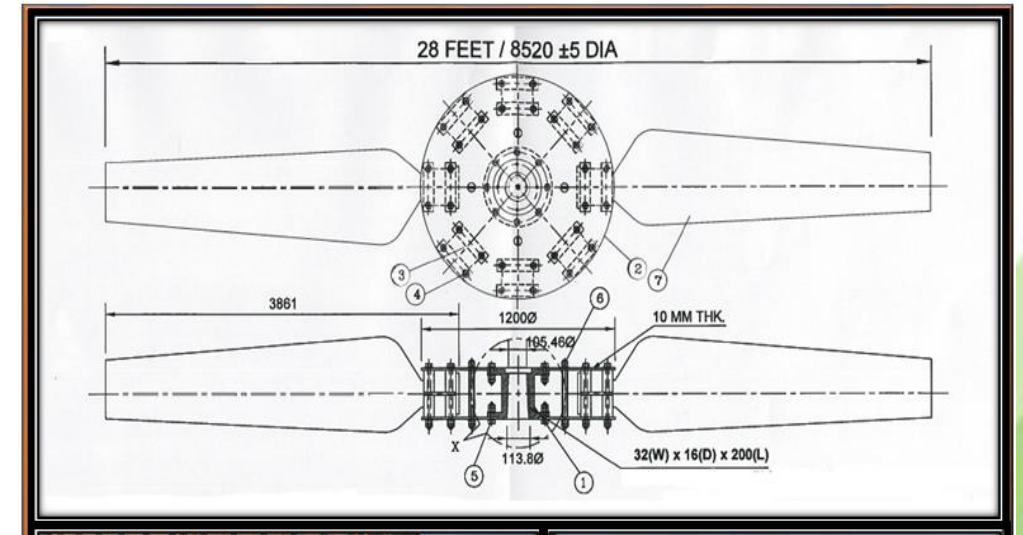
# Replacement of Existing Solid FRP Fans with High Efficiency Hollow FRP Fans (6 Nos.) for Cooling Tower Cells of Ammonia-II Plant (Contd...)

## Modified System:

- Old solid FRP fans replaced with M/s ENCON make high efficiency energy saving E-Glass Epoxy FRP fans.
- Average power consumption of Fans has reduced from 77.3 kW to 48.5 kW per fan.
- Required Volumetric air flow from the cells of Cooling Tower is being achieved at blade angle of 14-15 deg.

## Saving & Payback

- ❖ Energy Saving achieved : **1368 MWH/ Annum**
- ❖ Monetary saving : **Rs. 1.12 crores/ Annum**
- ❖ Investments : **Rs. 51.0 Lakhs**
- ❖ Payback Period : **5.0 Months**



## Replication Potential

*The modification has high replication potential in any industry where such cooling tower fans are in operation.*

# Utilisation of Renewable Energy Sources

Year	Technology (Electrical)	Type of Energy	Onsite/ Offsite	Installed Capacity (MW)	Generation (million kWh)	% of purchased Electrical Energy	% of total Electrical power requirement
2019-20	Roof Top Solar panel	Solar Energy	Onsite	0.916	1.176	75.1	0.81
2020-21	Roof Top Solar panel	Solar Energy	Onsite	0.916	1.228	53.1	0.86
2021-22	Roof Top Solar panel	Solar Energy	Onsite	0.916	1.315	39.4	0.98

Year	Capacity addition, MW	Investment made, Rs. Lakhs
2019-20	0.092	43.5
2020-21	-	-
2021-22	-	-



## Purge Gas Recovery Unit

- *Purge Gas recovery unit was installed for recovery of hydrogen from purge gas of synthesis section of Ammonia-I and Ammonia-II Plants.*
- *Synthesis gas is recycled in ammonia plants for its full conversion to ammonia. Hydrogen is recovered from purge gas and is converted to ammonia.*
- *Remaining purge gas is burnt as fuel in primary reformer and its heat is recovered. All the gases are recycled & reused.*

Year	Energy Saving with PGR unit operation, Million Kcal
2019-20	110943
2020-21	122638
2021-22	114336



Year	CO2 Emission, MT	Emission Intensity, kg/MT Urea
2019-20	425861	391.9
2020-21	468621	398.1
2021-22	445998	394.2

Scope-I : a. Natural gas as fuel in Primary Reformer and Heat Recovery Unit (HRU) in Ammonia-II Plant.  
b. Natural Gas as a fuel in Captive Power Plant.

Scope-II : Emission due to consumption of Purchase Power from Uttar Pradesh Power Corporation Ltd. (UPPCL).

### Initiative for Carbon Capture:

- ✓ To reduce CO2 emission to the atmosphere, CO2 recovery unit (Capacity: 450MTPD) was installed in year 2006. Reduction in Green House Gases (GHG) is around 177480 MTPA for FY 2021-22.
- ✓ Installation of CDR unit resulted in achieving higher capacity utilization and helped to reduce CO2 emission to the atmosphere.



## **1. Daily Monitoring System:**

- a) *All Plants submit their raw material input and production data on day basis.*
- b) *All data transferred to technical via cloud system*
- c) *In technical section complete data summarised and evaluation done for production output and specific energy consumption.*

## **2. Review meeting chaired by: Unit Head (Designation: Sr. Executive Director)**

## **3. Separate budget for Energy Conservation: Rs. 58.162 million**

## **4. Energy efficiency awareness training program : Periodically classes is being conducted for plant personnel to make aware them about efficient use of energy as well as to reduce the energy losses.**

**Steps taken for increasing Safety, productivity and for Efficient Use of Energy**

1. Preparation of plant performance and energy reports on daily, monthly and yearly basis
2. Formation of Energy Conservation Cell & Steps taken based on the recommendations of energy cell
3. Involvement of plant personnel through Plant Suggestion Schemes

**Some of the suggestions (From Workmen) mentioned below:**

- a) Provision of linking water sprinkler system with HP ammonia sensors in HP Ammonia Feed Pump Area
- b) Design, fabrication & Installation of pipe box for arresting online leakage in E-3516 Gas outlet.
- c) To change the plan of mechanical seal of Cooling Water Re-circulation Pump.
- d) Modification of Neem Coating Spray System - shifting from MT-1 to BC-1.
- e) Provision of filter in TK-3431 control oil header separately.

- In Aonla Unit, Energy Management System ISO 50001:2011 was implemented from November 2014.
- Now IFFCO Aonla certified with ISO 50001:2018.
- Effective date is 18<sup>th</sup> January 2022.
  
- % investment of energy saving projects on total turnover of the company for FY 2021-22 : 0.17%



## Certificate of Registration

ENERGY MANAGEMENT SYSTEM - ISO 50001:2018

This is to certify that: **Indian Farmers Fertiliser Cooperative Ltd.**  
Aonla Unit:  
Paul Pothan Nagar  
P.O.: IFFCO Aonla Township  
Bareilly 243 403  
Uttar Pradesh  
India

Holds Certificate No: **ENMS 751679**

and operates an Energy Management System which complies with the requirements of ISO 50001:2018 for the following scope:

The Manufacture of Urea and Generation of Power.

For and on behalf of BSI:   
Michael Lam - Managing Director Assurance, APAC

Original Registration Date: 2022-01-18  
Latest Revision Date: 2022-01-18

Effective Date: 2022-01-18  
Expiry Date: 2025-01-17

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...making excellence a habit.™

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*Award Program is a platform to know about the ideas adopted by other companies in their process and giving a thrust to move in direction of energy conservation as well as improved plant operation.*

*IFFCO Aonla Unit is committed to work on sustainable basis for the efficient use of energy. IFFCO Aonla-II Unit also received the following awards in previous 2 years:*

- 1. IFFCO Aonla-II Unit received the National Energy Conservation Award (Certificate of Merit) for the year 2020 from Government of India, Ministry of Power in appreciation of the achievements in Energy Conservation in the Fertilisers sector.*
- 2. IFFCO Aonla-II Unit received State Energy Conservation Award-2021 (1st position) from Uttar Pradesh New & Renewable Energy Development Agency (UPNEDA).*



## राष्ट्रीय ऊर्जा संरक्षण पुरस्कार

यह प्रशस्ति प्रमाण-पत्र

मेसर्स इंडियन फार्मर्स फर्टिलाइजर कोऑपरेटिव लिमिटेड,

आंवला यूनिट-2

बरेली (उत्तर प्रदेश) को

वर्ष 2020 के लिए

उर्वरक सेक्टर में

ऊर्जा संरक्षण के सराहनीय प्रयास के लिए

प्रदान किया जाता है।

विद्युत मंत्रालय  
नई दिल्ली  
14 दिसम्बर, 2020

*सहस्र*  
सचिव,  
भारत सरकार

Ministry of Power  
New Delhi  
14 December, 2020



## National Energy Conservation Award

This commendation certificate is awarded to

M/s Indian Farmers Fertiliser Cooperative Limited

Aonla Unit-2

Bareilly (Uttar Pradesh)

in appreciation of their efforts in

Energy Conservation in the

Fertilizer Sector

for the year 2020

*Shri*  
Secretary to the  
Government of India



Winner of Best Production Performance Award-2021



State Energy Conservation Award-2021 (1st position)



*Thank You*

*Indian Farmers Fertiliser Cooperative Limited (Aonla-II Unit)*