IFFCO Aonla Unit-I

Welcomes

Hon'ble Panel of Judges & Delegates

Presented by:

Mr. Neeraj Rajesh (Chief Manager- Urea),
Mr. J S Garcha (Chief Manager- Ammonia),
Mr. Sunil Kumar (Manager (GE))
Indian Farmers Fertiliser Cooperative Limited, IFFCO Aonla Unit

Leading producer & marketer of fertiliser in India

No. of plant locations : 5

Installed Annual Production Capacity

- Urea : 4.24 Million MT
- NPK/DAP : 4.34 Million MT
IFFCO Aonla Unit, located in northern part of India, operates
Two streams of Ammonia (capacity 1740 MTPD each) and 4 streams of Urea (capacity 1515 MTPD each) and is based on Natural Gas as feed and fuel.
## Last 3 Years Specific Energy Consumption

<table>
<thead>
<tr>
<th>Year</th>
<th>Specific energy consumption (Gcal/MT Urea)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015-16</td>
<td>5.570</td>
</tr>
<tr>
<td>2016-17</td>
<td>5.604</td>
</tr>
<tr>
<td>2017-18</td>
<td>5.344</td>
</tr>
</tbody>
</table>

Specific energy consumption in F.Y. 2016-17 is slightly higher in comparison to FY 2015-16 due to energy consumed in ongoing activities of Energy Saving Project.
## Comparison with National & International Benchmark

<table>
<thead>
<tr>
<th>Description</th>
<th>National Benchmark (Gcal/MT of Urea)</th>
<th>Average Value (For All Gas based Plant), (Gcal/MT of Urea)</th>
<th>International Benchmark (Gcal/MT of Urea)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific Energy Consumption</td>
<td>5.158</td>
<td>5.880</td>
<td>Not Available</td>
</tr>
<tr>
<td>IFFCO Aonla-I: Urea Plant (year: 2017-18)</td>
<td>5.344</td>
<td>5.344</td>
<td>5.344</td>
</tr>
</tbody>
</table>
Roadmap to achieve National & International Benchmark

- Advanced Process Design
- Complex Integration
- Improve Operating Practices
- Minor Modifications
- Major Modifications
Energy Conservation Projects implemented in last 3 years
<table>
<thead>
<tr>
<th>Title of Energy Saving project implemented</th>
<th>Year of Implementation</th>
<th>Total Annual Savings (Rs Lakhs)</th>
<th>Invest. Made (Rs Lakhs)</th>
<th>Payback (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Following modifications are carried out for H.P. Carbamate Pumps</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Provision of O-ring to resolve oil bypassing problem from inboard bearing housing of H.P. Carbamate Pump</td>
<td>2015-16</td>
<td>120</td>
<td>0.1</td>
<td>&lt;1 (1 Day)</td>
</tr>
<tr>
<td>B. To enlarge the size of drain orifice from 2.0 mm to 5.0 mm to avoid chocking of drain line of H.P. Carbamate Pump</td>
<td>2015-16</td>
<td>76</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Title of Energy Saving project implemented</td>
<td>Year of Implementation</td>
<td>Total Annual Savings (Rs Lakhs)</td>
<td>Invest. Made (Rs Lakhs)</td>
<td>Payback (Years)</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>------------------------</td>
<td>-------------------------------</td>
<td>------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Reducing load of CO2 Blower (MK 2301) by closing antisurge valve, in CO2 Removal Section</td>
<td>2015-16</td>
<td>39</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Reduction in load of CO2 Blower (K2102) in CDR unit by way of stopping recirculation, by keeping the suction pressure control on variable frequency drive (VFD) of its Motor</td>
<td>2015-16</td>
<td>5</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Replacement of conventional lighting fixtures with energy efficient lighting fixtures</td>
<td>2015-16</td>
<td>5</td>
<td>21</td>
<td>4</td>
</tr>
</tbody>
</table>
# List of Energy Conservation Projects

<table>
<thead>
<tr>
<th>Title of Energy Saving project implemented</th>
<th>Year of Implementation</th>
<th>Total Annual Savings (Rs Lakhs)</th>
<th>Invest. Made (Rs Lakhs)</th>
<th>Payback (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilisation of Flash Steam generated in Steam Condensate Tank as motive fluid in booster ejector in Urea-I Plant</td>
<td>2016-17</td>
<td>200</td>
<td>3</td>
<td>&lt;1.0 Month</td>
</tr>
<tr>
<td>Replacement of conventional lighting fixtures with energy efficient lighting fixtures</td>
<td>2016-17</td>
<td>5</td>
<td>15</td>
<td>3.0</td>
</tr>
</tbody>
</table>
## List of Energy Conservation Projects (Contd…)

<table>
<thead>
<tr>
<th>Title of Energy Saving project implemented</th>
<th>Year of Implementation</th>
<th>Total Annual Savings (Rs Lakhs)</th>
<th>Invest. Made (Rs Lakhs)</th>
<th>Payback (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Saving Project (Schemes listed below)</td>
<td>2017-18</td>
<td>10552</td>
<td>38700</td>
<td>3.7</td>
</tr>
<tr>
<td>Replacement of conventional lighting fixtures with energy efficient lighting fixtures</td>
<td>2017-18</td>
<td>9.7</td>
<td>14</td>
<td>1.4</td>
</tr>
</tbody>
</table>
List of Energy Conservation Projects (Contd…)

Energy Saving Project has been implemented in IFFCO Aonla-I Unit in F.Y. 2017-18. Following are the modifications incorporated during ESP:

**Ammonia Plant:**

1. Replacement of existing finned type Combustion Air Preheater with new plate type Combustion Air Preheater.
2. Replacement of HP boiler at downstream of High Temperature Shift Converter with new steam super-heater.
3. Replacement of existing GV solution based CO2 removal section by aMDEA solution based CO2 removal section for less energy requirement.
4. Replacement of existing Water Cooler using indirectly cooled DM water as cooling medium for cooling of synthesis gas with new heat exchanger using cooling water as cooling medium.

5. Replacement of existing BFW Pre-heater in synthesis loop with a new BFW Pre-heater of higher surface area.

6. Revamp of Synthesis Gas Compressor involving replacement of HP case and LP case barrels by new barrels for increase in efficiency.

7. New Ammonia wash system in Synthesis Gas Compressor 2nd discharge to remove oxygenated compounds from synthesis gas and sending 3rd stage discharge directly to recirculator stage discharge.
List of Energy Conservation Projects (Contd…)

Urea Plant:


9. Following schemes have been implemented in Urea Plant:
   8 (A) Replacement of existing CO2 Compressors with new higher efficiency compressors
   8 (B) Installation of VAM in 11 & 21 streams of Urea Plant

Power Plant:

10. Advance seal uprate and exhaust duct modification in GTG-I.
Innovative Projects
Utilisation of Flash Steam generated in Steam Condensate Tank as motive fluid in booster ejector installed in Urea-I Plant
1. Steam Condensate tank receives condensate from various steam consumer points.

2. Due to difference in temperature and pressure of condensate receives from various consumer points and steam condensate tank, flash steam (of 2.0 kg/cm²) is generated in condensate tank.

3. This flash steam is condensed in a condenser which is an integral part of this condensate tank.

4. Cooling water is used as cooling media in condenser.
5. Urea solution is being concentrated from 85 to 99.5% in Evaporation & Vacuum section.

6. In existing system, vacuum in Evaporation & Vacuum section is created by set of ejectors in which low pressure steam (4.5 kg/cm²a) is used as motive fluid.

7. Booster ejector is located at the downstream of 2nd Stage Separator in which LP steam of 4.5 kg/cm²a was used before modification.
Original system

Urea – I Plant

1st condenser for 2nd Separator

Booster Ejector

Low Pressure Steam

Urea-11 Unit

Urea Melt Pump

Drain

PSV

Steam Condensate Pump

CW

After Modification
1. For usage of the generated flash steam, cooling water flow to condenser has been stopped.

2. Available flash steam is now used as motive fluid in place of low pressure steam (4.5 kg/cm²a) and guided to the inlet nozzle of booster ejector of 2nd Stage Separator in Evaporation & Vacuum section.

3. With the above modification, heat from condensation of flash steam which was earlier being dumped in cooling water is now utilised in the urea plant.
Approximately 2.9 MT/hr LP steam has been saved which is equivalent to HP Steam saving of 1.8 MT/hr.

Saving & Payback:

Energy Saving achieved : 9190 Gcal/annum
Monetary saving : Rs. 200 Lakhs/annum
Investments : Rs. 3.0 Lakhs
Payback Period : Less than a week
The modification is innovative in the sense that energy saving have been achieved by generating low pressure flash steam of 2.0 kg/cm²a and utilizing the same in the system at other place. It resulted in saving of LP steam (4.5 kg/cm²a).

The modification has high replication potential in any industry where such type of heating and cooling arrangements are in operation.
Utilisation of Renewable Energy Sources

Renewable energy generations

- Solar Water Heating System
- Solar Street Light System
- Roof Top Solar Photovoltaic Panel at various building

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Unit</th>
<th>FY 2015-16</th>
<th>FY 2016-17</th>
<th>FY 2017-18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof Top Solar PV</td>
<td>KWH/day</td>
<td>-</td>
<td>-</td>
<td>378</td>
</tr>
<tr>
<td>Solar Water Heating</td>
<td>KWH/year</td>
<td>34800</td>
<td>34800</td>
<td>34800</td>
</tr>
<tr>
<td>Solar Street Light</td>
<td>KWH/year</td>
<td>1100</td>
<td>1100</td>
<td>1100</td>
</tr>
</tbody>
</table>
Utilisation of Waste Material

Waste Utilisation

- Purge Gas Recovery (PGR) unit to recover Hydrogen and recycle it back for achieving energy saving
- Utilisation of waste heat for DM water heating
- NG fuel heating from Primary Reformer Flue Gas

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Unit</th>
<th>FY 2015-16</th>
<th>FY 2016-17</th>
<th>FY 2017-18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purge Gas Recovery</td>
<td>Gal/year</td>
<td>117864</td>
<td>111164</td>
<td>92106</td>
</tr>
<tr>
<td>DM Water heating in Ammonia Plant</td>
<td>Gal/year</td>
<td>71669</td>
<td>67558</td>
<td>56190</td>
</tr>
<tr>
<td>NG fuel heating from PR Flue Gas</td>
<td>Gal/year</td>
<td>27364</td>
<td>25795</td>
<td>14900</td>
</tr>
</tbody>
</table>
## GHG Inventorisation

### CO2 generation per MT Urea:

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Unit</th>
<th>CO2 Gen./MT Urea</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 2015-16</td>
<td>Gal/year</td>
<td>0.523</td>
</tr>
<tr>
<td>FY 2016-17</td>
<td>Gal/year</td>
<td>0.519</td>
</tr>
<tr>
<td>FY 2017-18</td>
<td>Gal/year</td>
<td>0.500</td>
</tr>
</tbody>
</table>

**Note:** CO2 generation sources includes fuel consumption in Primary Reformer, Auxiliary Boiler in Ammonia Plant and Purchased Power Used:
Team work, Employee Involvement & Monitoring
Daily monitoring system

1. Estimation of saving in terms of steam, power, gas etc.
2. Calculation of saving in terms of Raw Material, i.e. natural gas
3. Derive Total energy saving based on energy value of raw material.
4. Total yearly production is used for calculating specific energy consumption.

Daily review meeting chaired by Unit Head
Energy Efficiency / Awareness Training Program

- Energy Conservation Cell
  - Energy monitoring cells for Ammonia, Urea, Product handling, Offsites and Power plant
  - Each cell consists of persons from Technical, respective Production, Maintenance and Instrumentation sections
  - Management Representative – reporting to top management
  - Energy Manager

- Preparation of plant performance and energy reports on daily, monthly and yearly basis and accordingly corrective actions are taken.
Steps taken based on the recommendations of energy cell

- Monitoring and achieving the most optimum vacuum in surface condensers.
- Based on the performance evaluation, compressors/turbines are recommended for overhauling.
- Trimmed operation of cooling towers to achieve most optimum cooling water temperature.
- Steam lines insulation survey helped in reducing the loss of heat to atmosphere.
% investment on turnover

- IFFCO Aonla-I Unit has implemented Energy Conservation Project in the FY 2017-18.
- Apart from ESP, Various energy saving schemes implemented in-house regularly.
- Investment for the ESP and in-house energy saving modifications are given below:

% investment for energy conservation projects on turnover | 23.77% (Rs. 3758.8 Million)
Awards in recent past

Indian Farmers Fertiliser Cooperative Limited, IFFCO Aonla Unit
Awards in recent past

- Most Innovative Environmental Project Award from Confederation of Indian Industry (CII) under CII Environmental Best Practices Award-2017.
- FAI Safety Award-2017 (Runner up) for excellence in safety from The Fertiliser Association of India.
- FAI Safety Award-2017 (Sarvashreshtha Suraksha Puraskar), NSCI Safety Award-2017 from National Safety Council of India.
- Safety Innovation Award in Fertiliser & Chemicals sector from Institute of Engineers (India).
- Most Innovative Environmental Project Award from Confederation of Indian Industry (CII) under CII Environmental Best Practices Award-2017.
Excellence Award for Case Study presented & Best Suggestor Award from (INSSAN-NIC) in 19th National Creativity Summit-2017.

16th Annual Greentech Safety Award-2017 (Gold Award) in Fertiliser sector from Greentech Foundation.

7th Annual Greentech HR Award-2017 (Gold Award) from Greentech Foundation.

Energy Efficient Unit Award-2016 in Fertiliser sector from Confederation of Indian Industry (CII).
Thank you!