ENERGY CONSERVATION MEASURES AT NATIONAL FERTILIZERS LIMITED, VIJAIPUR
Unit Profile

• National Fertilizers Limited, (A Govt. of India Undertaking), was incorporated on 23rd August 1974.

• Second largest producer of nitrogenous fertilizer in the country.

• Four operating fertilizer units located at Nangal, Bhatinda, Panipat and Vijaipur.

• Total annual installed capacity of 35.68 lakh MT Urea.
Unit Profile

• The Vijaipur unit, which is an ISO 9001:2008, ISO 14001:2004 & OHSAS 18001:2007 (Integrated Management System) certified unit,

• Two Ammonia and Urea Plants - Vijaipur-I and Vijaipur-II.

• Reassessed capacities of Ammonia plants are 1520 MTPD each and that of Urea Plants are 2620 MTPD each.

• Vijaipur-I unit is the first inland Natural Gas based fertilizer unit on the cross-country Hazira- Vijaipur- Jagadishpur Natural Gas pipeline.

• Vijaipur-I plants were commissioned in December 1987 and after a decade Vijaipur-II plants were commissioned in March 1997. Both the streams are based on “Steam reforming process” of Haldor Topsoe (Denmark) for Ammonia plants with Natural gas feed in Vijaipur-I.
Unit Profile

• NG/Naphtha feed in Vijaipur-II. The Urea plants are based on Saipem (Italy)‘s “Ammonia stripping process”.

• Certain technological developments involving additional energy saving features, those had taken place after commissioning of Vijaipur-I, were incorporated in Vijaipur-II Plant.

• In order to reduce specific energy consumption and increase production level, Vijaipur-I and Vijaipur-II were revamped in the year 2012-13 along with installation of 450MTPD Carbon dioxide Recovery (CDR) plant.

• The revamped capacities are 1750MTPD ammonia and 3030MTPD urea for Vijaipur-I and 1864MTPD ammonia and 3231MPD urea for Vijaipur-II.
Unit Profile

• Vijaipur Unit is self reliant in Power. There are three nos of Gas Turbine Generators (GTGs) of capacity 17.225MW, two in operation and one remaining standby.

• Each GTG operates in Co-generation mode with associated HRSG boilers for efficient use of Gas Turbine exhaust gases to generate steam. HRSGs are supported by supplementary firing.

• There are other Auxiliaries, viz. Water Treatment Plants; Cooling Towers; Atmospheric Ammonia Storage; Instrument & Service Air System; Effluent Treatment and Management Systems; etc.

• Silos are there to ensure uninterrupted operation of Plants in the event of dislocation of supply of Railway Rakes by Indian Railways on whom the Unit is heavily dependent for dispatch.
Unit Profile

• NFL, Vijaipur is very much committed to Energy Management.
• NFL has a dedicated Energy management cell with headed by Dy. General Manager (Technical Services and R&D) who is also a Certified Energy Auditor.
• For all ENCON measures, the ECC is the principal functioning & coordinating cell. 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.
Unit Profile

• The daily energy consumption is monitored and analyzed by Technical Services Department and suitable corrective action is taken in case of increase in energy consumption.

• 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, C&MD, Directors) for approval of budget & implementation.
Unit Profile

• 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 plants are also given top priority for early implementation.

• 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.

• Feasibility study for capacity enhancement along with associated Energy savings is being carried out by M/s HTAS & M/s Saipem.
Energy efficiency is inversely proportional to Specific Energy Consumption. Energy efficiencies can be improved by reduction in specific energy consumptions which can be achieved by:

- higher on-stream efficiency
- higher scale of operation
- less no. of tripping / reduction in
- unproductive energy consumption
HOW TO IMPROVE ENERGY EFFICIENCY

- optimization of steam and power
- optimization of plant parameters
- Reduction in steam leakages through steam traps and insulation
- waste minimization

The above factors can be achieved by means of monitoring plant performance, strict vigilance, analysis of tripping and equipment breakdown to avoid their recurrences, reduction in start-up time etc.
Further reduction in specific energy consumption is possible by:

1. Technology up-gradation
2. Revamps/ Retrofits of plants
3. Recognition of ENCON options and implementation of economically viable Energy saving Schemes
NFL, Vijaipur, is very much committed to Energy management. Considering that Fertilizer manufacturing is an energy intensive process, we have realized that a small step towards ENCON within the premises of NFL shall be a great leap in the energy front of the Country and shall help in materializing the Targets set forth under the Energy Conservation Act 2001.
ENCON PRACTICES

- Internal norms setting and benchmarking.
- Stringent and close monitoring, analysis, review & follow-up action
- Good house keeping
- Increase in capacity utilization & On stream factors
- Optimization of Operation practices- Optimum utilization of electrical & thermal energies
ENCON PRACTICES

- Conducting internal & External energy Audits
- Training & Motivation of employees by recognition of suggestions with suitable awards
- Formation of Energy Management Cell comprising of members from various discipline with Energy Manager as Co-ordinator
- Campaign on Energy Conservation to inculcate awareness amongst employees, school children, residents of township & nearby villages.
ENCON PRACTICES

- Reduction in Startup time of ammonia plant from 48 hrs to 30 Hrs by:
  - Provision of suitable Interconnection between Vijaipur-I & Vijaipur-II plants.
  - Time Optimization during startup by way of proper co-ordination and optimization of Startup procedure based on experience.
ENCON PRACTICES

MONITORING & REPORTING SYSTEM

- Energy management flows from the Top.
- Active individual participation under the suggestion scheme
- Close monitoring & Review with Energy Manager as Coordinator. Weekly review under the chairmanship of Unit Head.
- Sp. Energy Cons per MT of Product for each Unit and Complex: Daily, Monthly & Quarterly & Annually with detailed break up for feed, fuel, steam & power
ENCON PRACTICES

MONITORING AND REPORTING SYSTEM

• Sp Energy Cons for Steam & Power: Daily, Monthly & Quarterly & Annually
• Efficiency calculation of Equipment & machinery: Periodically as per schedule drawn up.
• Monitoring of: Stack temp., Critical plant parameters, Oxygen in flue gases, leakages from steam traps & vents.
ENERGY MANAGEMENT APPROACH

Identification of Losses
- Brainstorming/out of Box thinking
- End-end Survey
- Energy Audit

Monitoring
- Performance evaluation
- Quantification of Gains

Analysis
- Discussion in Plant
- Check by each department
- Approval & Budget

Execution
- Planning
- Material Procurement
- Execution
- Training of Personnel
ENERGY POLICY OF NFL VIJAIPUR

To promote Energy conservation ideas, an Energy Policy has been adopted in 2003

National Fertilizers Limited, Vijaipur, a urea manufacturing unit, is committed for continual improvement in the energy performance. In order to accomplish this objective, it will strive for:

- Optimum utilization of natural resources.
- Maximum recovery of low grade and waste energy.
- Reducing breakdowns by detailed study of each failure & taking appropriate preventive measures.
- Benchmarking the energy performance with other energy efficient units.
Inculcating awareness for energy conservation among employees and encouraging through reward for initiatives taken by them.

- Conducting regular energy audits.
- Up-gradation of processes and equipment with latest technology.
- Implementation of energy saving schemes.
- To bring down energy consumptions as per targets given under “Perform, Achieve and Trade”
MAIN THRUST AREAS TO IMPROVE ENERGY EFFICIENCY

- Higher on-stream efficiency
- Higher average plant load
- Less no. of tripping / reduction in unproductive energy consumption
- Optimization of thermal and electrical energy
- Recovery of low grade heat
- Utilization of gases being vented
- Optimization of plant parameter, Improvement of Operation & Maintenance practices
- Change in design
- Implementation of schemes for sustainable development
MAJOR ENERGY CONSERVATION SCHEMES AT NFL VIJAIPUR
## MAJOR ENERGY SAVING SCHEMES IMPLEMENTED OVER THE YEARS AND RESULTANT BENEFIT

<table>
<thead>
<tr>
<th>Brief Description of the Scheme</th>
<th>Year of Implementation</th>
<th>Energy Savings (Gcal)</th>
<th>Investment (Rs. Lakhs)</th>
<th>Reduction in CO₂ Emission (MT/Year)</th>
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</thead>
<tbody>
<tr>
<td>Installation of Cryogenic Purge Gas Recovery Unit</td>
<td>1992-93</td>
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<td>500</td>
<td>11000</td>
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<tr>
<td>Low Grade Heat recovery from process condensate top vapor by installing DM water pre-heater in Ammonia-I (Shell &amp; Tube HE)</td>
<td>1998-99</td>
<td>43200</td>
<td>150</td>
<td>10500</td>
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<tr>
<td>Low Grade Heat recovery from process condensate bottom liquid by installing DM water pre-heater in Ammonia-I (Plate type HE)</td>
<td>2004-05</td>
<td>43200</td>
<td>60</td>
<td>10500</td>
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<tr>
<td>Replacement of Condensing steam turbine of Ammonia Cooling Water pumps with motor in Vijaipur-I</td>
<td>2004-05</td>
<td>45000</td>
<td>500</td>
<td>11000</td>
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<tr>
<td>Replacement of one condensing steam turbine of Urea Cooling water pump with motor in Vijaipur-II</td>
<td>2004-05</td>
<td>23300</td>
<td>70</td>
<td>5600</td>
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<tr>
<td>Installation of 05 no. additional high efficiency sieve trays in all four streams of Urea plants &amp; modification in existing trays to increase CO₂ conversion efficiency</td>
<td>2004-05 (VP-1)</td>
<td>35000</td>
<td>200</td>
<td>8400</td>
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<tr>
<td></td>
<td>2005-06 (VP-II)</td>
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<tr>
<td>Installation of Pre-concentrator in both the streams of Urea plant in Vijaipur-I (Low Grade Heat Recovery) for partial utilization of heat of carbamate vapors which otherwise was getting wasted in cooling water</td>
<td>2006-07</td>
<td>103700</td>
<td>900</td>
<td>24900</td>
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<tr>
<td>Recovery of C-3 off gases from VP-I Urea plant and using it as fuel in CPP Boilers</td>
<td>2011-12</td>
<td>23190</td>
<td>82</td>
<td>23500</td>
</tr>
<tr>
<td>Recovery of C-3 off gases from VP-II Urea plant and using it as fuel in CPP Boilers</td>
<td>2012-13</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Revamp of Vijaipur-I</td>
<td>2012-13</td>
<td>140000</td>
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<td>33600</td>
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<tr>
<td>Revamp of Vijaipur-II</td>
<td>2012-13</td>
<td>53300</td>
<td>65000</td>
<td>12800</td>
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<tr>
<td>Carbon Dioxide Recovery Unit</td>
<td></td>
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<td>99000</td>
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</thead>
<tbody>
<tr>
<td>Energy Saving coating in casing of 03 no. cooling water pumps</td>
<td>2014-15</td>
<td>125</td>
<td>9</td>
<td>30</td>
</tr>
<tr>
<td>Replacement of Cooling Tower fan blades with FRP blades (Reduction in power by 25% with increase in air flow)</td>
<td>2014-15</td>
<td>3100</td>
<td>31</td>
<td>740</td>
</tr>
</tbody>
</table>
SUSTAINABLE ACTIVITIES

Besides implementation of energy saving schemes, NFL Vijaipur is always committed to sustainable development schemes e.g. small energy saving schemes by implementation of modification & suggestion schemes, water recovery schemes, usage of renewable energy etc.

• As a small step towards use of renewable energy and reduction in consumption of nonrenewable energy / fossil fuels, we have implemented solar lighting in factory main gate, solar water heater at NFL hospital and NFL Guest House.

• Lighting in the control rooms has been changed to energy efficient LED lighting. Replacement of the old lamps with LED lighting is being carried out in phases.
SNAPSHOTS OF SOME OF THE ENERGY SAVING SCHEMES IMPLEMENTED
RECOVERY OF LOW GRADE HEAT -
RECOVERY OF HEAT FROM BOTH TOP &
BOTTOM PRODUCT IN PROCESS
CONDENSATE STRIPPING SECTION IN
AMMONIA PLANT OF VP-I
HEAT RECOVERY FROM PROCESS CONDENSATE BY INSTALLING DM WATER PRE-HEATER IN AMMONIA-I

Process Condensate generated in the plant was earlier stripped with low pressure steam to remove ammonia, methanol, CO2 and other unwanted volatile compounds from the process condensate before sending to the polishing unit. In this section, for condensing the over head vapours, Air Cooler was provided as there was no scope for preheating DM water (consumed in the Ammonia plant), which was already getting fully heated in the Benfield Section.

In 1998, the Air cooler was replaced with a Heat Exchanger for preheating DM water from 35ºC to 70ºC, required for the Offsite Boilers. In order to balance the surplus LP steam, the motor driven pump in the Benfield section was taken in line and one of the backpressure turbines BFW pump was stopped.
In the second phase, a new plate type heat exchanger was installed to recover the heat of the treated process condensate which earlier used to get cooled by CW in the final cooler from about 90ºC to 40ºC by exchange of heat with DM water. The pressure of PC stripper has been raised from 0.6 kg/cm²g to about 1.3 kg/cm²g to make the extra heat recovery possible.
COST BENEFIT ANALYSIS

Annual Energy saving realized = 66.5 Million
Investment = 6 Million
Payback Period = 1 Month

CHANGES CARRIED OUT IN APRIL 04:

1) Installation of Plate Type Heat exchanger to Recover Heat from Bottom Product. The treated process condensate was earlier cooled by CW in final cooler from about 90ºC to 40ºC. This available heat of PC is being recovered by exchanging heat with DM water in a New plate heat exchanger (E-1331).

2) The pressure of PC stripper has been raised from 0.66 Kg/Cm²g to about 1.5 kg/cm²g to make the extra heat recovery possible.
<table>
<thead>
<tr>
<th>Parameters</th>
<th>Before Installation of Plate type HE</th>
<th>After Installation of plate type HE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Pressure</td>
<td>0.6 kg/cm²</td>
<td>1.3 kg/cm²</td>
</tr>
<tr>
<td>Stripper top temperature</td>
<td>92°C</td>
<td>107°C</td>
</tr>
<tr>
<td>Stripper bottom temperature</td>
<td>107°C</td>
<td>120°C</td>
</tr>
<tr>
<td>Steam flow to Condensate Stripper</td>
<td>20 Te/Hr</td>
<td>20 Te/Hr</td>
</tr>
<tr>
<td>DM Water flow</td>
<td>230 Te/Hr</td>
<td>230 Te/Hr</td>
</tr>
<tr>
<td>DM Water temperature at inlet &amp; Outlet of Ammonia-I</td>
<td>35/71.4°C</td>
<td>38/99°C</td>
</tr>
<tr>
<td>Net heat recovery after installation of Plate type HE</td>
<td></td>
<td>5.7 Gcal/Hr</td>
</tr>
</tbody>
</table>
RECOVERY OF LOW GRADE HEAT-
INSTALLATION OF
PRE-CONCENTRATOR IN UREA PLANT
INSTALLATION OF PRE-CONCENTRATOR IN UREA-I PLANT

Pre-concentrator is an additional vacuum stage utilizing heat of condensation of carbamate vapors from MP decomposer which otherwise is wasted in CW. Under this retrofitting:

- Major part (60%) of the low grade heat (approx. 9.396 Gcal/h) that was otherwise dumped in circulating Cooling Water in Medium Pressure Decomposition stage, is recovered in the first stage (E-14A) of Urea Concentration Section.

- In this process around 22 te/h of Low Pressure Steam, otherwise being required in this Urea Concentration Section is saved.
**ORIGINAL SCHEME WITHOUT PRE-CONCENTRATOR**

- **Carbamate Solution from P-3**
- **Ammonical water from waste water section**
- **Urea solution from stripper**
- **MP Decomposer vapor to MP condenser. Dumping of low grade heat in CW.**
- **Vacuum Evaporator using LP steam to heat 72% concentrated Urea solution.**

- **MP Condenser (E-7)**
- **MP Absorber (C-1)**
- **E-14 1st Vacuum Evaporator**

- **Condensate outlet**
- **To Vacuum 1st Concentrator (MV-6)**
- **To E-9**
- **Air vent**
- **LP Steam Inlet**
- **Solution outlet from LP Decomposer**
- **Vapours from MV-I**
- **Urea solution to LP decomposer**
MODIFICATION WITH CASALE PRE-CONCENTRATOR

Carbamate Solution From P-3

MP Decomposer vapor to MP Pre-concentrator (E14-A) for recovery of

Urea solution from stripper

Air vent

MP Condenser (E-7)

CW out

CW In

MP Absorber (E-7)

TO Carbamate pump (P-2)

Solution outlet from LP Decomposer

To MP Condenser after recovery of heat in Pre-concentrator.

Pre-concentrator. A HE with two parts E-14 A & E-14 B. Heat of MP

To Vacuum separator
Saving of LP Steam (saturated) @ 210Kg/MT of Urea has been achieved against guaranteed saving of 195 kg/MT of urea with the installation of Pre-Concentrator.

The saving of energy is @ 0.12 Gcal/MT Urea, offering benefit of @ Rs. 5.0 crores per annum

The pay back period works out to be @ 22 months with total project cost of @ Rs. 9.0 crores.

Prills quality of Urea has also improved.

The scheme has been implemented in 21 & 11 streams in Sept.’06 & May’07 respectively.
OPTIMIZATION OF THERMAL & ELECTRICAL ENERGY
REPLACEMENT OF CONDENSING TURBINE OF COOLING WATER PUMP IN AMMONIA I PLANT WITH MOTOR

Savings: 30250 Gcal/Annum
Investment: Rs 84 lakhs
REPLACEMENT OF CONDENSING TURBINE OF COOLING WATER PUMP IN UREA-II PLANT WITH MOTOR

Savings:
22500 Gcal/annum

Investment:
Rs. 70 lakhs
RECOVERY OF HEAT FROM VENTED GASES (C-3 OFF GAS)
RECOVERY OF HEAT FROM C-3 OFF GASES:

In Urea plant, C-3 off gases is being vented to the atmosphere continuously to control the loop pressure. Each stream of Urea Plant generates around 700 Nm³/h of C-3 off gases, so total generation of C-3 off gases is around 2800 Nm³/h. C-3 off gas comprises Hydrogen, Methane, Ammonia, Nitrogen & Oxygen in the ratio of 25-30%, 7-10%, 2.5-12%, 50-55% & 6-10% respectively. Considering the heating value of C-3 off gases, it was proposed to utilize these gases in HRU-I &II as supplementary fuel.
SKETCH FOR UTILIZATION OF C-3 OFF GASES AS SUPPLEMENTARY FUEL IN CPP BOILERS

E1 - HP STRIPPER
MV-2/E2/ME2 - MP DECOMPOSER
E7 - MP CONDENSER
C-1 - MP ABSORBER
E9A&B - NH3 CONDENSER
V1 - AMMONIA RECEIVER

C-5 - INERT WASHING COLUMN
C-3/E11 - MP INERT WASHING TOWER
CW - COOLING WATER
BENEFITS OF RECOVERY OF C-3 OFF GAS

• **Specific Energy Consumption:** Saving of 300 Nm³/h corresponding to saving in specific energy consumption to the tune of 0.013 Gcal/MT Urea

• **Energy Savings:** 2.94 Gcal/Hr (Considering a heating value of 1464 kcal/Nm³ and off gas flow of 2000 NM³/Hr).

• **Green House Gas Emissions:** Environment benefits of reduction in annual CO₂ emission by 23500 MT CO₂ emission per annum and comparatively lower NOx emission as compared to usage in Primary Reformer. The reduction in CO₂ emission is comparatively higher due to the fact that direct venting of methane in the off gas is being avoided.

• **Investment:** Rs. 82 Lakhs

• **Savings:** Rs. 5.12 Crores / Annum.

• **Pay-back period:** 1.6 Months (Considering energy cost as Rs.2200/ Gcal)
C-3 off gas to HRU burners
C-3 off gas to NG Line to HRU burner fuel
ENERGY SAVING BY REVAMP OF VIJAIPUR-I & VIJAIPUR-II PLANTS

1. Energy Saving and Capacity Enhancement project in Ammonia-I & Urea-I Plant

2. Energy Saving and Capacity Enhancement project in Ammonia-II & Urea-II Plant

REVAMP OF AMMONIA-I PLANT

Major energy saving schemes implemented

- Replacement of existing Combustion Air Preheater to SS Plate type combustion Air Preheater
- Conversion of Benfield CO2 removal section to GV CO2 removal section
- Installation of S-50 Ammonia converter along with new Waste Heat Boiler
- Installation of Parallel Air Compressor
- Addition of one new cooling tower cell & pump
REVAMP OF UREA-I PLANT

- Installation of MP Pre-Decomposer
- L P Steam Booster Ejector for MP Pre-decomposer
- Modification of Existing 1st & 2nd stage Vacuum system
- Installation of Additional Ammonia pump of smaller Capacity
- Replacement of trays in distillation tower
- Installation of additional Hydrolyser pre-heater
- Bulk flow Urea Prill Cooler
- Addition of one cell and a pump in cooling tower
REVAMP OF AMMONIA-II PLANT

- Replacement of Combustion Air Preheater with plate type heater
- Up gradation of Synthesis gas compressor
- Installation of S-50 additional converter & WHB in Synthesis loop
- Replacement of Primary Reformer burners
- Replacement of Secondary Reformer burner nozzles
- Replacement of packings in GV tower
REVAMP OF UREA-II PLANT

- Installation of Pre-concentrator with vacuum system
- Installation of MP Pre-decomposer
- Steam booster Ejectors/ Stripper steam condensate separator
- Revamp of CO2 compressor and turbine
- Modification in 31/41 ME-5 vacuum system
- Replacement of distillation tower (C-2) trays
- Additional small capacity HP Ammonia feed pump in 31 and 41 streams
- Replacement of HP Carbamate pumps, Carbamate electors & other small pumps
- Bulk flow Urea Prill Cooler
ENERGY SAVING BENEFITS OF REVAMPS

• Energy saving in Vijaipur-I: 140000 Gcal/annum
• Energy saving in Vijaipur-II: 53000Gcal/MT Urea
• Total reduction in CO2 emission: 145000MT per annum
Energy saving by application of energy saving coating inside the casing of cooling water pumps

- There are total 14 nos Cooling Water Circulation pumps at NFL Vijaipur, out of which 10 remains in line with four pumps as standby. As the impellers of all the pumps are of SS make, there shall not be any gain in energy in case of application of coating in the impellers. Hence, it has been decided to apply energy saving coating in the casings of the pumps which would reduce roughness of the surfaces and result in power saving by 2-3%.

- **Investment in the scheme:** 2.6Lakhs/pump
- **Benefit:** power saving by 2-3%.
coating inside the casing of cooling water pumps
## Evaluation of Effect of coating

### MP-3801C Parameters readings before coating

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<tr>
<th>Sr. no.</th>
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<th>Discharge pressure</th>
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<th>Steam flow</th>
<th>C.W. Flow</th>
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<tr>
<td>1.</td>
<td>MP-3801C</td>
<td>3.85</td>
<td>91.3</td>
<td>FULL OPEN</td>
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<tr>
<td>2.</td>
<td>TP-3801B</td>
<td>3.85</td>
<td>5950</td>
<td>FULL OPEN</td>
<td>8.76</td>
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<tr>
<td>3.</td>
<td>Common header</td>
<td>3.6</td>
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<td>1.</td>
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<tbody>
<tr>
<td><strong>Discharge Pressure</strong> = 3.85 kg/cm² = 37755 Pa</td>
<td><strong>Discharge Pressure</strong> = 4.08 kg/cm² = 400109 Pa</td>
</tr>
<tr>
<td><strong>C.W. Flow</strong> = 10900 M³/h = 3.02 M³/sec</td>
<td><strong>C.W. Flow</strong> = 10900 M³/h = 3.02 M³/sec</td>
</tr>
<tr>
<td><strong>Hydraulic Power</strong> = 1.144 Mwh</td>
<td><strong>Hydraulic Power</strong> = 1.2083 Mwh</td>
</tr>
<tr>
<td><strong>Power Consumed</strong> = 1.478 Mwh</td>
<td><strong>Power Consumed</strong> = 1.489 Mwh</td>
</tr>
<tr>
<td><strong>Efficiency</strong> = 77.40 %</td>
<td><strong>Efficiency</strong> = 81.15 %</td>
</tr>
</tbody>
</table>

**Increase in Efficiency** 81.15% - 77.40% = **3.75%**
## Evaluation of Effect of coating

### MP-3801A Parameters readings before coating

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Pumps</th>
<th>Dis. Pr. St PG</th>
<th>Dis. Pr. PT</th>
<th>Current / RPM</th>
<th>Discharge valve opening</th>
<th>Steam flow</th>
<th>C.W. Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MP-3801C</td>
<td>3.71</td>
<td>3.67</td>
<td>91.3</td>
<td>FULL OPEN</td>
<td>-----------</td>
<td>21800</td>
</tr>
<tr>
<td>2.</td>
<td>TP-3801A</td>
<td>3.72</td>
<td>3.71</td>
<td>5950</td>
<td>FULL OPEN</td>
<td>7.065</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Common header</td>
<td>3.52</td>
<td>3.52</td>
<td></td>
<td></td>
<td></td>
<td>21800</td>
</tr>
</tbody>
</table>
Evaluation of Effect of coating

MP-3801A Parameters readings after coating

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>pumps</th>
<th>Discharge pressure</th>
<th>Current / RPM</th>
<th>Discharge valve opening</th>
<th>Steam flow</th>
<th>C.W. Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MP-3801C</td>
<td>3.68 / 3.67</td>
<td>90.2</td>
<td>FULL OPEN</td>
<td>-----------</td>
<td>21800</td>
</tr>
<tr>
<td>2.</td>
<td>TP-3801A</td>
<td>3.71 / 3.71</td>
<td>5593</td>
<td>FULL OPEN</td>
<td>6.81</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Common header</td>
<td>3.51/3.52</td>
<td>--------------</td>
<td></td>
<td>-----------</td>
<td>21800</td>
</tr>
</tbody>
</table>

Steam saving at same discharge pr. = 7.065 – 6.81 = 0.255 t/h
% Saving = 3.6 %.
## Evaluation of Effect of coating

### MP-3801B Parameters readings Before coating

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>pumps</th>
<th>Discharge pressure</th>
<th>Current / RPM</th>
<th>Discharge valve opening</th>
<th>Steam flow</th>
<th>C.W. Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MP-3801C</td>
<td>3.41</td>
<td>90.8</td>
<td>FULL OPEN</td>
<td>-----------</td>
<td>21800</td>
</tr>
<tr>
<td>2.</td>
<td>TP-3801B</td>
<td>3.3</td>
<td>5813</td>
<td>FULL OPEN</td>
<td>8.710</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Common header</td>
<td>3.43</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>21800</td>
</tr>
</tbody>
</table>
Evaluation of Effect of coating

MP-3801B Parameters readings after coating

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>pumps</th>
<th>Discharge pressure</th>
<th>Current / RPM</th>
<th>Discharge valve opening</th>
<th>Steam flow</th>
<th>C.W. Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MP-3801C</td>
<td>3.43</td>
<td>90.1</td>
<td>FULL OPEN</td>
<td>-----------</td>
<td>----------</td>
</tr>
<tr>
<td>2.</td>
<td>TP-3801B</td>
<td>3.3</td>
<td>5717</td>
<td>FULL OPEN</td>
<td>8.710</td>
<td>21800</td>
</tr>
<tr>
<td>3.</td>
<td>Common header</td>
<td>3.43</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>21800</td>
</tr>
</tbody>
</table>

Steam saving at same discharge pr. = 8.710 – 8.40 = 0.31 t/h
% Saving = 3.559 %.
### Evaluation of Effect of coating

#### MP-3801B Parameters readings after coating

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>pumps</th>
<th>Discharge pressure</th>
<th>Current / RPM</th>
<th>Discharge valve opening</th>
<th>Steam flow</th>
<th>C.W. Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MP-3801C</td>
<td>3.41</td>
<td>90.8</td>
<td>FULL OPEN</td>
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<td>21800</td>
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<tr>
<td>2.</td>
<td>TP-3801B</td>
<td>3.3</td>
<td>5813</td>
<td>FULL OPEN</td>
<td>8.710</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Common header</td>
<td>3.43</td>
<td>--------</td>
<td>--</td>
<td>--</td>
<td>21800</td>
</tr>
</tbody>
</table>

Steam saving at same discharge pr. = 7.065 – 6.81 = 0.255 t/h
% Saving = 3.6 %.
Installation of 18000Nm³/hr capacity Purge Gas Recovery Unit in Ammonia Plant of Vijaipur-II

- Total Investment: Rs. 29.1 Crores
- Benefit: Reduction in Specific energy consumption by 0.03 Gcal/MT Urea.
Replacement of existing 16” dia line from Methanator downstream to Synthesis Gas Compressor suction with 18”dia pipeline

- Investment: Rs 80 lakhs
- Replacement required for debottlenecking for operation at higher load
- Energy saving: 0.002Gcal/MT urea
- Payback period: 3.2 years
- Status: The scheme shall be commissioned in the next annual turn around of Vijaipur-II Plants in April, 2016
Installation of two nos. new Cooling Tower Cells in VP-II plants along with Cooling Water pumps and associated pipings

- Total actual cost: Rs 1395 lakhs
- Benefit: Debottlenecking in operation at higher plant load and energy saving
Energy Saving Project of Vijaipur-I and Vijaipur-II Plants (Phase-II)

- In order to bring down specific energy consumptions, especially for Vijaipur-I, Energy Saving Project (Phase-II) shall be implemented.
- M/S HTAS has been entrusted the job of conducting study and recommending the energy saving schemes.
- The recommended schemes shall be implemented based on economic viability.
- As such in house study had also been conducted in this regard and few schemes identified.
AT NFL VIJAIPUR

THERE IS CONTINUOUS ENDEAVOUR TO CONSERVE ENERGY

- Our efforts are to remain one amongst the best operating fertilizer plants contributing to Humanity’s cause.

Thank You