

## Energy Conservation Measure implemented in 2006-07

<b>ID</b>	<b>Title of the measure</b>	<b>Sector:</b> Fertilisers
<b>Year</b>	1. S-50 Converter with HP Boiler alongwith Make up Gas Chiller in Ammonia Plant:	Technology: Steam Reforming of Natural Gas

Two energy conservation schemes have been installed under this title:

### a. S-50 Converter with HP Boiler:

#### **Original System:**

In Ammonia Plant Synthesis Section, ammonia is produced in Syn Gas Converter (S-200). The ammonia conversion per pass was 30 %. The reaction is Exothermic so ammonia formation produces heat which is recovered in Waste Heat Boiler. Ammonia formed is separated in Ammonia Separator and the unconverted gas is recycled to Converter through Syn Gas Compressor Recirculaor.

#### **Modified System:**



#### **New Installations:**

- i) S-50 Converter at the downstream of new Waste Heat Boiler
- ii) New Waste Heat Boiler alongwith Steam Drum at the downstream of existing S-200 Converter

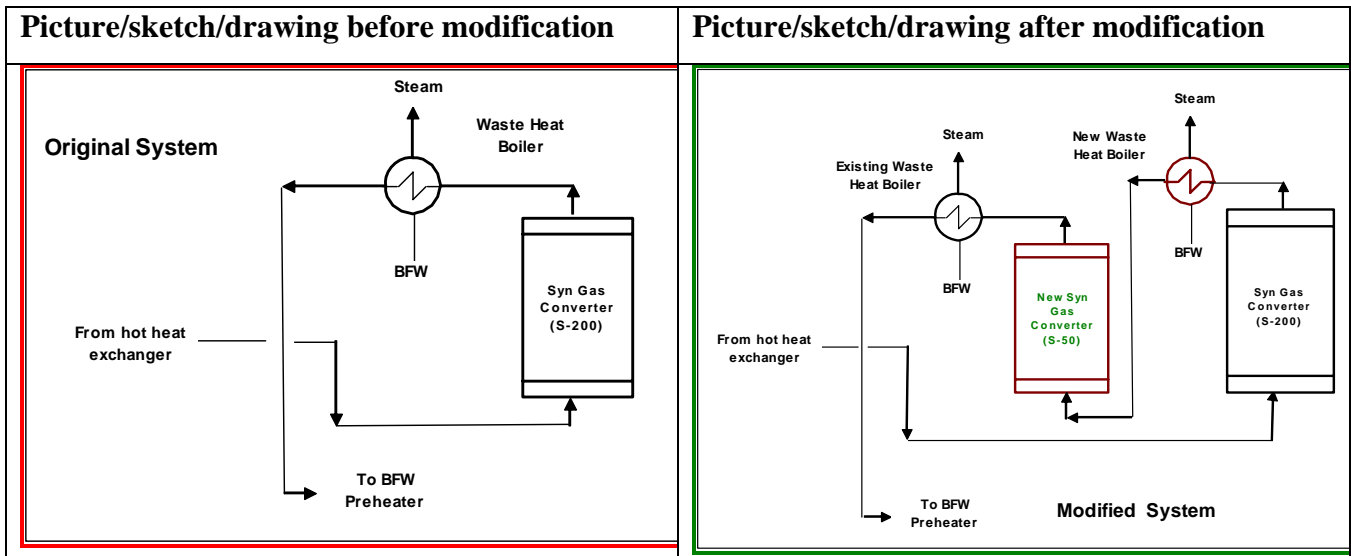
The S-50 converter has been installed downstream the existing S-200 Converter. The S-50 Converter increases the conversion per pass and reduces the gas circulation rate through the Synthesis loop and thereby the pressure drop in the loop is reduced. The savings are seen on the power consumption of the Synthesis Gas Compressor. Furthermore, an HP waste heat boiler is

installed downstream the S-50 for utilisation of the heat produced in the new converter. There is a single bed of catalyst consisting of Haldor Topsoe KM-1 unreduced catalyst having a total volume of 125 m<sup>3</sup>. A bypass across the boiler upstream of S-50 Converter has been provided to control the inlet temperature to the new S-50 during start-up. The loop pressure, circulation rate, etc. has been optimized with the additional S-50 Converter. Due to the reduction in the circulating synthesis gas, there is additional energy saving in the Syn Gas compressor turbine.

The benefit of the S-50 converter is as mentioned above, a higher ammonia conversion which is 36% per pass in place of 30% per pass without S-50 Converter and a lower loop circulation rate.

Due to the high outlet temperature from the existing converter (446°C) it is necessary to install a waste heat boiler before the S-50 Converter in order to reach a catalyst bed inlet temperature of approximately 370°C for S-50 Converter. This gives additional production of HP steam.

The heat of reaction from the S-50 converter is utilised for production of HP steam in the existing waste heat boiler, E 3501, while the heat of reaction from the existing S-200 is utilised for production of HP steam in the new WHB, E 3516. The HP steam generated is mixed and routed to the front end RG Steam Super-heater for superheating.



**b.) Make up Gas Chiller:**

In order to reduce power on the synthesis gas compressor, K 3431, a make-up gas chiller, E 3316, is introduced to cool the make-up gas from 30°C to 6°C with the help of liquid ammonia from the refrigeration loop.

## Original System:

In the original plant layout the make-up gas after Methanator is cooled to 30°C in the Final Gas Cooler before being compressed in the Synthesis Gas Compressor, K 3431.

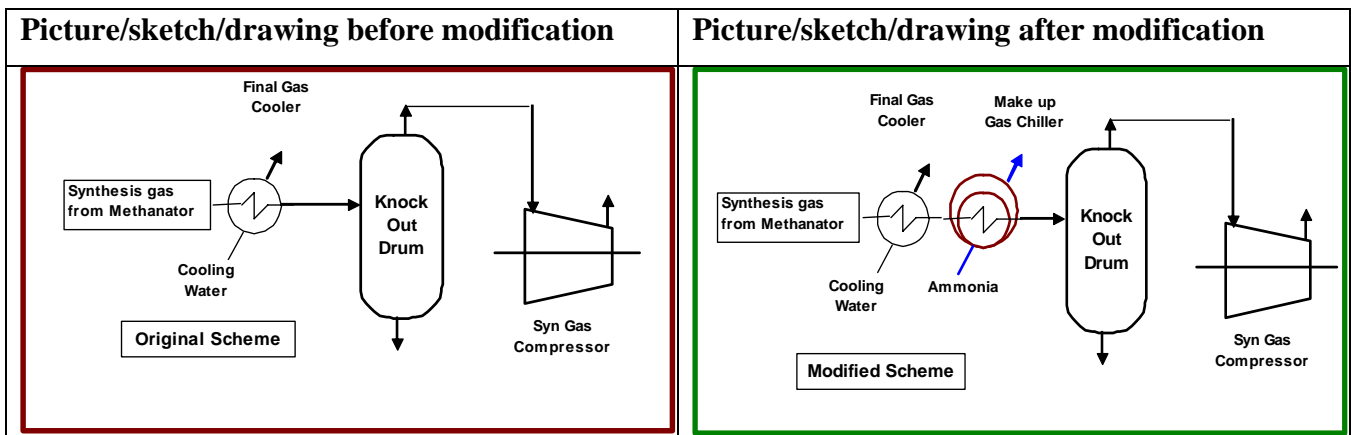


## Modified System:

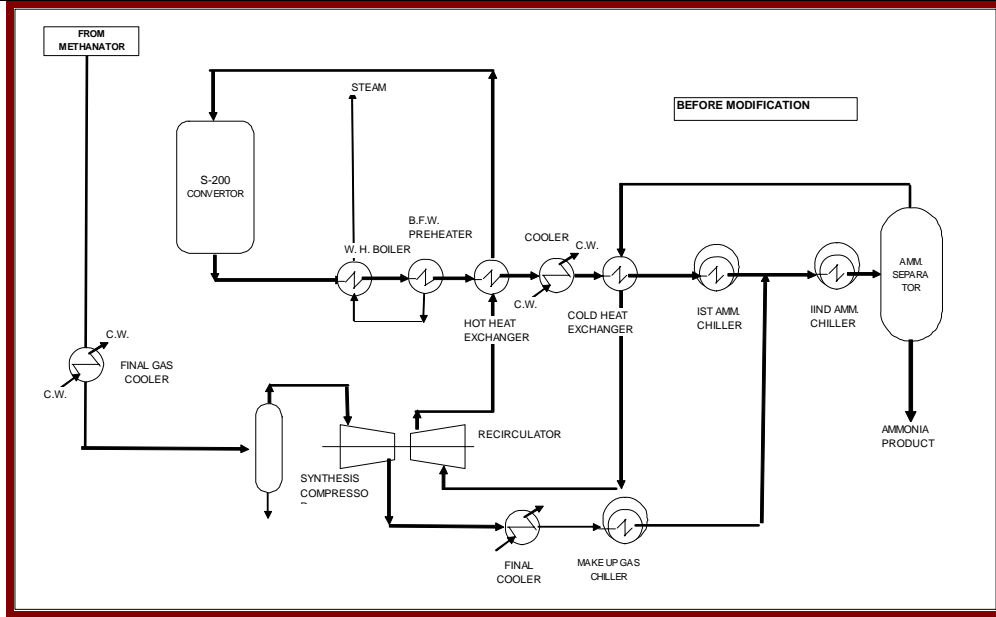
### New Installation:

**Make up gas Chiller at the down stream of Final Gas Cooler located after Methanator.**

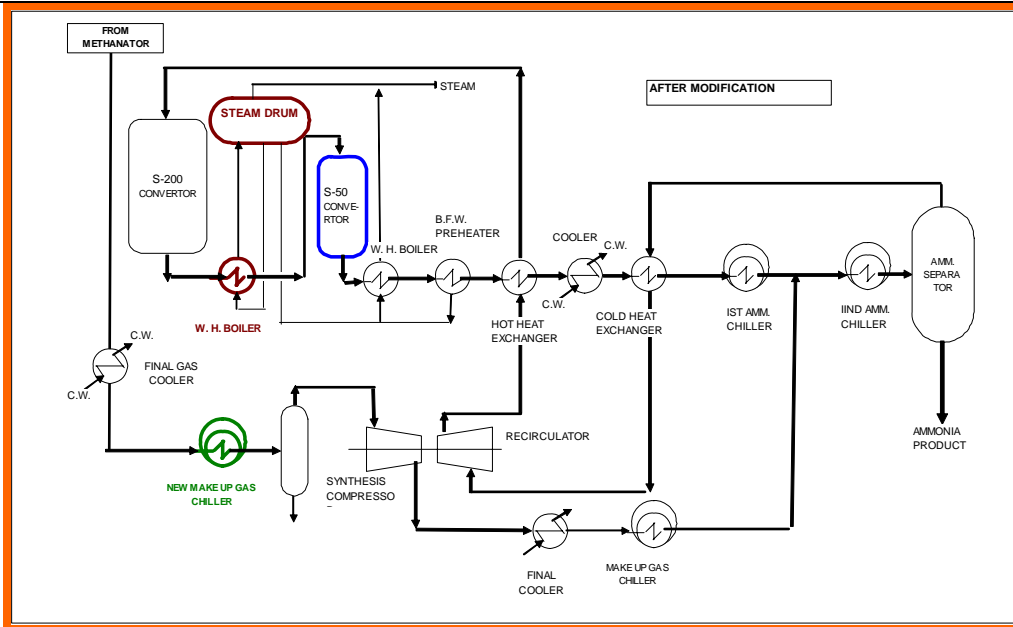
A saving in power in the Synthesis Gas Compressor is achieved by cooling the gas from final Gas Cooler to 6°C by way of increasing the compression efficiency of the 1st stage of the compressor. Furthermore, it was observed that the Refrigeration Compressor is operating very close to the surge limit even with a anti-surge valve open. Make-up gas chiller has improved the operation of the Refrigeration Compressor as the anti-surge valve remains closed at normal load. In addition to the energy saving in Synthesis Gas Compressor, the additional ammonia vapour from new make-up chiller improves efficiency of Refrigeration Compressor at lower load by further closing anti-surge valves.



**Picture/sketch/drawing before modification (BOTH SCHEMES)**



**Picture/sketch/drawing after modification (BOTH SCHEMES)**



**Agency that executed the project (with complete address and email):**

<p>Basic Engineering</p>	<p>M/s HTAS A/s                  NYMOLLEVES 55, P. O. BOX 213, DK-2800                  LYNGBY DENMARK                  FAX:45272999                  Email : techservice@topsoe.dk</p>
<p>Detailed Engineering</p>	<p>M/s PDIL,                  PDIL BHAWAN, A-14, SECTOR-1, NOIDA-                  201301</p>

	DISTT: GAUTAM BUDH NAGAR (U. P.) Email: rssahay@pdil.nic.in		
Total investment, <b>Rs. 4186 Lakh</b>	Year of implementation: <b>2006-07</b>		
<b>First year energy cost savings, Rs. 1748 Lakh</b>			
<b>First year other savings Rs.</b>			
<b>On annual basis</b>			
<b>Reduction in sp. energy consumption (MKcal/MT ammonia)=A</b>	<b>0.125</b>		
<b>Annual Capacity of Ammonia Plant (MT)=B</b>	<b>501600</b>		
<b>Energy Saving (MKcal) = AXB</b>	<b>62700</b>		
<b>Energy tariff, Rs/MKcal</b>	<b>2787.97</b>		
<b>Company complete address:</b> IFFCO Aonla-II P. O. IFFCO Township Bareilly (U. P.)-243403 <b>Contact person who could be contracted for more information:</b> N. C. Nigam, Senior General Manager	We authorise Bureau to use this information for dissemination  Signature Date		

## Energy Conservation Measure implemented in 2006-07

<b>ID</b>	<b>Title of the measure</b>	<b>Sector:</b> Fertilisers
<b>Year</b>	2. Additional combustion air Module in convection Section of Primary Reformer in Ammonia Plant	Technology: Steam Reforming of Natural Gas



### **Original System:**

The existing combustion air pre-heater, (E-3205) in the convection section of the Primary reformer has six sections of out of which one section was kept as dummy section for installation of new modules in future for increase in the surface area of the pre- heater. Each section has two blocks.

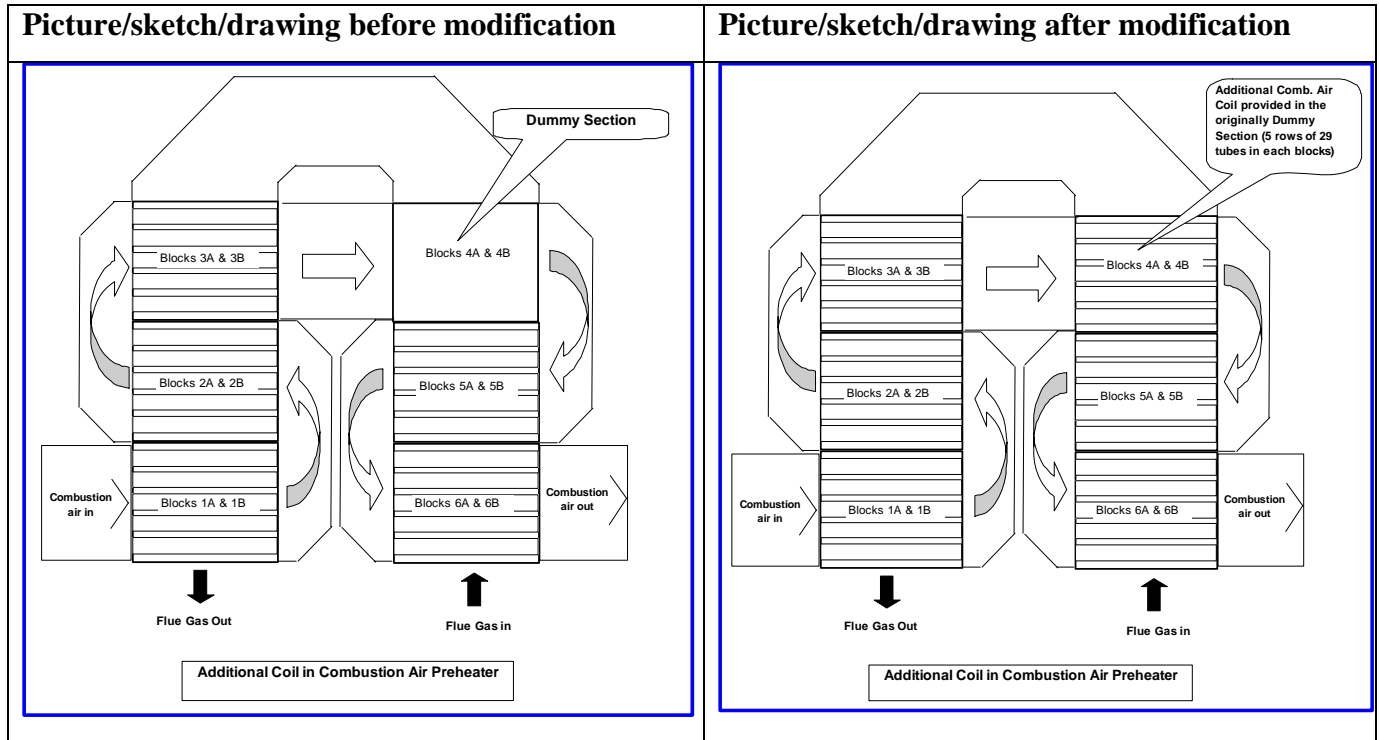
### **Modified System:**

#### **Installation: 29 tubes in 5 rows in two blocks of originally dummy section**

Installation of additional tubes tubes in the originally dummy section has further increased the combustion air temperature resulting in increased air preheating duty by approximately 0.4 Gcal/h and also decrease the outlet temperature of the flue gas from the waste heat section.

The installation of an additional heat transfer in the combustion air pre- heater E -3205 has resulted in lower specific energy consumption as less fuel gas consumption in the Primary reformer burners due to additional heat of combustion air.

The total energy saving by installation of additional air pre- heater module is 0.011 Gcal/ MT of ammonia.



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Basic Engineering	M/s HTAS A/s NYMOLLEVES 55, P. O. BOX 213, DK-2800 LYNGBY DENMARK FAX:45272999 Email : techservice@topsoe.dk			
Detailed Engineering	M/s PDIL, PDIL BHAWAN, A-14, SECTOR-1, NOIDA- 201301 DISTT: GAUTAM BUDH NAGAR (U. P.) Email: rssahay@pdil.nic.in			
Total investment, <b>Rs189.2 Lakh</b>	Year of implementation: <b>2006-07</b>			
<b>First year energy cost savings, Rs. 139.8 Lakh</b>				
<b>First year other savings Rs.</b>				
<b>On annual basis</b>	<table border="1"> <tr> <td data-bbox="979 1770 1141 1879"><b>Reduction in sp. energy consumption (MKcal/MT)</b></td> <td data-bbox="1141 1770 1304 1879"><b>0.01</b></td> <td data-bbox="1304 1770 1482 1879"></td> </tr> </table>	<b>Reduction in sp. energy consumption (MKcal/MT)</b>	<b>0.01</b>	
<b>Reduction in sp. energy consumption (MKcal/MT)</b>	<b>0.01</b>			

<b>ammonia)=A</b>			
<b>Annual Capacity of Ammonia Plant (MT)=B</b>	<b>501600</b>		
<b>Energy Saving (MKcal) = AXB</b>	<b>5016</b>		
<b>Energy tariff, Rs/MKcal</b>	<b>2787.97</b>		
<p><b>Company complete address:</b>  IFFCO Aonla-II  P. O. IFFCO Township  Bareilly (U. P.)-243403</p> <p><b>Contact person who could be contracted for more information:</b>  N. C. Nigam, Senior General Manager</p>	<p>We authorise Bureau to use this information for dissemination</p> <p>Signature</p> <p>Date</p>		

## Energy Conservation Measure implemented in 2006-07

<b>ID</b>	<b>Title of the measure</b>	<b>Sector:</b> Fertilisers
<b>Year</b>	3 . Installation of additional feed/effluent exchanger in process condensate system to recover heat in Ammonia Plant	Technology: Steam Reforming of Natural Gas

### Original:

In the original system heat of stripped condensate was recovered by the coming process condensate in Condensate feed/effluent exchanger (also PC-PC Exchanger) comprising of two exchangers E-3321 A & B. It was observed that the process condensate from the, condensate feed/effluent exchanger, E-3321 A/B was remaining 155°C against the design temperature of 125°C. Due the high temperature at the inlet of the water cooler, E-3322, which is located at the down stream of the condensate feed/effluent exchanger, E-3321 A/B, tube leak was observed at frequent intervals.

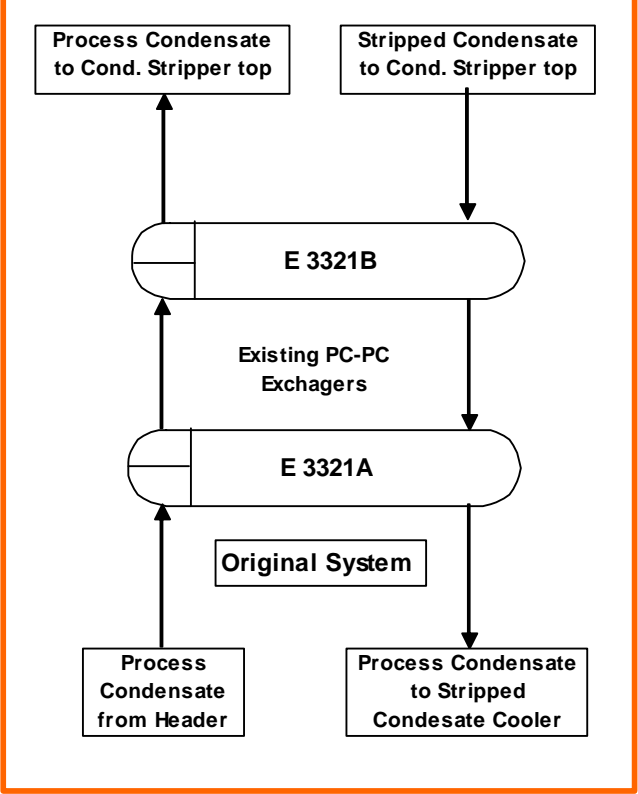
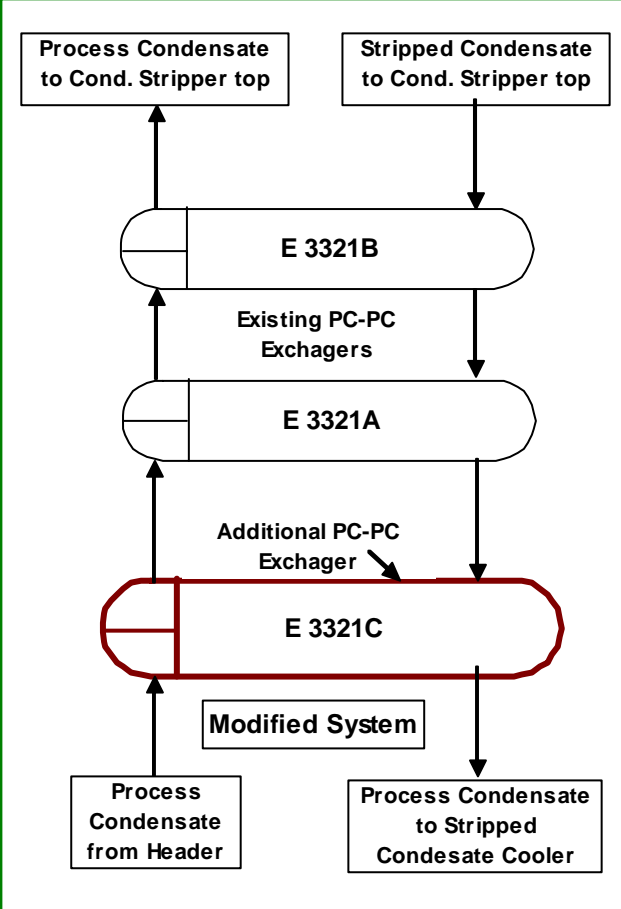
### Modification:



### Installation: An additional heat exchanger in series with original feed/effluent exchanger

An additional feed/effluent exchanger, E 3321C has been installed in series with the existing exchangers which has reduced the condensate temperature to the water cooler to 125°C thereby totally stopping the tube leak in the water cooler.

The total energy saving by installation of additional feed/effluent exchanger, E 3321 C is 0.04 Gcal/ MT of ammonia.

Picture/sketch/drawing before modification	Picture/sketch/drawing after modification
 <p>The diagram illustrates the 'Original System' within an orange border. It shows two heat exchangers, E 3321A and E 3321B, connected in series. Between them are 'Existing PC-PC Exchangers'. Process condensate flows from a 'Process Condensate from Header' through E 3321A and E 3321B to 'Process Condensate to Cond. Stripper top'. Stripped condensate flows from 'Stripped Condensate to Cond. Stripper top' through E 3321B and E 3321A to 'Process Condensate to Stripped Condensate Cooler'.</p>	 <p>The diagram illustrates the 'Modified System' within a green border. It shows three heat exchangers: E 3321B at the top, E 3321A in the middle, and E 3321C at the bottom. Between E 3321B and E 3321A are 'Existing PC-PC Exchangers'. Between E 3321A and E 3321C is an 'Additional PC-PC Exchanger', which is highlighted with a red border. Process condensate flows from a 'Process Condensate from Header' through E 3321A and E 3321C to 'Process Condensate to Cond. Stripper top'. Stripped condensate flows from 'Stripped Condensate to Cond. Stripper top' through E 3321B, E 3321A, and E 3321C to 'Process Condensate to Stripped Condensate Cooler'.</p>
<b>Agency that executed the project (with complete address and email):</b>	
Basic Engineering	M/s HTAS A/s NYMOLLEVES 55, P. O. BOX 213, DK-2800 LYNGBY DENMARK FAX:45272999 Email : techservice@topsoe.dk
Detailed Engineering	M/s PDIL, PDIL BHAWAN, A-14, SECTOR-1, NOIDA- 201301 DISTT: GAUTAM BUDH NAGAR (U. P.) Email: <a href="mailto:rssahay@pdil.nic.in">rssahay@pdil.nic.in</a>

Total investment, <b>Rs. 71.4 Lakh</b>	Year of implementation: <b>2006-07</b>		
<b>First year energy cost savings, Rs. 559.4 Lakh</b>			
<b>First year other savings Rs.</b>			
<b>On annual basis</b>			
<b>Reduction in sp. energy consumption (MKcal/MT ammonia)=A</b>	<b>0.04</b>		
<b>Annual Capacity of Ammonia Plant (MT)=B</b>	<b>501600</b>		
<b>Energy Saving (MKcal) = AXB</b>	<b>20064</b>		
<b>Energy tariff, Rs/MKcal</b>	<b>2787.97</b>		
<b>Company complete address:</b> IFFCO Aonla-II P. O. IFFCO Township Bareilly (U. P.)-243403  <b>Contact person who could be contracted for more information:</b> N. C. Nigam, Senior General Manager	We authorise Bureau to use this information for dissemination    Signature Date		

## Energy Conservation Measure implemented in 2006-07

ID	Title of the measure	Sector: Fertilisers
Year	4. Provision of pressure Control Valve in Distillation Tower (C-2) Off gas line in Urea Plant to save ammonia from venting from Ammonia Accumulator	Technology: Steam Reforming of Natural Gas

### Original System:-

In Urea Plant, air had to be continuously put in Reflux Accumulator (V-8) to maintain Distillation Tower (C-2) pressure.

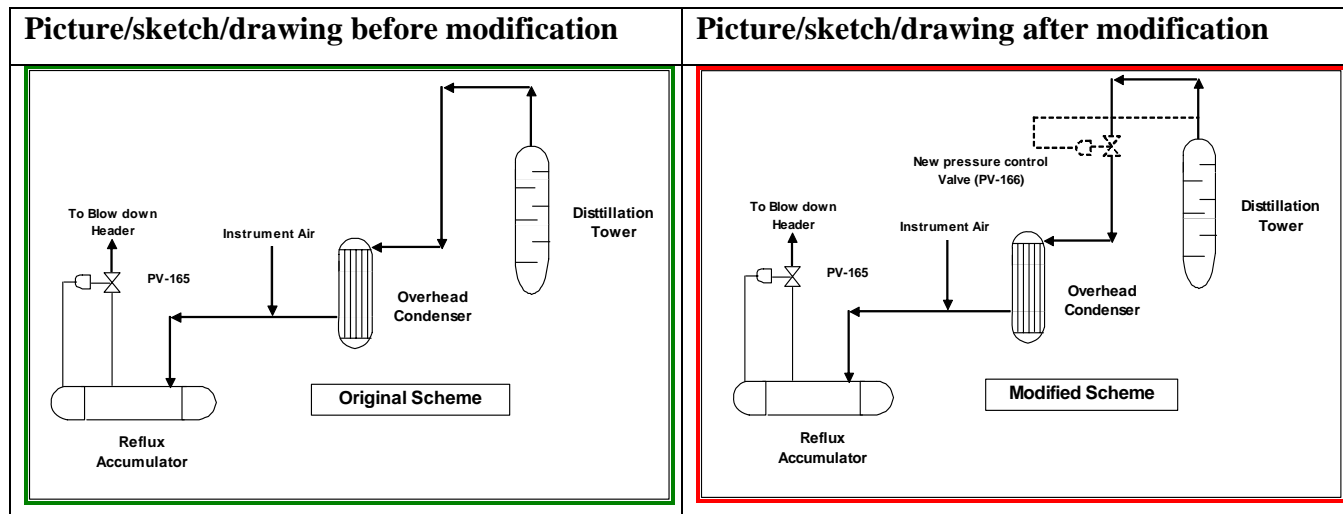
Distillation tower (C-2) pressure was operated at 1.5 kg/cm<sup>2</sup>g, which is being maintained through PV-165. This pressure control valve (PV-165) is mounted after over head condenser (E-17) and reflux accumulator (V-8).

For operational flexibility of Distillation tower (C-2), PV-165 was kept floating. For this purpose, air had to be continuously fed in V-8, which leads to ammonia losses.



**Modified System:**

Control valve (PV-166) has been installed between Distillation Tower and Over Head Condenser (E-17) so that pressure of C-2 is maintained independently and air injection into V-8 is stopped. With this proposed modification, saving of around 14 Kg/hr of ammonia is achieved.





<b>Agency that executed the project (with complete address and email): Inhouse</b>			
Total investment, <b>Rs 9.16 Lakh</b>	Year of implementation: <b>2006-07</b>		
<b>First year energy cost savings, Rs. 23.6 Lakh</b>			
<b>First year other savings Rs.</b>			
<b>On annual basis</b>			
<b>Reduction in sp. energy consumption (MKcal/MT ammonia)=A</b>	<b>0.00098</b>		
<b>Annual Capacity of Ammonia Plant (MT)=B</b>	<b>864600</b>		
<b>Energy Saving (MKcal) = AXB</b>	<b>847</b>		
<b>Energy tariff, Rs/MKcal</b>	<b>2787.97</b>		
<p><b>Company complete address:</b>                  IFFCO Aonla-II                  P. O. IFFCO Township                  Bareilly (U. P.)-243403</p> <p><b>Contact person who could be contracted for more information:</b>                  N. C. Nigam, Senior General Manager</p>	<p>We authorise Bureau to use this information for dissemination</p> <p>Signature                  Date</p>		

## Energy Conservation Measure implemented in 2006-07

<b>ID</b>	<b>Title of the measure</b>	<b>Sector:</b> Fertilisers
<b>Year</b>	5. Replacement of 160 W, MLL type lamp with energy efficient 50 W metal halide lamp	Technology: Steam Reforming of Natural Gas

We were using 160 W Mercury vapour lamps in (160 MLL) in urea silo .However; there had been rapid development in the field of illumination system in the recent past. Energy efficient metal halide lamp with longer average life & better colour rendering were introduced. To save energy as well as reducing maintenance cost, the existing 160 W MLL lamps were replaced with 50w metal halide lamps in the silo in phase manner. This has resulted to following benefits:

- 1 Earlier energy consumption due to lighting in urea silo 35040 KWH. & now it has reduced to 10950 KWH for 25 lamps.
- 2 Average life of MLL Type Lamp was 5000 hrs. However, changing them with 50w Metal Halide lamps (whose average life is 15000hrs) the maintenance cost has been reduced to 1/3 times.

Picture (MLL Type Lamp)	Picture (Metal Halide Lamp)
	
<b>Agency that executed the project (with complete address and email): Inhouse</b>	
Total investment, Rs <b>0.826 Lakh</b>	Year of implementation: <b>2006-07</b>
<b>First year energy cost savings, Rs. 0.617 Lakh</b>	
<b>First year other savings Rs.</b>	

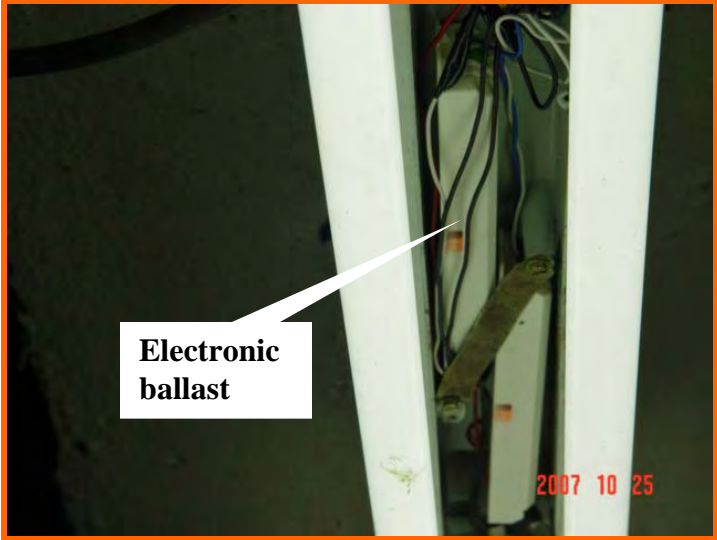
<b>On annual basis</b>	<b>MWH</b>			
<b>Power consumption before</b>	<b>35.040</b>			
<b>Power consumption before</b>	<b>10.950</b>			
<b>Energy tariff, Rs/MWH</b>	<b>2561.09</b>			
<b>Company complete address:</b> IFFCO Aonla-II P. O. IFFCO Township Bareilly (U. P.)-243403 <b>Contact person who could be contracted for more information:</b> N. C. Nigam, Senior General Manager		We authorise Bureau to use this information for dissemination  Signature Date		

## Energy Conservation Measure implemented in 2006-07

<b>ID</b>	<b>Title of the measure</b>	<b>Sector:</b> Fertilisers
<b>Year</b>	6. Replacement of conventional ballast of fluroscent tubelights with electronics ballast	Technology: Steam Reforming of Natural Gas

We were using conventional electromagnetic ballast for fluorescent tube light fixtures ( 4 feet , 36 w) . However, there had been rapid development in the field of illumination system in the recent past. Energy efficient Electronic ballast with longer average life & less power losses were introduced. To save energy as well by reducing losses in the system, the existing conventional electromagnetic ballast were replaced with electronic ballast in phase manner. This has resulted to following benefits:

- 1 Earlier energy consumption due to conventional electromagnetic ballast for fluorescent tube fittings ( 4 feet , 36 W) was 21024 KWH. Now this has reduced to 6132 KWH due to replacement of 200 ballasts.
- 2 To compensate flickering effect, electronic ballast were fixed in place of conventional ballast in existing fittings

<b>Picture (Electronic Ballast)</b>	
	
<b>Agency that executed the project (with complete address and email): Inhouse</b>	
Total investment, <b>Rs 0.40 Lakh</b>	Year of implementation: <b>2006-07</b>

<b>First year energy cost savings, Rs. 0.382 Lakh</b>				
<b>First year other savings Rs.</b>				
<b>On annual basis</b>	<b>MWH</b>			
<b>Power consumption before</b>	<b>21.024</b>			
<b>Power consumption after</b>	<b>6.132</b>			
<b>Energy tariff, Rs/MWH</b>	<b>2561.09</b>			
<b>Company complete address:</b> IFFCO Aonla-II P. O. IFFCO Township Bareilly (U. P.)-243403		We authorise Bureau to use this information for dissemination		
<b>Contact person who could be contracted for more information:</b> N. C. Nigam, Senior General Manager		Signature Date		