

## Energy Conservation Measure implemented in 2006-2007

	Title of the measure	Sector : <b>Petrochemical</b>
	<b>SRT Heaters Efficiency improvement through additional convection Bank and Installation of Waste Heat Recovery Boiler</b>	Technology : <b>ABB Lummus</b>

### Description of the energy conservation measure:

In the Naphtha Cracker Plant, there are 5 nos. SRT Heaters with natural draft to crack Naphtha at 830 0C. The flue gas temperature of the Heaters would remain in the range 300 0C to 330 0C. As there is sufficient potential in this stream for heat recovery, hence it was proposed in furnaces modification scheme inclusion of additional convection bank and a waste heat recovery boiler.

Higher heat recovery by adding only convection coils was not possible in view of higher pressure drop which will reduce the throughput from the Heaters. Hence, it was suggested to divert the flue gases from all the 5 nos. SRT Heaters through a common header to a Waste Heat Recovery Boiler (WHRB) and having induced draft through installation of 2 no.s ID Fan. In WHRB low pressure steam is generated which is diverted to the low pressure steam network.



(Photograph of a section of SRT Heaters before modification)

The heat recovery is of the order of 9.0 MMKCal/Hr and the stack temperature has come down to 103 oC. Improvement in Efficiency for all the 5 Heaters as a whole is around 9% from 84% to 93% resulting in substantial Energy saving.

**This unique scheme was designed by M/s. ABBL. No where such design as mentioned above is existing in the Petrochemical Complexes in India. In the Petrochemical Complex at Haldia, Hazira, Gandhar etc. they have efficient Waste heat recovery in the convection zone of**

**individual heater. Hence, modification is not required. Secondly the stack temperature is optimum. Thirdly all these complexes have heater without natural draft system.**

The benefit of the proposal is that by installing WHRB, it would be possible to avoid venting of high temperature flue gas to the atmosphere. Secondly, the low pressure steam generated will help in reducing high pressure steam generation at CPP as this high pressure steam is let down to the low



( Photograph of SRT Heaters after modification – Common duct for all the Heaters & with WHRB installation and a Chimney )

pressure steam network. Reduction in steam generation at CPP will ultimately result in Reduced Fuel consumption. Thereby substantial quantity of Green house gas emission is reduced.

M/s. ABBL the Licensor carried out both Basic Engineering and Detailed engineering. The WHRB was fabricated by M/s Thermax.

The Project was executed in January'07 commissioned on 8<sup>th</sup> Feb.'07. Investment for additional convection bank, WHRB along with ID fans being around Rs 8 Crores. Payback period of the scheme is 9 months.

Agency that executed the project (with complete address and email): For details pl. contact Company person whose details are mentioned below.					
Total investment, Rs.: 800 Lakhs			Year of implementation: Feb., 2007		
First year energy cost savings, Rs.: 1100 Lakhs					
First year other savings, Rs.:					
On annual basis	kWh 000'	Coal (Tons)	Gas Nm <sup>3</sup>	Furnace Oil (MT)	Other
Energy consumption before					
Energy consumption after				7347*	
Energy tariff, Rs/ kWh/ Ton/ Nm <sup>3</sup> / kL ...				16073	
Company complete address:  Anil Kewalramani GM (Central Technical Services) Reliance Industries Ltd. Vadodara Mfg. Division P.O. Petrochemicals Dist. Vadodara - 391346  * Net estimated saving after the implementation of the scheme				We authorise Bureau to use this information for dissemination  Signature  Date 30.102007	

## Energy Conservation Measure implemented in 2006-2007

	Title of the measure	Sector : <b>Petrochemical</b>
	<b>Detailed Audit Study of Steam Traps of the Whole Site</b>	Technology : <b>Forbes Marshall</b>

### Description of the energy conservation measure:

M/s Forbes Marshall was assigned the job of detailed audit of Steam Traps of the whole Vadodara Site. The study involved following steps :

- a) Detailed survey of all the Traps in all the plants and Yard piping region and submission of the report. Also, in the study to carry out survey for the leakages / passing of the associated valves of the Traps.
- b) Based on the report recommendation all the plants to arrest leakages of the steam .
- c) Steam traps rectification for those traps with minor malfunctioning. For these traps spares to be supplied by M/s Forbes Marshall and replacement to be done in their presence.
- d) Plants to replace traps, valves and change layout as recommended in the report.
- e) Resurvey of all the Traps to assess the performance to be completed by 1<sup>st</sup> Qtr. of 2007-08.
- f) Finally to estimate the saving based on all above measures. Around 35 % malfunctioning steam traps have been alright. Secondly, arresting of large no: of steam leaks from valves, flanges and traps.

Investment on the scheme is Rs. 25.0 Lakhs for the detailed audit study. The revenue earning due to the arresting of leakages and loss of steam from malfunctioning steam traps is Rs. 141.0 Lakhs. Payback period is just 3 months.



(Photograph of RIL, Vadodara Mfg. Div. where detailed audit of steam traps of whole site was done)

Agency that executed the project (with complete address and email): For details pl. contact Company person whose details are mentioned below.					
Total investment, Rs.: 25.0 Lakhs			Year of implementation: 2006-07		
First year energy cost savings, Rs.: 141.0 Lakhs					
First year other savings, Rs.:					
On annual basis	kWh 000'	Coal (Tons)	Gas Nm <sup>3</sup>	Oil (kL)	Other
Energy consumption before					
Energy consumption after				880*	
Energy tariff, Rs/ kWh/ Ton/ Nm <sup>3</sup> / kL ...				16073	
Company complete address:  Anil Kewalramani GM (Central Technical Services) Reliance Industries Ltd. Vadodara Mfg. Division P.O. Petrochemicals Dist. Vadodara - 391346				We authorise Bureau to use this information for dissemination  Signature  Date 30.10.2007	

## Energy Conservation Measure implemented in 2006-2007

	Title of the measure	Sector : <b>Petrochemical</b>
	<b>Major Overhaul of Mitsubishi Air Compressor</b>	Technology : <b>M/s Mitsubishi</b>

### Description of the energy conservation measure:

Major Overhaul of Mitsubishi Air compressor was carried out with the objective of improving the energy efficiency and performance. Heat transfer from across the inter and after exchangers of the compressor had reduced and the power consumption by the compressor had increased. The overhaul job was carried out by OEM supplier. The result of the Overhaul job of the compressor are as under :

- Reduced inlet temp. for intercoolers and reduced outlet temp. after cooler. This was mainly on account of chemical cleaning of the exchangers carried out after careful consideration.
- The power consumption by the compressor reduced by 46 KW/Hr.

Estimated Investment on the scheme was Rs. 100.0 Lakhs and Annual saving of Rs. 12.0 Lakhs.



(Photograph showing Mitsubishi Air Compressor for which overhaul job was carried out for improving Energy Efficiency and performance)



**(Photograph showing other side view of Mitsubishi Air Compressor for which overhaul job was carried out for improving Energy Efficiency and performance)**

Agency that executed the project (with complete address and email): For details pl. contact Company person whose details are mentioned below.

Total investment, Rs.: 100.0 Lakhs

Year of implementation: 2006-07

First year energy cost savings, Rs.: 12.0 Lakhs

First year other savings, Rs.:

On annual basis	kWh 000'	Coal (Tons)	Gas Nm <sup>3</sup>	Oil (kL)	Other
Energy consumption before					
Energy consumption after	400*				
Energy tariff, Rs/ kWh/ Ton/ Nm <sup>3</sup> / kL ...	3.0				

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\* Net estimated saving after the implementation of the scheme.

## Energy Conservation Measure implemented in 2006-2007

	Title of the measure	Sector : <b>Petrochemical</b>
	<b>Diversion of Waste gases of a Column condenser vent from flare to the fuel gas system</b>	Technology : <b>Own initiative</b>

### **Description of the energy conservation measure:**

Since inception of the Feed preparation unit plant, Waste gases from Column C-702 were being diverted from the condenser vent to flare. Detailed study was carried out by in-house team comprising of Operation, Maint. and Central technical Services representatives to study the diversion of Waste gases from Column overhead condenser vent to the fuel gas system so as effectively utilise the energy which was being wasted by flaring it. Based on the study following modifications were carried out :

- a) Laying of a header of 2 " size from column C-702 of the FPU plant up to Cracker plant and to the fuel gas drum.
- b) The header was steam traced to avoid any inline condensation .

Estimated quantity of waste gases diverted to flare was 20 kg/hr. Investment on the scheme was few lakhs of around Rs. 5.0 Lakhs for the in-house inventory complete piping and instruments were arranged. Annual saving for the scheme is Rs. 25.0 Lakhs.



Column C-702

**(Photograph showing Column C-702 in Feed preparation unit plant where from overhead condenser vent waste gases were diverted from flare to the fuel gas system in Cracker plant)**

Agency that executed the project (with complete address and email): For details pl. contact Company person whose details are mentioned below.

Total investment, Rs.: approx. 5.0 Lakhs  
(internal piping & instruments)

Year of implementation: 2006-07

First year energy cost savings, Rs.: 25.0 Lakhs

First year other savings, Rs.:

On annual basis	kWh 000'	Coal (Tons)	Gas Nm <sup>3</sup>	Oil (kL)	Other
Energy consumption before					
Energy consumption after				158*	
Energy tariff, Rs/ kWh/ Ton/ Nm <sup>3</sup> / kL ...				16073	

Company complete address:

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\* Net estimated saving after the implementation of the scheme

## Energy Conservation Measure implemented in 2006-2007

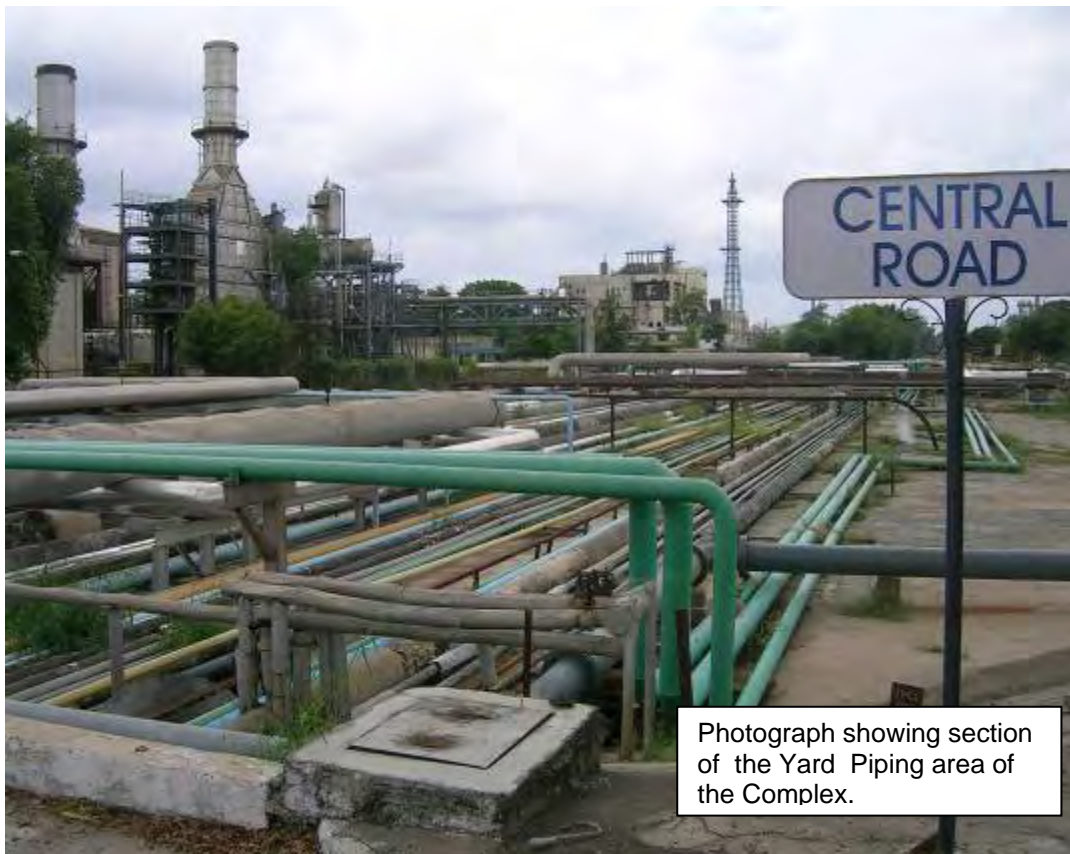
	Title of the measure	Sector : <b>Petrochemical</b>
	<b>Reducing Utilities losses in Yard piping region &amp; rectification of insulation of cracker plant &amp; critical areas</b>	Technology : <b>Own initiative</b>

### **Description of the energy conservation measure:**

Major drive was carried out during the year for reducing the Energy losses in Yard Piping Area. The detailed survey was carried out by a Committee. The objective of the Project are listed as under :

- Finding out Steam leakages in Yard Piping Area and getting it attended through concerned agencies
- Finding out Service water, Raw water, Cooling water, DM water leakages in Yard Piping area and getting it attended through concerned agencies..
- Finding out Plant air and Instrument air leakages in Yard Piping Area and getting it attended through concerned agencies.
- Find out Nitrogen leakages in yard piping areas and getting it attended through concerned agencies
- Finding out Hydrogen leakages in Yard Piping Area and getting it attended through concerned agencies.
- Finding Hydrocarbon leakages in Yard Piping Area and getting attended through concerned agencies.
- Finding out sanitary water leakages and getting it attended through concerned agencies.
- Checking health of lines physically and if suspected abnormal, to be informed to concerned agency for required actions and rectification.
- Carrying insulation survey of steam lines in Yard Piping Areas and wherever if insulation is found damaged bare, then got it repaired reinsulated through concerned agency.
- Carrying out other surveys whenever required in plants and give report to Management.
- To check the vegetation growth under and around yard piping lines and inform HSE to get it cleaned..

The drive had been quite successful. Arresting of the various leakages have saved Enormous Energy and Revenue for the Complex. Also there was considerable improvement in the housekeeping of Yard piping region. Secondly, big insulation rectification job was carried out for Cracker plant and critical areas. Estimated revenue earning due to the all above measures being 300 Rs. Lakhs.



Photograph showing section of the Yard Piping area of the Complex.

Agency that executed the project (with complete address and email): For details pl. contact Company person whose details are mentioned below.

Total investment, Rs.: 150.0 Lakhs	Year of implementation: 2006-07
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First year energy cost savings, Rs.: 300.0 Lakhs

First year other savings, Rs.:

On annual basis	kWh 000'	Coal (Tons)	Gas Nm <sup>3</sup>	Oil (kL)	Other
Energy consumption before					
Energy consumption after				1866*	
Energy tariff, Rs/ kWh/ Ton/ Nm <sup>3</sup> / kL ...				16073	

<p>Company complete address:</p> <p>Anil Kewalramani GM (Central Technical Services) Reliance Industries Ltd. Vadodara Mfg. Division P.O. Petrochemicals Dist. Vadodara - 391346</p> <p>* Net estimated saving after the implementation of the scheme</p>	<p>We authorise Bureau to use this information for dissemination</p> <p>Signature</p> <p>Date 30.10.2007</p>
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## Energy Conservation Measure implemented in 2006-2007

	Title of the measure	Sector : <b>Petrochemical</b>
	<b>Efficient Usage of alternative Waste streams in Utility Boilers</b>	Technology : <b>Own initiative</b>
<p><b>Description of the energy conservation measure:</b></p> <p>During the year 2006-07 alternative waste steams generated internally and also available from other sites of RIL were efficiently utilized in Utility boilers substituting the main liquid fuel i.e. Furnace Oil.</p> <p>The Fuels utilized were :</p> <ul style="list-style-type: none"><li>Carbon Black Feed Stock- CBFS</li><li>Slop Oil- Waste stream from Effluent handling plant</li><li>Mixed oil from other sites of RIL.</li></ul> <p>The methodology adopted for usage of the fuels mentioned above are as under :</p> <ul style="list-style-type: none"><li>a) Detailed analysis of all of the fuels in the Laboratory.</li><li>b) Analyzing the fuels to be burnt with other available fuels in different proportions &amp; interpreting the results based on the burning characteristics.</li><li>c) Working out the logistics of storage &amp; transfer of CBFS, Slop oil &amp; Mixed oil.</li><li>d) Finalization of filter details for sediments removal.</li><li>e) Looking for suitable pumps from internal inventory for unloading without going from new procurement &amp; thereby saving of money.</li></ul> <p>Successful trial was carried out alongwith the Operation group without jeopardizing any of the operation of the complex.</p> <p>The total Revenue saving for the Complex in terms of the Purchased Energy bill is around Rs. 383 Lakhs. Infact, this is one of the most important measure for controlling the energy cost.</p>		



Aux. Blrs. where the waste fuels were burned as alternative to the main Furnace oil.

Agency that executed the project (with complete address and email): For details pl. contact Company person whose details are mentioned below.

Total investment, Rs.: NIL

Year of implementation : 2006-07

First year energy cost savings, Rs.: 382.0 Lakhs saving in Energy Bill.

First year other savings, Rs.:

On annual basis	kWh 000'	Coal (Tons)	Gas Nm <sup>3</sup>	Oil (kL)	Other
Energy consumption before					
Energy consumption after				2377*	
Energy tariff, Rs/ kWh/ Ton/ Nm <sup>3</sup> / kL ...				16073	

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Vadodara Mfg. Division  
P.O. Petrochemicals  
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\* Net estimated saving after the implementation of the scheme

## Energy Conservation Measure implemented in 2006-2007

	Title of the measure	Sector : <b>Petrochemical</b>
	<b>Detailed Energy Audit w.r.t Re-engineering of Steam and Condensate systems of a plant</b>	Technology : <b>M/s Forbes Marshall</b>

### **Description of the energy conservation measure:**

The Detailed Audit w.r.t Re-engineering of Steam and Condensate systems of Polypropylene Co-polymer plant was carried out by M/s Forbes Marshall. The study involved following :

- a) Survey of Steam Traps w.r.t performance , sizing, type selection and layout.
- b) Survey of Condensate return header w.r.t to layout and sizing.
- c) Study of De-superheater system w.r.t appropriate temp. control of the Steam.
- d) Study of the reasons for venting of low low pressure steam @ 0.5 TPH and 1.0 kg/cm<sup>2</sup>g on a continuous basis.

The Outcome of the study is as under :

- a) Installation of new De-superheater system.
- b) Overcoming all the problems associated with Steam Traps and condensate return systems.
- c) Steam venting of low low pressure stopped which was a very significant of the Energy Audit study.
- d) Steam cons. by the plant reduced. It reduced from 0.7 to 0.45 and condensate return improved from 0.08 to 0.3 MT / MT of the product.

**Total investment for the Detailed Energy Audit and Equipments were Rs. 14.0 Lakhs. Annual saving comes to Rs. 66.0 Lakhs. Payback period is around 3.0 months.**



**( De-Superheater Control valve installed in Polypropylene Co-polymer plant )**



**( De-Superheater Condensate Spray nozzle installed in Polypropylene Co-polymer plant )**

Agency that executed the project (with complete address and email): For details pl. contact Company person whose details are mentioned below.					
Total investment, Rs.: 14.0 Lakhs			Year of implementation: 2006-07		
First year energy cost savings, Rs.: 66.0 Lakhs					
First year other savings, Rs.:					
On annual basis	kWh 000'	Coal (Tons)	Gas Nm <sup>3</sup>	Furnace Oil (MT)	Other
Energy consumption before					
Energy consumption after				*411	
Energy tariff, Rs/ kWh/ Ton/ Nm <sup>3</sup> / kL ...				16073	
Company complete address:  Anil Kewalramani GM (Central Technical Services) Reliance Industries Ltd. Vadodara Mfg. Division P.O. Petrochemicals Dist. Vadodara - 391346  * Net estimated saving after the implementation of the scheme				We authorise Bureau to use this information for dissemination  Signature  Date 30.10.2007	

## Energy Conservation Measure implemented in 2006-2007

	Title of the measure	Sector : <b>Petrochemical</b>
	<b>Detailed Energy Audit of Cooling Water Network system of Utilities plant</b>	Technology : <b>M/s DSCL</b>

### **Description of the energy conservation measure:**

The Detailed Energy Audit for the subject mentioned area was carried out by M/s DSCL. The study involved following :

- a) Flow measurement for all the plants in the Cooling water network taking measurement for the supply and return at each plant battery limit. Secondly, in each plant flow measurement carried out for all the major consumers.
- b) Measurement of supply pressure of CW by pumps.
- c) Measurement of pressure drop across the Plant by measuring the pressure at each plant battery limit for supply and return stream. Also, same exercise done for the major consumers in each plant.
- d) Development of Simulation network module using EPANET software taking the flow measurements and pressure data as mentioned point a) to c)
- e) Estimation of Pump efficiency for all the pumps installed.

The outcome of the study are as under :

- a) Throttling of supply to those consumers where excess flow of CW was there like STGs condensers, Refrigeration plant condensers and a Fibre plant. Because of this there was improved distribution of CW to those plants where little starvation was there.
- b) Improved availability of CW coupled with little sacrifice on the head and flow resulted in stoppage of a Cooling water pump which was a very significant development of the detailed Energy audit study.

Cost of the Energy Audit being Rs. 6.0 Lakhs while Annual saving is quite significant of Rs. 144.0 Lakhs mainly due to stoppage of a pump.



( Photograph showing Cooling Tower of Utilities plant which was taken up for Energy Audit study of CW network system )



( Photograph showing partial header network of the CW system of Utilities plant )

Agency that executed the project (with complete address and email): For details pl. contact Company person whose details are mentioned below.					
Total investment, Rs.: 6.0 Lakhs			Year of implementation: 2006-07		
First year energy cost savings, Rs.: 144.0 Lakhs					
First year other savings, Rs.:					
On annual basis	kWh 000'	Coal (Tons)	Gas Nm <sup>3</sup>	Oil (kL)	Other
Energy consumption before					
Energy consumption after	4800*				
Energy tariff, Rs/ kWh/ Ton/ Nm <sup>3</sup> / kL ...	3.0				
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* Net estimated saving after the implementation of the scheme				Signature	
				Date 30.10.2007	

## Energy Conservation Measure implemented in 2006-2007

	Title of the measure	Sector : <b>Petrochemical</b>
	<b>SRT Heaters Convection zone cleaning</b>	Technology : <b>Own initiative</b>

### Description of the energy conservation measure:

SRT heater cleaning is carried out when Heater is down for TLE cleaning. On top of the convection zone there are 2 nos. of manholes which are opened and through each man hole a duct is laid connected to a separate vacuum blower. On the sides of the convection zone peeping openings are there. From here air lancers are introduced. Air at a pressure of 10 kg/cm<sup>2</sup> pressure is injected through air lancers and the dust is removed from top due to vacuum provided at the manhole. When cleaning was started, initially the result was good. During second cleaning of the same heater after few months stack temperature drop was lesser in view of fairly cleaner surface. Cleaning time requirement is around 8 hours for a heater. Drop in stack temperature for the heaters by around 38 oC.



(Photograph of one of the SRT Heater where the scheme has been implemented)

The above mentioned cleaning process was carried out for H-102 an H-104 heaters. Investment on the scheme is Rs. 2.0 Lakhs. Annual Saving of Rs. 38.0 Lakhs.

Agency that executed the project (with complete address and email): For details pl. contact Company person whose details are mentioned below.					
Total investment, Rs.: 2.0 Lakhs			Year of implementation: 2006-07		
First year energy cost savings, Rs.: 38.0 Lakhs					
First year other savings, Rs.:					
On annual basis	kWh 000'	Coal (Tons)	Gas Nm <sup>3</sup>	Oil (kL)	Other
Energy consumption before					
Energy consumption after				235*	
Energy tariff, Rs/ kWh/ Ton/ Nm <sup>3</sup> / kL ...				16073	
Company complete address: Anil Kewalramani GM (Central Technical Services) Reliance Industries Ltd. Vadodara Mfg. Division P.O. Petrochemicals Dist. Vadodara - 391346				We authorise Bureau to use this information for dissemination	
* Net estimated saving after the implementation of the scheme				Signature  Date 30.10.2007	