

## United Phosphorous Limited

### Unit : Vapi ( Gujarat )



#### **Introduction**

United Phosphorus Limited (UPL) is the largest producer in India of crop protection products with a wide range of products that include fumigants, fungicides, insecticides, rodenticides and herbicides. The company ranks fourth amongst the generic agrochemical companies in the world.

UPL is having their manufacturing units at Vapi, Ankleshwar, Jhagadia, Halol and UK. UPL-Vapi unit was the first unit established in 1969, situated 180 km from Mumbai on national highway no.8.

It is an ISO 9001, ISO 14001 and OHSAS 18000 certified company

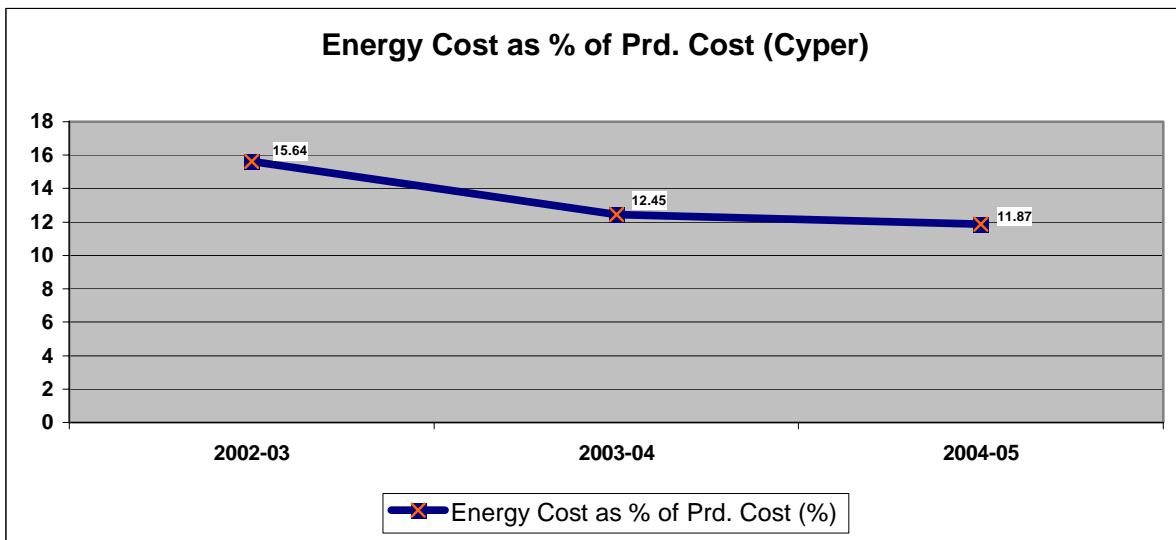
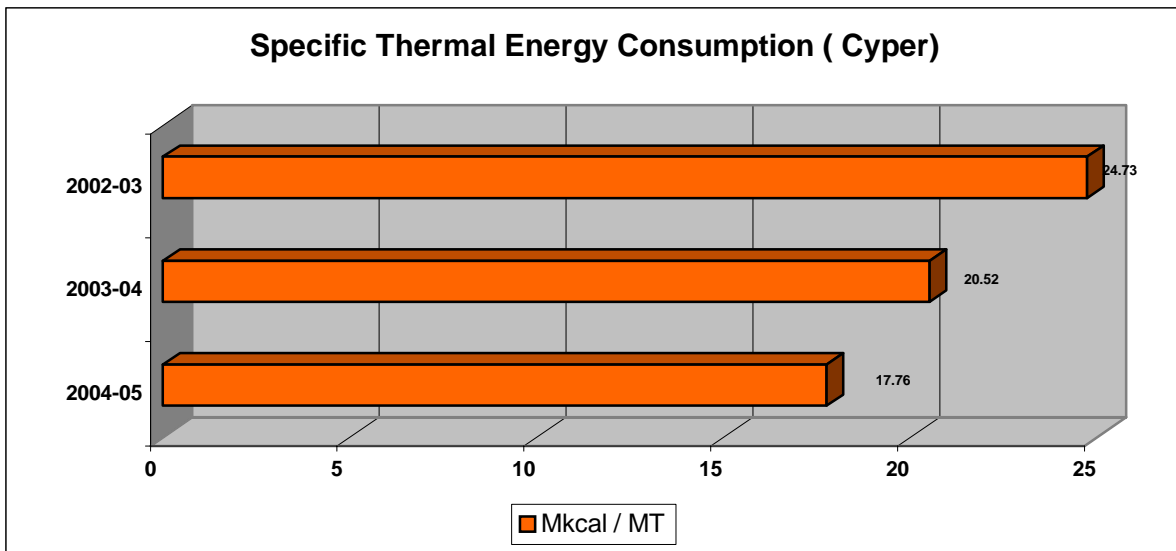
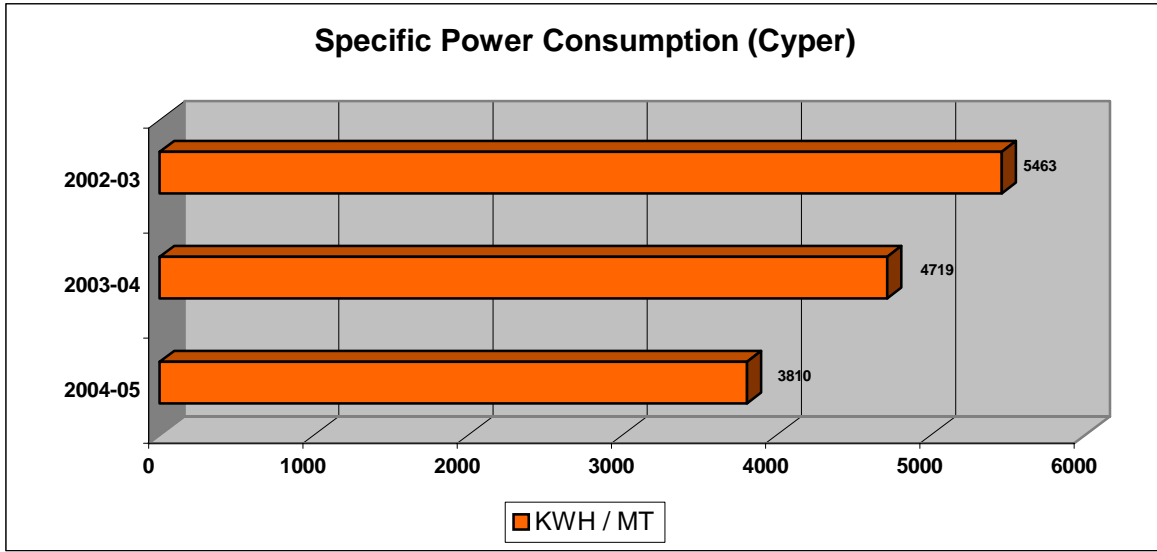
The unit sales turnover was Rs 230.64, 244.75 and 286.77 crores in the year 2002-03, 2003-04 and 2004-05 respectively.

Through acquisitions, strategic alliances and subsidiaries, UPL has built a network across the globe - in Europe, America, Asia Pacific, CIS, Africa and Australia with fully owned subsidiaries in Argentina, Australia, Bangladesh, China, Cuba, Denmark, Honduras, Hong Kong, Japan, Mauritius, Mexico, Poland, Russia, South Africa, USA, UK, Zambia, Zimbabwe and representative offices in Sri Lanka & Vietnam.

#### **Energy Consumption:**

The specific Energy consumption of main product Cypermetherine is on declining trend due to various innovations, R&D for yield improvement, Energy conservation, capacity utilization, process improvements measures etc. Cypermetherine is being manufactured with DVACL and MPBAD, combined direct power consumption of these main products are 60 % of the total electricity purchased and combined thermal energy consumed is 80 % of the total thermal energy purchased. The scenario of UPL – VAPI unit in the past three years is as given below.

Description	Unit	2002-03	2003-04	2004-05
Annual production of main product	MT	1739	1827	2320
Specific Energy consumption – Electrical	Kwh / MT	5463.9	4719.02	3810.86
Specific Energy consumption - Thermal	Million Kcal / MT	24.73	20.52	17.76
Total Manufacturing cost	Lakhs Rs	6265.65	7161.66	7897.58
Total Energy cost	Lakhs Rs	957.16	891.6	937.13
Energy cost as % age of Total manufacturing cost	%	15.64	12.45	11.87



## **Energy Conservation Commitment, Policy and Set up**

UPL is committed for Total Energy conservation, prevention of energy wastages, new technologies implementation and R&D for quality to reduce specific energy consumption of their main product lines. Because of the commitment, one of the main Objectives of the company is to reduce Energy bill by 10 %.

Energy management set up is comprising of three groups

- The Apex group indicates the commitment of the top management. It gives proper guidelines, support, and encouragement to the Energy conservation activities. The group is headed by COO.
- The core group forms the middle Management including GM (works), Dept heads, and Energy Manager.
- The working group comprises of various profession engineers at all plant level. By monthly meeting is conducted, where various energy conservation proposals are put, analyzed, discussed. With no payback proposals are implemented immediately and with investment are reported to the management. Monthly reports of Energy saving and proposal are put to the Management in MIS.

For 2005-06, The Energy conservation team consisting of following members

<b>Name</b>	<b>Department</b>
Devendra Chhangani	Team leader - Energy Manager ( BEE approved )
V.K. Srivastava	Asst. Manager - Electrical
J.S.Rana	Asst. Manager - Instrumentation
P. I.Shah	Deputy Manager - Production
A. Wankhade	Asst. Manager – MAXPRO
A.B. Dhimmer	Asst. Manager – Maintenance
P. Sonwane	Sr. Executive – Process
K.Parikh	Sr. Executive - MIS

The Commitment of the top management is also reflects, as every three years Energy Audit is conducted by External Auditor.

We have conducted external audit from M/s SAKET projects Ltd - Ahmedabad in 2003 and from M/s DSCL Energy services Co. - Ahmedabad in July 2005 both are approved Energy auditor from Govt of Gujarat.

### **Our Energy Management Policy is**

We shall strive for continuous energy economy through

- To employ cleaner & more efficient technologies.
- Adopting appropriate energy conservation technologies to all new projects.
- Replacement of energy inefficient equipment with energy efficient equipment.
- Carry out regular internal & external audits to identify areas for improvements.
- Enrich our experience on energy conservation by exchange of ideas with our group companies and other organizations.
- Improved capacity utilization.
- To ensure energy conservation Program throughout the organization.
- Formulation of overall energy strategy & targets.

As a part of our energy conservation and environment protection, we are committed to reduce specific energy consumption by 10 % every year till 2007.

## **Energy Conservation Achievements**

<b>Description</b>	<b>Unit</b>	<b>2002-03</b>	<b>2003-04</b>	<b>2004-05</b>
Energy saving activities	Nos	17	14	22
Savings achieved	Rs Lac	86	79	117
Investment	Rs Lac	21	20	77

### **Major Energy saving schemes implemented in 2004-05 :**

We have implemented total 22 major energy efficiency projects in year 2004-05, inclusive of in-house R & D efforts, innovations. The themes of these projects were based on following ideas.

- Optimization of cooling water-pumping system
- Performance improvement of refrigeration plants
- Condensate and flash steam recovery
- Improvement in steam generation and distribution
- Performance improvements of steam ejectors
- Electric heating to steam heating
- Replacement of worm gear boxes with planetary gearboxes
- Replacement of steam ejectors with OTL vacuum pumps
- Power factor improvement by installation of capacitors & APFCR
- Replacement of reciprocating chillers with screw chillers
- Purchasing of Energy efficiency motors for all new requirements
- Replacement of thermocol insulation with PUF for cold services
- Steam ejectors combinations for different applications
- Conversion of indirect heating to direct heating
- Replacement of inefficient compressor to efficient compressor
- Installation of CFL lamps
- Steam trap monitoring and replacement
- Steam / air leakages monitoring

### **In house R & D efforts / Technology innovations / Process up gradations:**

At UPL Vapi unit we are continuously working on main product line for better utilization of energy, productivity and resources through following ideas:

- Capacity enhancement through process intensification.
- By alternate manufacturing processes.
- Batch to Continuous operation.
- BCT reduction by in-house R&D efforts
- Increase in batch size.
- Better Mixing Technology
- Full capacity utilization.

## **Major Energy conservation plans and Targets for 2005-06:**

United Phosphorous Limited, Vapi unit is committed to improve energy performance on continual basis by finding out new ideas / innovations in the field of electrical and thermal energy. For the year 2005-06, we have planned / ordered few major energy reduction proposals as a part of our main objectives.

<b>SN</b>	<b>Energy conservation targets</b>	<b>Expected savings in Rs Lacs</b>	<b>Investment in Rs Lacs</b>	<b>Target date</b>
1	MPBAD, MR112 steam ejector to be replaced with OTL vacuum pump	16	4.5	Ordered 15 Oct-2005
2	Boiler blow down heat recovery	13	8.5	Dec-2005
3	Contaminated condensate heat recovery	11	10	Dec-2005
4	Direct condensate recovery DVACL	4.4	1	Sep-2005
5	VFD in Boilers	4.15	2	Oct-2005
6	Electrical heating to steam heating for FO preheat	4.12	1.5	Oct-2005
7	Replacement of inefficient reciprocating chiller to energy efficient screw chiller 170 TR	42	25	Dec-2005
8	Cyper hexane recovery, steam ejector to OTL vacuum pump	9	5	Oct-2005
9	Triple effect evaporator in place of direct evaporation	128	90	Ordered 15 <sup>th</sup> Oct 2005
10	Conversion of incoming GEB line from 11 to 66 KV		192	Ordered 15 <sup>th</sup> Oct 2005
11	Energy efficient N2 plant for continuous operation		30	Ordered 15 <sup>th</sup> Sep 2005
12	DVACL distillation ejector modification	18	5.5	Ordered 15 <sup>th</sup> Oct 2005
13	TCBN distillation ejector modification	5.7	1.2	Ordered 15 <sup>th</sup> Sep 2005
14	DVACL cooling pump replacement	7	1	Oct-2005

### **For year 2005-06:**

Planned investment = **377.2 Rs Lacs**

Savings Expected = **262.3 Rs Lacs**

## **Unit : United Phosphorous Limited ( Vapi – Gujarat )**

### **Energy Conservation Measures ( 2004-2005 )**

#### **Project: 1**

#### **Background & Observation Made:**

Objective is to minimize the operating cost of vacuum generating system at DVACL plant in order to reduce electrical energy.

In DVACL plant, at DVA stage, water ring vacuum pump is used to generate vacuum required in the process of lot sucking. For that water ring vacuum pump is replaced by once through lubrication type vacuum pump. This has reduced not only the operating cost of the system but also the effluent generated due to the water ring vacuum pump.

### Technical & Financial Implementation:

#### With water ring vacuum pump

Power consumption = 24.25 kwh  
Effluent Generated = 1.8 kL/hr

#### With OTL type vacuum pump

Power consumption = 4.85 kwh  
Oil Consumption = 0.4 lit/hr  
Solvent recovery = 74 KL / annum

#### Power saving = 1.7 Lac Kwh / annum

Total Saving/annum = Rs. 20.24 lacs  
Total investment = Rs 4.5 lacs

### Impact of Implementation:

- Power saving of 1.7 Lac Kwh / annum
- Solvent recovery 74 KL / annum
- Overall saving Rs 20.24 Lac
- Reduces effluent generation

### **Project: 2**

#### Background & Observation Made:

Objective is to minimize the operating cost of vacuum generating system in order to reduce thermal energy.

In Pesticide plant, at cyper concentration, steam jet ejector is used to generate vacuum required in the process. Cyper concentration steam jet ejector is replaced by once through lubrication type vacuum pump to reduce the operating cost. This has resulted into reduction in the steam consumption and effluent generation and reduction in solvent consumption.

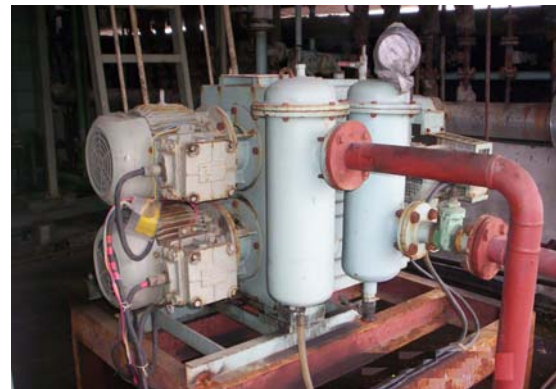
### Technical & Financial Implementation:

Steam consumption = 250 kg/hr  
Power Consumption in water circulation to ejector condenser = 2.95 kwh

#### with OTL pump

Power consumption = 8.58 kwh  
Oil Consumption = 0.4 lit/h  
Solvent Recovery = 222 KL / annum  
Thermal saving = 676 M Kcal / annum  
Total Saving = Rs 9.65 Lac p.a.  
Total Investment = Rs 3.5 Lac

### Impact of Implementation:



- Steam saving of 676 M Kcal / annum
- Solvent recovery 222 KL / annum
- Overall saving Rs 9.65 Lac
- Reduces effluent generation

### **Project: 3**

#### **Background & Observation Made:**

For DVACL plant brine requirement was fulfilled by conventional reciprocating type chillers.

To fulfill the requirement of appx. 134 TR load, three no of reciprocating type chillers were used to generate brine at -20 Deg C. The overall efficiency of three different systems were poor. We have decided for the single screw chiller of 134 TR capacity in place of conventional reciprocating type chillers.

#### **Technical & Financial Implementation:**

Overall Ikw/TR	= 2.2 ( with Reciprocating type chiller )
Screw chiller Ikw/ TR	= 1.91
Kwh saving	= ( 2.2-1.91 ) x 134
Total KWH saving / annum	= 327000
Total Saving/annum	= Rs 17.46 Rs
Total Investment	= Rs 30 Lac

#### **Impact of Implementation:**

- Power saving of 3.27 Lac Kwh / annum
- Annual saving of Rs 17.46 Lac
- No maintenance



## **Project: 4**

### **Background & Observation Made:**

DVA aqueous solution evaporation condensate and Flash steam recovery.

Appx. 40 T of condensate and 11 % of flash steam recovery identified and energy utilized in Boiler feed water day tank from DVA aqueous solution evaporation plant. We have installed M/s Forbes Marshall's supplied pressured powered condensate pump along with flash steam recovery system

### **Technical & Financial Implementation:**

Condensate recovered: = 40 T / day  
Flash steam recovered = 11 %  
Total saving in Thermal Energy  
Condensate = 813 M Kcal  
Flash steam = 948 M Kcal  
Total saving / annum = Rs 26 Lacs  
Total Investment = 3.5 Lacs



### **Impact of Implementation:**

- Thermal energy saving of 1761 M Kcal / annum
- Annual saving of Rs 26 Lac
- Reduction in effluent generation

## **Project: 5**

### **Background & Observation Made:**

RP furnaces, indirect type heating element were consuming more power to get the required heat for process

with our in house R & D efforts, we have tried direct type electrical heating in place of indirect heating. It has saved almost 50 % of power required for heating.

### **Technical & Financial Implementation:**

**Indirect heating element = 18 Kw**  
Direct type heating element = 9 Kw  
The batch timing remained same for the process  
Total Kwh saving = 300000  
Total Saving/annum = Rs 16 Lacs  
Total Investment = Rs 8.25 Lac

### **Impact of Implementation :**

- Power saving of Rs 16 Lac

## **Project: 6**

### **Background & Observation Made:**

RP furnaces, radiation losses through the furnace wall found high

To control the radiation losses specialized high emissive insulation paint were applied inside the walls of the furnaces. By doing that we have found that power consumed for the batch has reduced.

### **Technical & Financial Implementation:**

Power reduction for a batch after applying the paint	= 18.93 %
Total KWH saving / annum	= 83000
Total Saving/annum	= Rs 4.47 Rs
Total Investment	= Rs 0.5 Lac

### **Impact of Implementation:**

- Power saving of Rs 4.47 Lac
- Surrounding area good working condition

## **Project: 7**

### **Background & Observation Made:**

Using electrical oil heating for product temperature upto 300 Deg C

It was observed that, the heating was not proper for the batch and it was inefficient. We have decided for the oil-fired heater for the same application

We have installed one 50,000 Kcal/Hr oil fired heater supplied by M/s Heatex for the same application @ 82% thermal efficiency

It resulted into very fine temperature controlled profile for the product, which has improved product yield and purity also.

### **Technical & Financial Implementation:**

Electrical heater capacity	= 48 Kw
Heat requirement	= 41280 Kcal/Hr
Operating cost for Electrical heater	= 255 Rs/Hr [ Cost of Power ]
Operating cost for oil fired heater	= 74 Rs / Hr [ Cost of LDO ]
Power saving	= 0.81 Lac Kwh / annum
Total Saving/annum	= Rs 4.34 Rs
Total Investment	= Rs 2.5 Lac

### **Impact of Implementation:**

- Power saving of Rs 4.34 Lac
- Better product result ( yield and purity )
- Reduced BCT, increased productivity
- No break down



## **Project: 8**

### **Background & Observation Made:**

Total seven nos cooling water pumps were audited for their operating efficiency. It was found that most of them were operating at 70-75 % efficiency

We have selected split flow type instead of back pull type pump and wherever applicable we have installed online booster pumps for overall better system efficiency. By doing that against 8 operating pumps, we are able to manage plant requirement from 4 nos better efficiency ( 80-85 % ) pumps.

### **Technical & Financial Implementation:**

Total power saving = 5.23 Lac Kwh / annum  
Total saving = Rs 27.93 Lac  
Total Investment = Rs 9.3 Lac

### **Impact of Implementation :**

- Total energy saving of Rs 28 Lac
- Less operating pump numbers
- Low RPM pump 1440 against 2900
- Low maintenance

## **Project: 9**

### **Background & Observation Made:**

Objective is to minimize the operating cost of gearboxes and reduction in noise level.

In DVACL & MPBAD plant, nine Reactors were having worm type gearboxes, which were working on 74% efficiency. For these reactors helical and planetary gearboxes were installed. Their efficiencies are around 94 %. This had reduced not only the operating cost of the system but also the noise level.

### **Technical & Financial Implementation :**

Power consumption = 112 kWh ( with worm type gear box )  
Power consumption = 90 kWh ( with planetary & helical type gear boxes )  
Total power saving = 1.86 Lac kWh / annum  
Total saving = Rs 9.29 Lac  
Total Investment = Rs 5.4 Lac

### **Impact of Implementation:**

- Power saving of 1.86 Lac kWh / annum
- Noise level reduction
- Less space

## **Project: 10**

### **Background & Observation Made:**

Objective is to minimize the operating cost of vacuum generating system.

In DVACL plant, at DVACL distillation, two steam jet ejector are used to generate vacuum in TFE and FFE in the process. The loads of both the system were studied. Observed that, if the pipeline size can be increased one Ejector can take the load of both the system. This has reduced the operating cost of the system by reduction in steam consumption, and power consumption.

### **Technical & Financial Implementation:**

Total Steam consumption	= 600 kg/hr (with two ejectors)
Power Consumption in water circulation to ejector condenser	= 24 kwh (with two ejectors)
Steam consumption	= 450 kg/hr (Single ejector)
Power Consumption in water circulation to ejector condenser	= 12 kwh (Single ejectors)
Total power saving	= 0.86 Lac Kwh / annum
Total Thermal saving	= 731 M Kcal / annum
Total saving	= Rs 15.37 Lac
Total Investment	= Rs 0.5 Lac

### **Impact of Implementation :**

- Saving in thermal energy 731 M Kcal / annum
- Saving in Electrical energy 0.86 Lac Kwh / annum
- Reduction in effluent

## **Project: 11**

### **Background & Observation Made:**

Objective is to minimize the operating cost of vacuum generating system.

In MPBAD plant, at MBB distillation, SS steam jet ejector is used to generate vacuum in the process of the order of one torr. The load of the system was studied and observed that, one torr of the system can be reduced to 3 torr for the same application. This will reduced the operating cost by reduction in steam consumption. We have replaced the ejector from SS to graphite type for better life.

### **Technical & Financial Implementation :**

Steam consumption	= 270 kg/hr (with 1 torr )
Steam consumption	= 170 kg/hr (with 3 torr )
Total saving in thermal energy	= 339 M Kcal / annum
Total Saving	= Rs. 5.28 lacs.
Total investment	= Rs 4 Lac

### **Impact of Implementation:**

- Thermal energy saving of 339 M Kcal / annum
- Total saving of Rs 5.28 Lac
- Low maintenance

## **Project: 12**

### **Background & Observation Made:**

Objective is to minimize the operating cost of vacuum generating system.

In DVACL plant, at TCBACL distillation, steam jet ejector is used to generate vacuum in the process of the order of one torr. It was old design and steam consumption was high. We have discussed with the H.K. Industries the supplier of the ejector system. They suggested replacing the X & W stage diffuser and nozzles. This will reduced the steam consumption.

### **Technical & Financial Implementation :**

Steam consumption	= 230 kg/hr ( Before modification )
Steam consumption	= 140 kg/hr ( After modification in X & W stage )
Total thermal saving	= 325 M Kcal / annum
Total saving	= Rs. 4.80 lacs.
Total Investment	= Rs 0.3 Lac

### **Impact of Implementation:**

- Thermal energy saving of 325 M Kcal / annum
- Total saving of Rs 4.8 Lac