



# MRF

*Tyres With Muscle*





## **UNIT PROFILE**

MRF Kottayam unit started in 1969 as the second plant of MRF, with a small rubber mixer and seven employees. Presently the employee strength is nearly 2000. Plant is engineered in four levels fully merged with the environment. World class rubber mixing facility with SCADA based recipe management, fully automated carbon handling systems and modern dust collecting systems keep the environment tidy. Facilities with upgraded systems for Tube, Tyre and PCTR manufacturing delivers world class product. MRF Kottayam is certified with ISO 9001/ TS 16949, ISO 14001/ OHSAS18001-2007 etc. TPM initiatives improved the plant performance in all areas. MRF Kottayam unit also registered small scale energy saving projects for carbon credits and its liaison works with UNFCCC being done by consultants M/s Ernst & Young.



## **ENERGY CONSERVATION & MANAGEMENT POLICY**



### **ENERGY CONSERVATION & MANAGEMENT POLICY**

**MRF-K IS COMMITTED TO MAINTAINING ENERGY EFFICIENT PRACTICES IN ITS PLANTS PROCESS LINES.**

**To achieve this goal, all the plant departments shall: -**

- ***OPTIMIZE THE USAGE OF ENERGY THROUGH VARIOUS ENERGY CONSERVATION ACTIVITIES.***
- ***OPTIMIZE THE USAGE OF AVAILABLE ENERGY THROUGH PROPER ENERGY MANAGEMENT PRACTICES.***
- ***CONTINUOUSLY MONITOR AND UPGRADE SYSTEMS & MACHINERIES TO IMPROVE ENERGY EFFICIENCY AND TO REDUCE WASTAGES.***
- ***CONTINUOUSLY MONITOR USAGE OF ENERGY AT ALL LEVELS AND WOULD REDUCE SPECIFIC ENERGY / FUEL CONSUMPTION TO MAXIMUM POSSIBLE LIMITS.***
- ***TRAIN ALL OUR EMPLOYEES TO PERFORM THEIR ACTIVITIES IN AN ENERGY EFFICIENT MANNER TO REDUCE WASTAGES.***

**It is our endeavor that each of our manufacturing lines ensures best energy efficient systems and practices.**

**Respective Plant Energy Cell leader is assigned the responsibility of carrying out the Energy conservation & management activities by collaborating with Energy Conservation & Management Cell.**

**Date 15.01.2006**

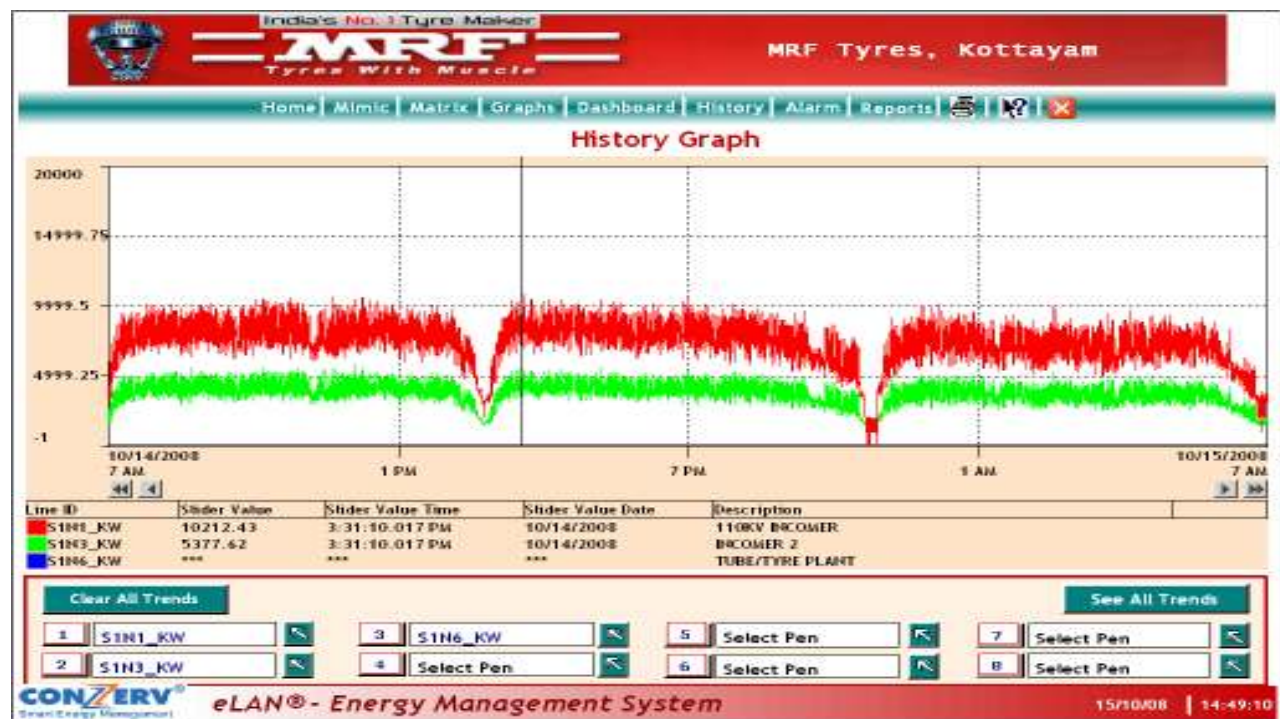
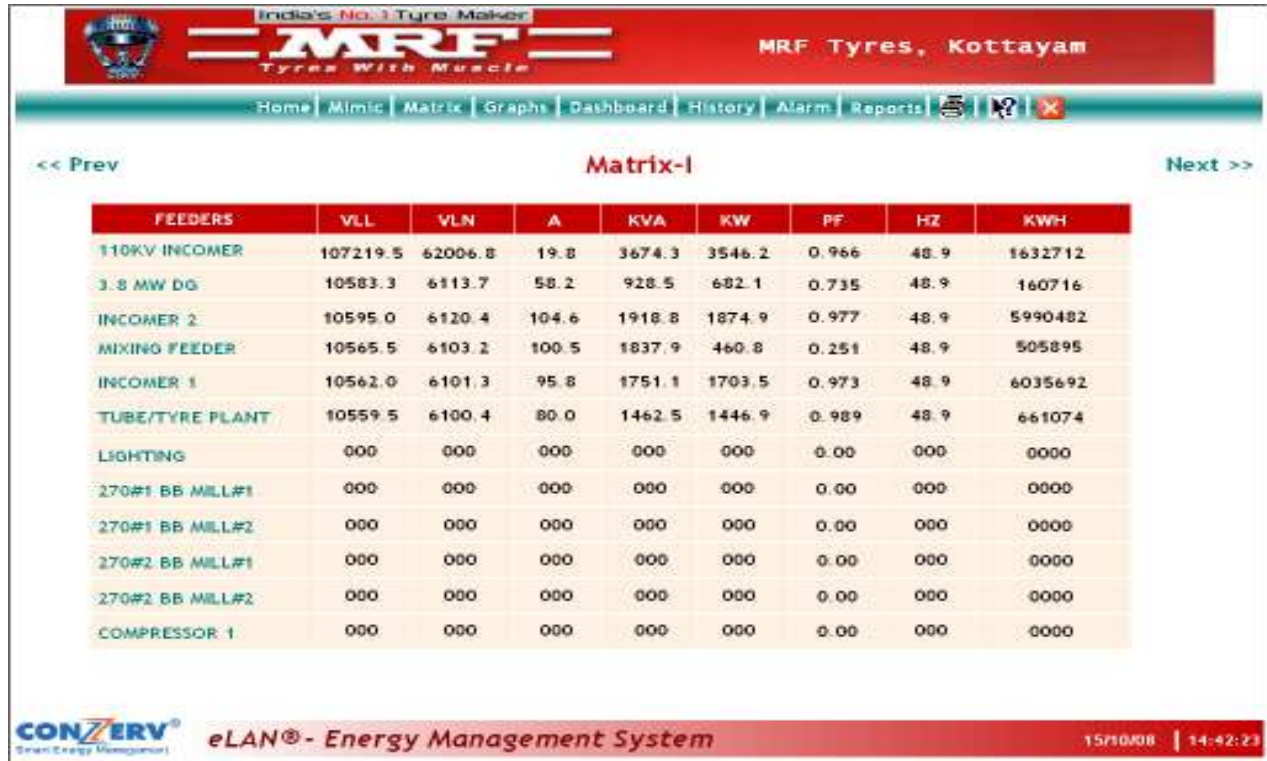
**Michael Rebeiro,  
GM-KP**



# ENERGY REPORTING SYSTEM

## ENERGY MANAGEMENT SYSTEM

We have introduced computerized EMS system connects 60 meters, at our 110 KV substation through M/s Conzerv, which is the primary reporting system.





## **Electrical Energy Reports**

In addition to the EMS we have daily reporting systems for Electrical energy and fuel energy.

1. Daily Electrical Energy Consumption Report with following data are published and analyzed in various forums.
  - Total Consumption from E.B & captive generation
  - Time Zone wise Energy consumption & KVA MD
  - Energy consumption; shift wise & Plant wise
  - Power Factor; Shift wise , daily and monthly average
2. Daily Energy consumption & Specific Energy reports of major energy consuming departments are published and analysed.
3. Hourly Load trend of the Plant is published on Daily basis.

## **Fuel Energy Reports**

1. Daily fuel consumption report and specific fuel consumption reports are prepared and published.

Review and Actions:

Consolidated monthly report of fuel and electricity is published by Accounts department and is verified and discussed in various forms. These reports are reviewed and compared with other MRF plants at H.O. Future Plans are made for control and reduction is initiated at plant level as well as H.O level.

## **ENERGY CONSERVATION & MANAGEMENT CELL**

GENERAL MANAGER –KOTTAYAM PLANT (UNIT HEAD)

Plant engineering manager (President)

Manager electrical maintenance (Vice President)

Energy Manager (Coordinator)

### **Members**

Area in charges – Production, Mechanical & Electrical –Plant 1

Area in charges – Production, Mechanical & Electrical –Plant 2&4



Area in charges – Production, Mechanical & Electrical –Plant 3

Energy conservation projects identified through regular audits, suggestion schemes, plant level brain storming meetings, etc are implemented by the concerned area in charges. Implemented projects are documented in KAIZEN format where the scope for horizontal deployment and target are shown. All Kaizens are evaluated monthly and rewarded for the best three.

## **Saving achieved through reduction in Specific energy consumption**

Through productivity improvement and energy conservation activities the specific energy and specific fuel consumption had come down to 831 KWh/T and 141 Ltrs/T respectively.

Savings achieved

	<b>Units /MT</b>	<b>Quantity</b>	<b>Value Rs Lakhs</b>	<b>Total value</b>
Electrical energy	50	2.509 MU KWh	98.85	251.85
Fuel Energy	17	8.5 Lakhs Ltrs	243	

**Total saving achieved is Rs 251 .85 Lakhs**

## **Details of Production & Energy consumption Details**

<b>Sl. No</b>	<b>Particulars</b>	<b>UOM</b>	<b>2005-06</b>	<b>2006-07</b>	<b>2007-08</b>
1	Production	MT	37811	45018.9	50199.9
2	Electricity Consumption	M. KWh	3.695	3.966	4.17
3	Fuel – Furnace Oil	KL	6285697	6716717	6859018



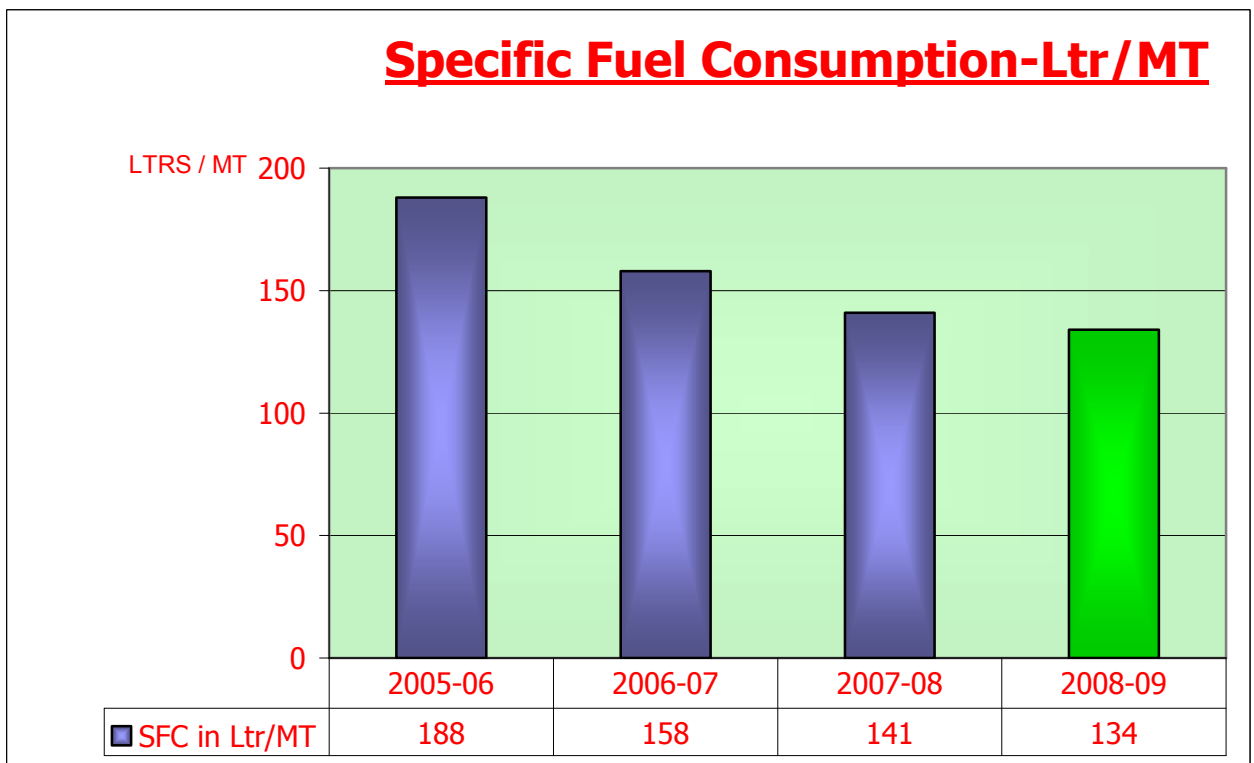
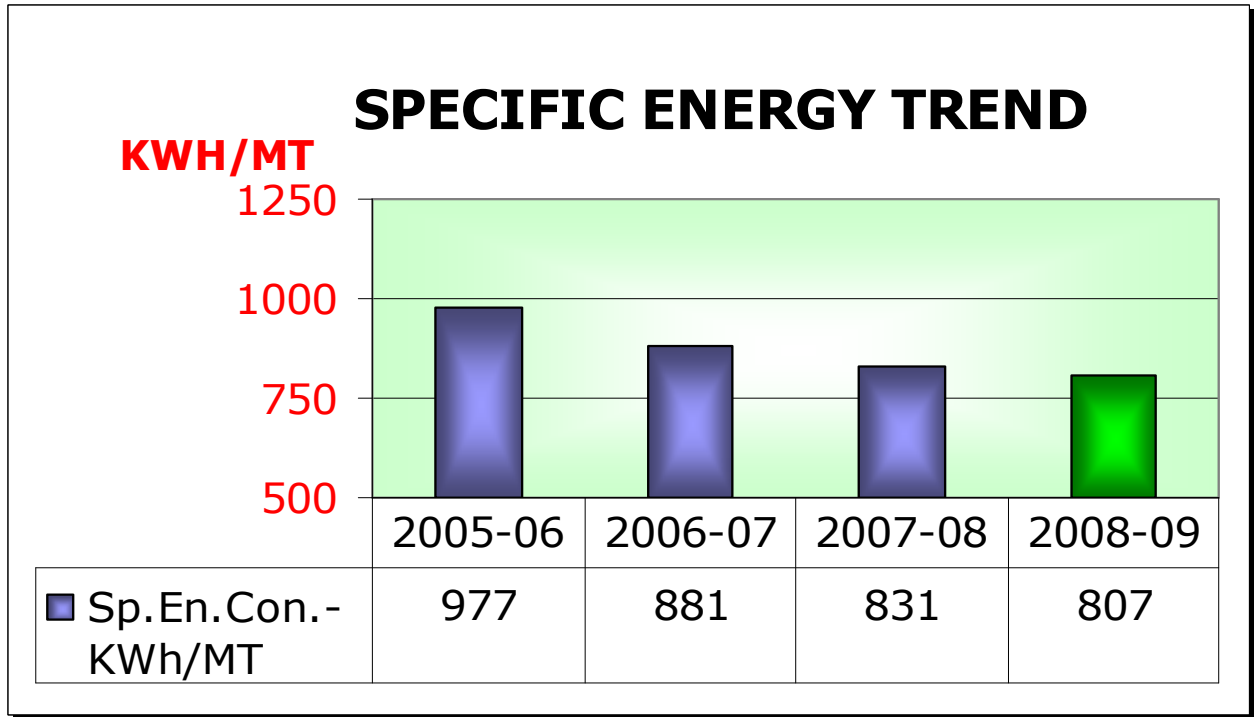
<b>Energy Cost in Lakh</b>				
Sl. No	Particulars	2005-06	2005-06	2006-07
1	Electricity	1967.03	2141.72	2288.7
2	Fuel	3016.65	3441.80	4208.45
<b>TOTAL</b>		<b>4983.68</b>	<b>5583.52</b>	<b>6497.15</b>

### **SPECIFIC ENERGY/FUEL CONSUMPTION**

	<b>Specific Energy Consumption</b>		<b>Specific Fuel Consumption</b>	
	Value KWh/MT	Reduction	Value-Ltrs/MT	Reduction
2005-06	977	-1.45	178	-2.3
2006-07	881	9.38	158	11.24
2007-08	831	5.68	141	10.76

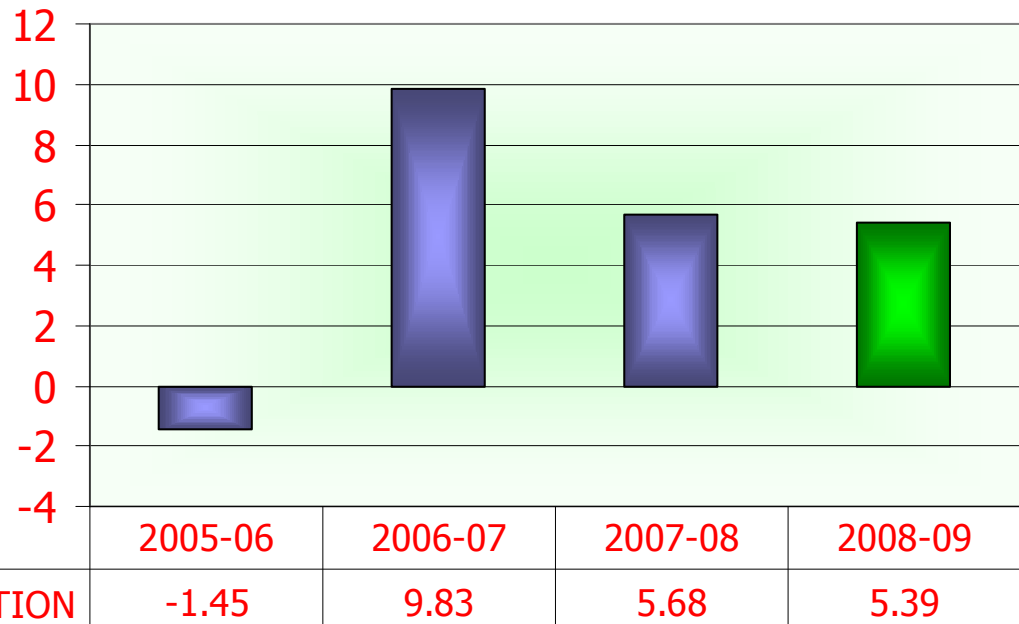


## SPECIFIC ENERGY TREND GRAPH

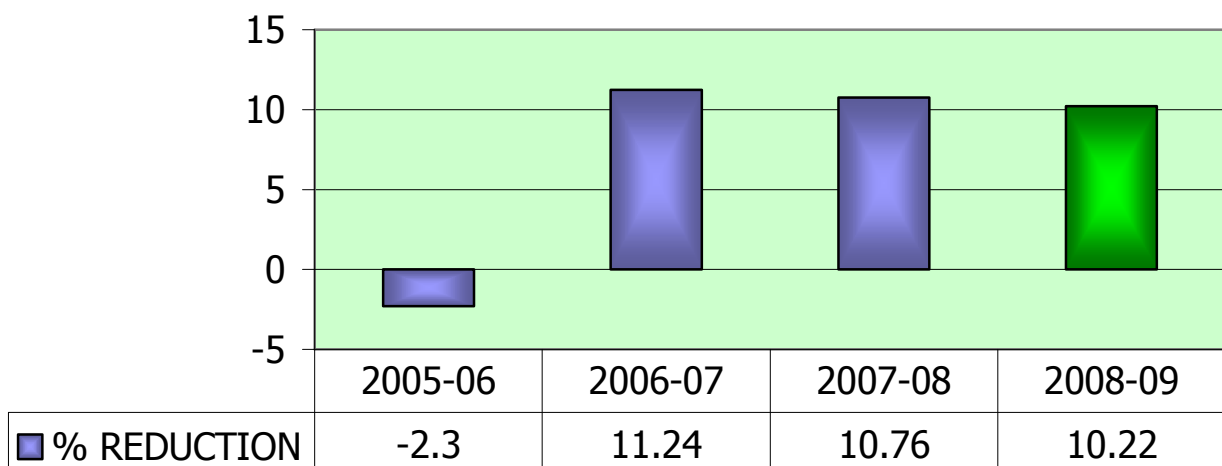




### % Reduction in Specific Energy



### % Reduction Trend of Specific Fuel Consumption





## **TRAINING PROGRAMS/CAMPAIGNS IN ENERGY CONSERVATION ORGANISED IN 2007-08**

- Training for all new staff on energy standards, management cell and on conservation.
- **Act, Activate, Achieve-**
  - Six days campaign on shop floor on conservation of resources had initiated by Plant-1. Awareness on steep hike in price of raw materials, Electrical energy, fuels etc were made through posters and classes. Different methods and possibilities to avoid and control the wastages also were discussed. Received 218 suggestions through campaign.
- A dedicated session for conservation of Electrical energy was organized based on the power crises in Kerala. Posters were displayed every where in the plant highlighting the impact of power cut and fuel cess on company and need for conservation of electrical energy.
- **Preserve- Conserve- Tide Resource (PCTR)**
  - Five days awareness program on the need for conservation of resource for the employees in PCTR- Plant. Received 186 suggestions through this campaign.
- Electrical Safety and energy conservation awareness class by Regional Electrical Inspector for MRF employees at MRF canteen hall.



# **DETAILS OF INNOVATIVE TECHNOLOGIES IMPLEMENTED FOR ENERGY CONSERVATION INCLUDING UTILIZATION OF RENEWABLE ENERGY**

- Variable frequency drives for motors.
- Energy efficient pumps and motors.
- Screw compressor for air.
- Energy efficient and soundproof blowers.
- Process improvements to improve productivity.
- Redesigning of machine/ process lay out.
- Electronic chokes, CFL, Slim tubes in lighting Circuits.
- Task oriented lighting through light sensors.
- Process optimization to avoid scraps by providing recipes in SCADA system.
- Interlocking the working auxiliary equipments with Main to avoid energy wastage.
- Power factor improvement.
- Computerized Energy Management system.

## **MAJOR ENERGY CONSERVATION INITIATIVES IN 2007-08**

### **ELECTRICAL ENERGY CONSERVATION**

#### **ADOPTING MODERN TECHNOLOGY FOR EFFICIENT OPERATION**

##### **1. INTRODUCTION OF SCREW COMPRESSOR**

To meet 100-PSI air requirement in Tyre plant, one number TS2 X Type compressor was used. This was very old and inefficient also. New energy efficient screw compressor provided in its place. It has got acoustic enclosure, which helped to reduce the sound pollution also.



PARAMETERS (annual basis)	KWh	Oil	Gas	Others
Consumption before	986656	NA	NA	NA
Consumption After	947189	NA	NA	NA
Investment (Rs in Lakhs)	9.5 lakhs	NA	NA	NA
Tariff (Rs per unit)	3.6	NA	NA	NA
Saving (RS in lakhs)	1.4	NA	NA	NA

### SCREW COMPRESSOR



## 2. INTRODUCTION OF ENERGY EFFICIENT AND SOUND PROOF BLOWER

10" Tread line was received with a 50HP 1150 CFM blower for blowing off the water from tread. This was producing high noise pollution also. Now it's replaced with 2 numbers of 10HP soundproof Energy efficient Blowers with efficient blowing nozzles. Horizontal deployment of this project is planned in the other two-extruder lines also immediately.

Result achieved: motor capacity reduced, Noise level reduced, Flow rate increased.

	<b>Blower motor</b>	<b>Noise level</b>	<b>Air Flow rate</b>
Before:	50 HP	95 DB	1150 CFM
After:	20 HP	63 DB	1450 CFM



PARAMETERS (annual basis)	KWh	Oil	Gas	Others
Consumption before	253000	NA	NA	NA
Consumption After	77000	NA	NA	NA
Investment (Rs in Lakhs)	3.5	NA	NA	NA
Tariff (Rs per unit)	3.94	NA	NA	NA
Saving (RS in lakhs)	6.9	NA	NA	NA



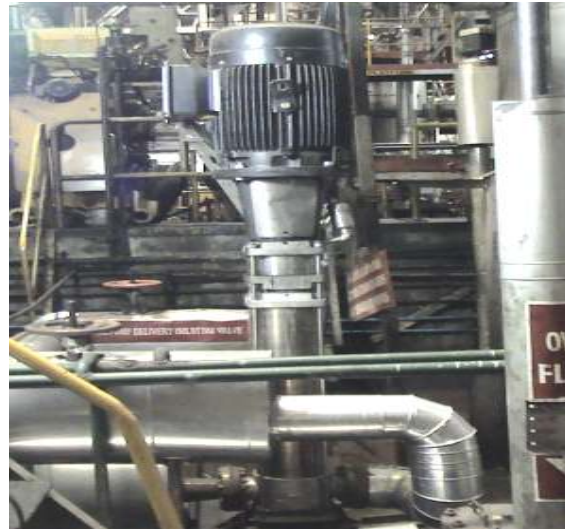
### 3. INTRODUCTION ENERGY EFFICIENT WATER PUMP IN TYRE CURING

Hot water Fill pump - 60 HP in Tyre curing trench No.2 was replaced with a high efficient, Vertical type 'GRUNDFOSS' make pump of 50HP.

PARAMETERS (annual basis)	KWh	Oil	Gas	Others
Consumption before	151536	NA	NA	NA
Consumption After	134217	NA	NA	NA
Investment (Rs in Lakhs)	8 lakhs	NA	NA	NA
Tariff (Rs per unit)	3.94	NA	NA	NA
Saving (RS in lakhs)	0.68	NA	NA	NA



**HOT WATER FILL PUMP**



**4. INTRODUCTION FRP FAN IN PLACE DICAST ALUMINIUM FAN IN COOLING TOWERS**

Most of the cooling towers are provided with Die cast Aluminum fan leaves. A plan is made to replace all such fans with FRP, which in turn will reduce Energy consumption and will offer high efficiency.

Following Projects are implemented

**500 T COOLING TOWER#1 IN TUBE PLANT**

Result achieved: motor capacity reduced, Noise level reduced, Flow rate increased.

	<b>Fan motor</b>	<b>Motor Load</b>	<b>Air Flow rate</b>
Before:	15 HP	10.5 KW	7.12 M/Sec
After:	15 HP	7.5 KW	9.17 M/s

PARAMETERS (annual basis)	KWh	Oil- KL	Gas	Others
Consumption before	88200	NA	NA	NA
Consumption After	63000	NA	NA	NA
Investment (Rs in Lakhs)	57000	NA	NA	NA
Tariff (Rs per unit)	3.94	NA	NA	NA
Saving (RS in lakhs)	0.99	NA	NA	NA



### 500 T COOLING TOWER#2 IN TUBE PLANT

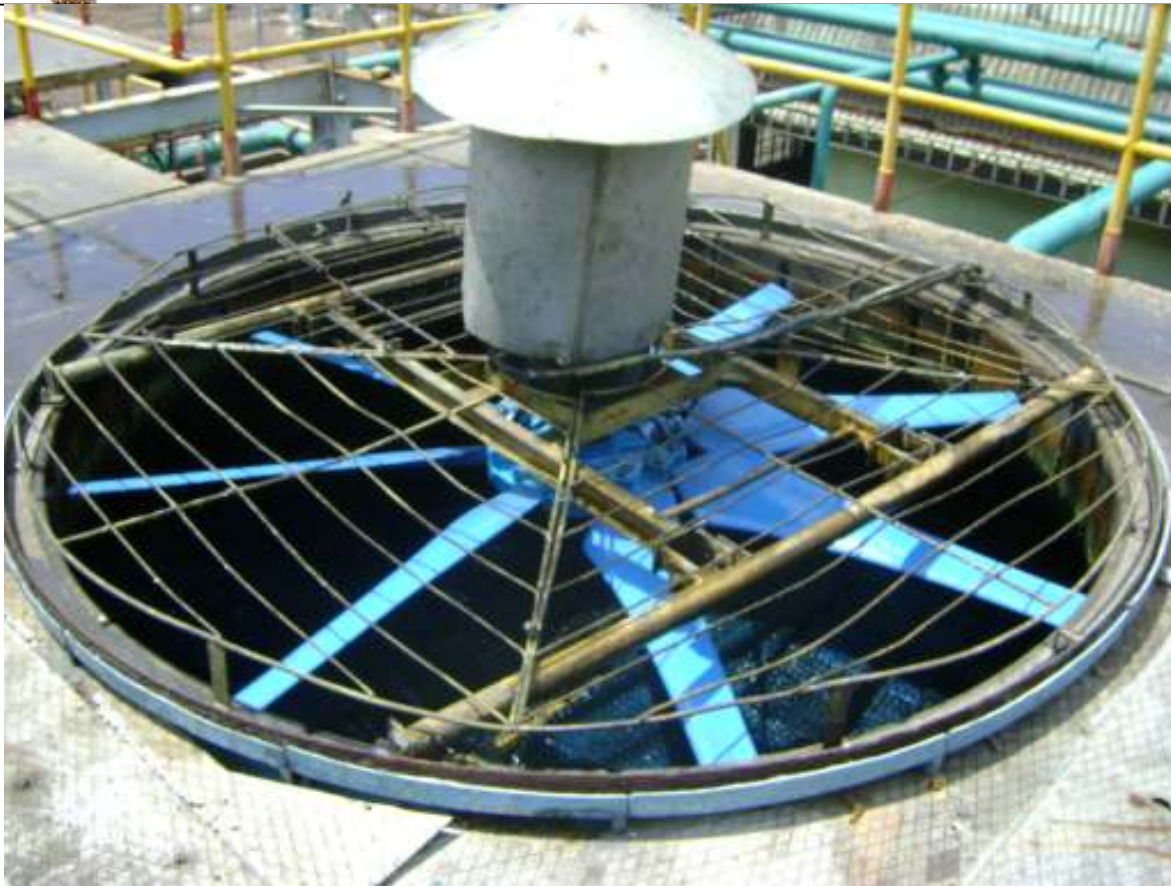
	<b>Fan motor</b>	<b>Motor Load</b>	<b>Air Flow rate</b>
Before:	15 HP	10.2 KW	1150 CFM
After:	15 HP	7.2 KW	1450 CFM

PARAMETERS (annual basis)	KWh	Oil	Gas	Others
Consumption before	85680	NA	NA	NA
Consumption After	60480	NA	NA	NA
Investment (Rs in Lakhs)	57000	NA	NA	NA
Tariff (Rs per unit)	3.94	NA	NA	NA
Saving (RS in lakhs)	0.99	NA	NA	NA

### 500 T COOLING TOWER#1 IN MIXING PLANT

	<b>Fan motor</b>	<b>Motor Load</b>	<b>Air Flow rate</b>
Before:	10 HP	7 KW	7.5M/s
After:	10 HP	5 KW	8.4 M/s

PARAMETERS (annual basis)	KWh	Oil	Gas	Others
Consumption before	588-0	NA	NA	NA
Consumption After	36000	NA	NA	NA
Investment (Rs in Lakhs)	0.50	NA	NA	NA
Tariff (Rs per unit)	3.94	NA	NA	NA
Saving (RS in lakhs)	0.57	NA	NA	NA



### 5. INTRODUCTION OF SCADA & RECIPIE IN DUAL TUBER EXTRUDER LINE

Through continuous monitoring of extruder parameters for all tread sizes, an optimum value for the speed of conveyors, extruders, mills etc were derived. This has been made as a recipe and included in the SCADA. Operator can select recipe from the screen provided for the sizes. This facility given to the operator has reduced the set up time, variation from operator to operator etc. This also contributed to reduced rework, improved productivity and there by reduction in specific energy.

Specific Energy	Before	Sep	After	Saving /year
	07 – Aug 07		Sep 07 –Aug 08	
	170 units/T		164 units/T	70128 units



PARAMETERS (annual basis)	KWh	Oil	Gas	Others
Consumption before		NA	NA	NA
Consumption After		NA	NA	NA
Investment (Rs in Lakhs)		NA	NA	NA
Tariff (Rs per unit)	3.94	NA	NA	NA
Saving (RS in lakhs)	1.2	NA	NA	NA

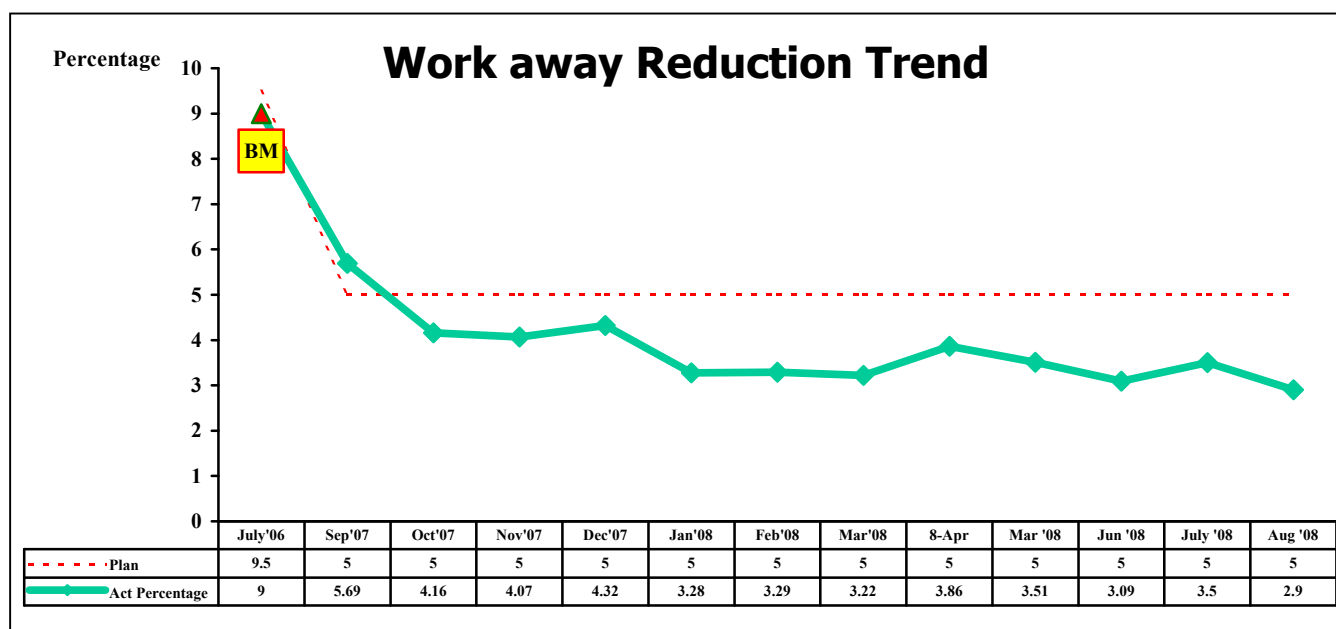
### Typical Recipe Screen of SCADA

RECIPE NUMBER 18      CURRENT RECIPE NAME 9.20SML      ENTER NEW NAME 9.20 sml

LINESPEED(MPM) 8.000 P.O TO SH-1 RATIO 1.000 SH-1 TO WEIGH RATIO 0.914 WEIGH TO ASC PAR RATIO 1.048 ASC PAR TO ASC RATIO 0.990 ASC TO TOP1 RATIO 1.037 TOP1 TO TOP2 RATIO 1.000 TOP2 TO TOP3 RATIO 1.000 TOP3 TO BOT1 RATIO 1.019 BOT1 TO BOT2 RATIO 1.000 BOT2 TO DSC RATIO 1.006 DSC TO WEIGH2 RATIO 0.960	ONLINE WEIGHT SET (Kgs) 7.00 TOLERANCE (KGS) 0.100 ONLINE WEIGHT-2 SET(Kgs) 30.00 OWC PER WITHIN CTRL LIMIT 0.300 OWC PER OUTSIDE CTRL LIMIT 1.000	CAP SET SPEED(rpm) 1.50 BASE SET SPEED(rpm) 1.50
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	D1	D2	D3	D4	D5	D6	D7	D8	D9
SET POINT (Deg / mm)	200.000	9.000	22.000	7.000	22.000	22.000	7.000	22.000	11.000
DEAD BAND (Deg / mm)	20.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
Ramp Within DBand (%/Deg/S)	0.030	0.060	0.030	0.060	0.030	0.030	0.060	0.030	0.030
Ramp Outside DBand (%/Deg/S)	0.200	0.400	0.200	0.400	0.200	0.200	0.400	0.200	0.200
Inst Outside Deadband (%/Deg)	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
Spare	10.000	0.000	7.000	0.000	0.000	0.000	0.000	0.000	0.000





## **PROCESS LINE MODIFICATION THROUGH ENGINEERING CHANGES**

### **6. Additional conveyor in DUAL TUBER EXTRUDER LINE**

System consists of 2 extruders, named Cap & Base. For feeding stock into these extruders, 5 Nos. of mill motors are used (3 Nos. in Cap side & 2 Nos. in Base side). One Mill fixed at Base side feeds stock to Base extruder, & Mill fixed at Cap side feeds stock to Cap extruder. They are named as Base feed mill & cap feed mill respectively. It is basically designed to extruder treads with dual compound in an extrusion.

Due to the increase in production the available extrusion line could not meet the requirement and decided to utilize the excess capacity in dual extruder line. But on detailed study, it's found that the feed mill at Cap side can feed stock to both extruders and an additional strip feed conveyor erected to base extruder. Due to this modification two numbers 250 hp mills could be switched off while extruding single stock treads.

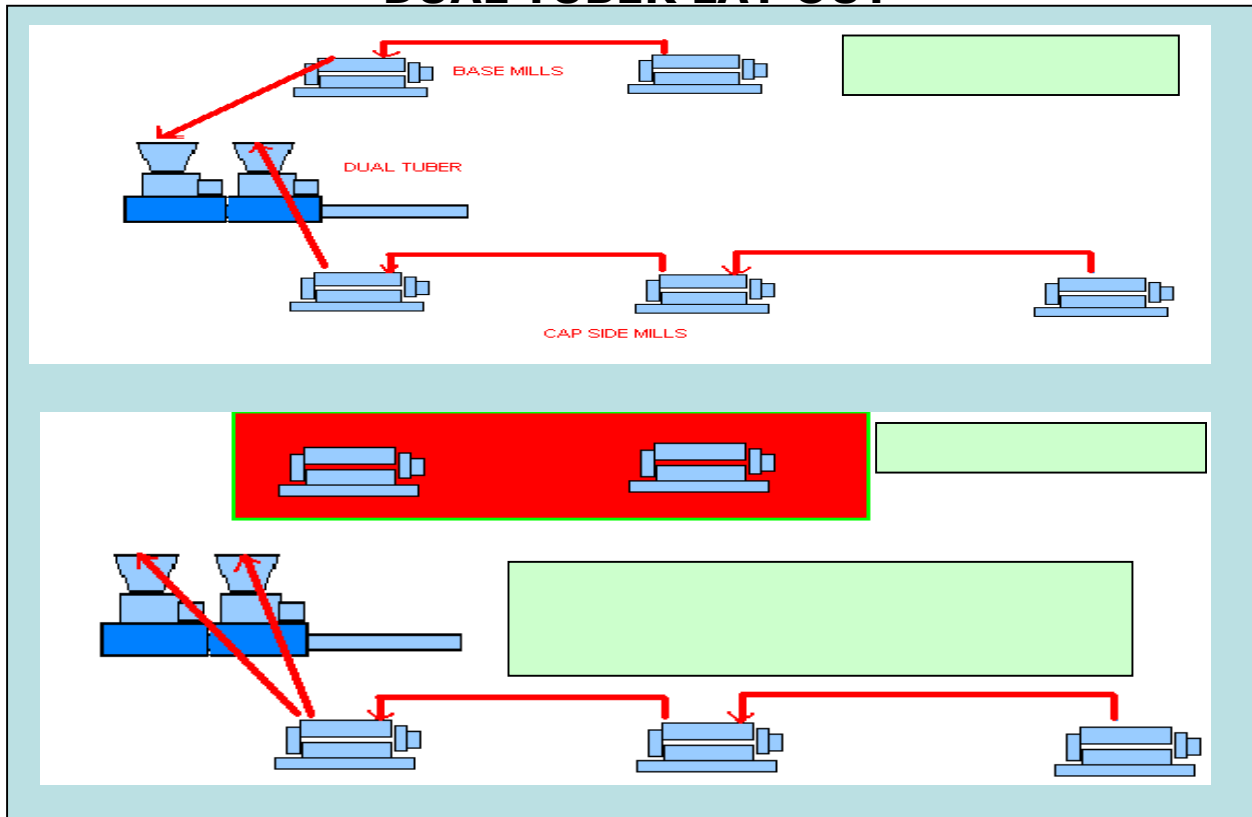
Average time obtained from this option is 2 hrs. / Day.

Reduction in units is 25 units / hour (50 units /day).

PARAMETERS ( annual basis)	KWh	Oil	Gas	Others
Consumption before	1947276	NA	NA	NA
Consumption After	1930380	NA	NA	NA
Investment (Rs in Lakhs)	1.62	NA	NA	NA
Tariff (Rs per unit)	3.94	NA	NA	NA
Saving (RS in lakhs)	0.91	NA	NA	NA



### DUAL TUBER LAY OUT



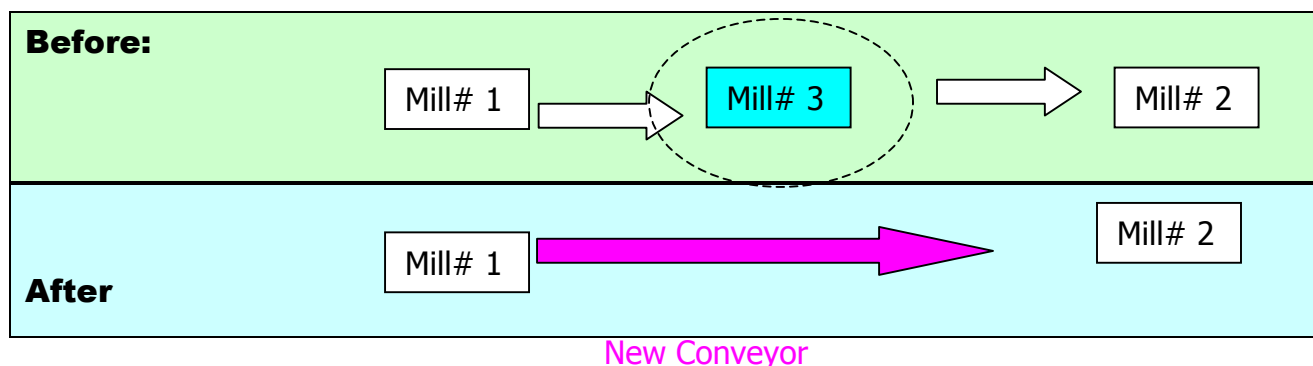


## 7. Additional conveyor in P-270# 1 BANBURY LINE

There are 4 mills used to batch-off the stocks dumped from the banbury mixer, such that each batches are passed thorough 3 mills. This arrangement helps to reduce one pass-through in mixer and saves energy. But 30% of the stocks mixed in this mixer does not require four mills and require only two mills. The existing arrangement gives the provision for either four or three mill operation. The energy consumption on this additional mill and conveyor is 60 units/hour. A new conveyor is erected between mill-1 and mill -2 giving provision for two mill operation, thus the 3<sup>rd</sup> mill and it's axillaries can be stopped when it is not required.

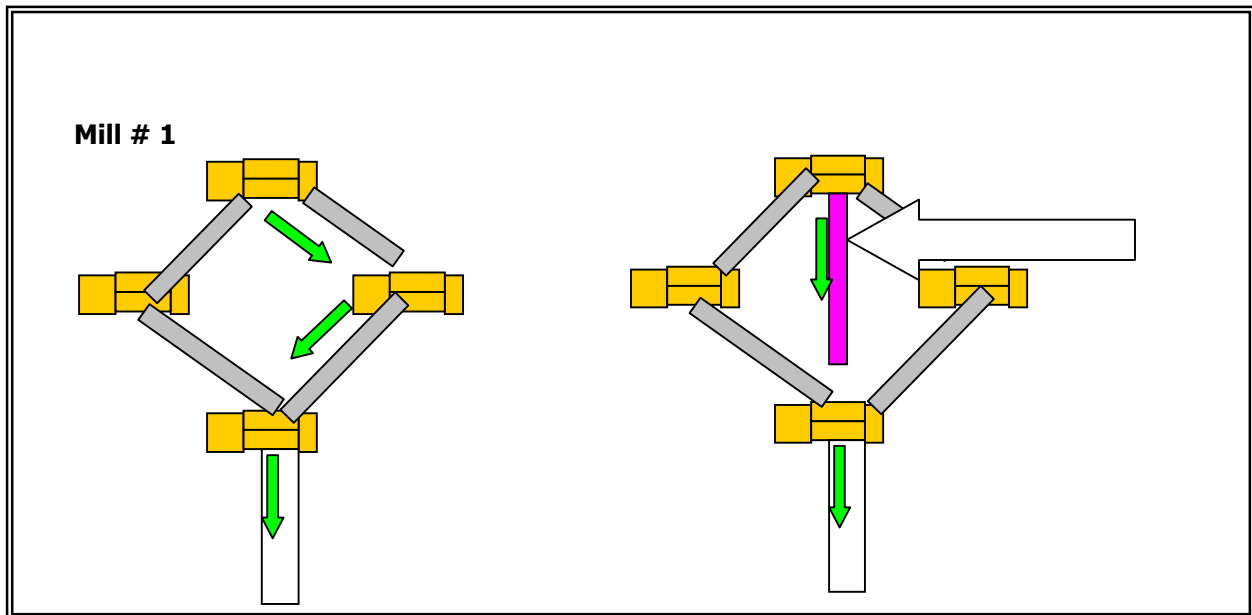
PARAMETERS ( annual basis)	KWh	Oil	Gas	Others
Consumption before	147000	NA	NA	NA
Consumption After	0	NA	NA	NA
Investment (Rs in Lakhs)	1.05	NA	NA	NA
Tariff (Rs per unit)	3.94	NA	NA	NA
Saving (RS in lakhs)	5.79	NA	NA	NA

### Process flow





## Equipment Lay out



## ENGINEERING MODIFICATION

### 8. TUBE EXTRUDER LINE BLOWER OPTIMISATION

In both Tube extruder lines, two Nos. 7.5 HP blowers were used for blowing off the water from the green tubes during extrusion. By modifying the blower out let duct, blowing nozzles and positioning the nozzles at the optimum location, one 7.5 HP blower each could be removed from the line.

#### 8. a. 10" Tuber line

PARAMETERS (annual basis)	KWh	Oil	Gas	Others
Consumption before	59880	NA	NA	NA
Consumption After	29400	NA	NA	NA
Investment (Rs in Lakhs)	0	NA	NA	NA
Tariff (Rs per unit)	3.94	NA	NA	NA
Saving (RS in lakhs)	1.2	NA	NA	NA



### 8.b. 8" Tuber line

PARAMETERS (annual basis)	KWh	Oil	Gas	Others
Consumption before	59880	NA	NA	NA
Consumption After	29400	NA	NA	NA
Investment (Rs in Lakhs)	0	NA	NA	NA
Tariff (Rs per unit)	3.94	NA	NA	NA
Saving (RS in lakhs)	1.2	NA	NA	NA



### 9. ELIMINATION OF LUB. OIL PUMP IN 11D2 MIXER

The banbury mixer was provided with 220 Oil as lubricator for Main bearings, discharge door, latch and hopper door bearings of 11D2 Mixer. During recent renovation work, the lubrication system is changed to Grease lubrication, this is resulted to elimination the 1.5 HP lubrication pump.



PARAMETERS (annual basis)	KWh	Oil	Gas	Others
Consumption before	6300	2400 ltr	NA	NA
Consumption After	nil	NA	NA	150 kg grease
Investment (Rs in Lakhs)	nil	NA	NA	2 lakhs
Tariff (Rs per unit)	3.94	NA	NA	NA
Saving (RS in lakhs)	0.25	NA	NA	NA

## 10. BALE CUTTER CONVEYOR SPEED REDUCTION

The sheet rubber bales, which are one among the major ingredients to the Banbury mixers, are being cut into small pieces on bale cutter before it is fed to the mixer. In bale cutter, there is a transfer conveyor to shift the cut pieces. Speed of the conveyor is optimized

	Conveyor motor	Motor Load	Conv. Speed
Before:	3 HP, 2800 RPM	3 KW	7.5M/s
After:	3 HP, 1440 RPM	5 KW	8.4 M/s

PARAMETERS (annual basis)	KWh	Oil	Gas	Others
Consumption before	11340	NA	NA	NA
Consumption After	4104	NA	NA	NA
Investment (Rs in Lakhs)	0.054	NA	NA	NA
Tariff (Rs per unit)	3.94	NA	NA	NA
Saving (RS in lakhs)	0.29	NA	NA	NA

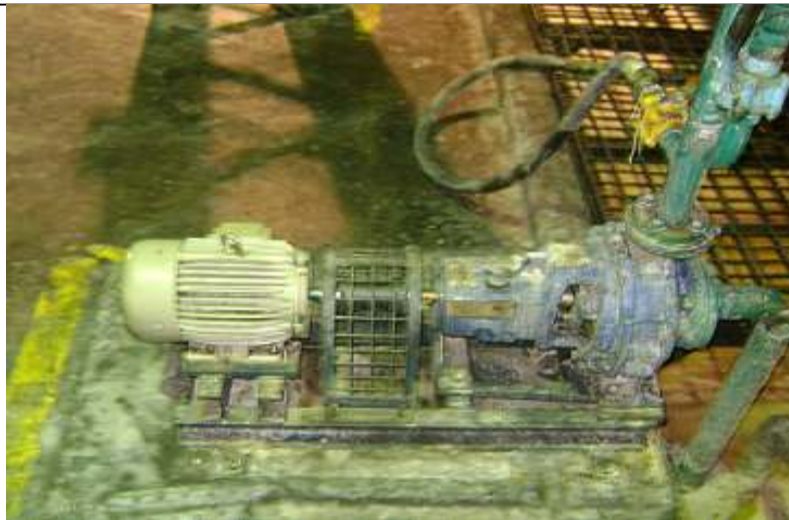


### **11. SOAP SPRAY PUMP OPTIMISATION IN F-620 BANBURY LINE**

The compound mixed in our Banbury line is being stacked on skids in sheet form. Sufficient ageing is given for this before the next process. Because of this ageing time and due to the property of rubber, the sheets can get stuck to each other. To avoid stickiness, soap solution spray is being applied on these sheets during process, before the stacking. One 5 HP pump was used for this purpose earlier which is optimized with 1.5 hp.

<b>Before:</b>	<b>5 HP</b>	<b>Flow: 11.5 Cub. Mtr /Hr</b>	<b>Head:30 M</b>
After:	1.5HP	Flow: 10 Cub. Mtr /Hr	Head:13 M

PARAMETERS (annual basis)	KWh	Oil	Gas	Others
Consumption before	23100	NA	NA	NA
Consumption After	7700	NA	NA	NA
Investment (Rs in Lakhs)	0.33	NA	NA	NA
Tariff (Rs per unit)	3.94	NA	NA	NA
Saving (RS in lakhs)	0.927	NA	NA	NA



## **12.PROVIDING ON-OFF CONTROL FOR COLD WATER PUMPS IN TYRE CURING**

In Tyre curing cold water system there were three 60 HP pumps running to meet the demand at 270 PSI. Whenever the demand falls, to avoid rise in system pressure the excess pressure was being bled out.

Modifications were done such that when demand falls, the 3<sup>rd</sup> pump will get switched off and will get ON when only when it demands.

PARAMETERS ( annual basis)	KWh	Oil	Gas	Others
Consumption before	319200	NA	NA	NA
Consumption After	159600	NA	NA	NA
Investment (Rs in Lakhs)	0.15	NA	NA	NA
Tariff (Rs per unit)	3.94	NA	NA	NA
Saving (RS in lakhs)	6.29	NA	NA	NA





### **13 . AVOIDING IDLE RUNNING OF SRAY COOLING PUMP IN DUEL TRUBER**

In Tread Extrusion line, water spray is used to cool the tread being extruded. The 30 HP pump is now interlocked with working of the conveyor line.

PARAMETERS (annual basis)	KWh	Oil	Gas	Others
Consumption before	109200	NA	NA	NA
Consumption After	84000	NA	NA	NA
Investment (Rs in Lakhs)	0.15	NA	NA	NA
Tariff (Rs per unit)	3.94	NA	NA	NA
Saving (RS in lakhs)	0.99	NA	NA	NA





## **14. INRODUCTION OF AC MOTOR & VFD IN PLACE OF DC MOTOR - 68' CALANDER LINE**

In 68" Calendar line, the wind up drive was provided with DC motor , which is now replaced with AC motor and VFD.

PARAMETERS ( annual basis)	KWh	Oil	Gas	Others
Consumption before	42456	NA	NA	NA
Consumption After	9048	NA	NA	NA
Investment (Rs in Lakhs)	0.4	NA	NA	NA
Tariff (Rs per unit)	3.94	NA	NA	NA
Saving (RS in lakhs)	1.32	NA	NA	NA

### **AC motor with VFD – Calendar Line**





## **15. INTRODUCTION OF VFD FOR STOCK LOADER MOTOR -68' CALANDER LINE**

In Feed Mills of 68" Calendar line, the stock Loader motor are provided with AC motor so that speed can be regulated to optimum level so that frequent start –stop is avoided

PARAMETERS ( annual basis)	KWh	Oil	Gas	Others
Consumption before	51504	NA	NA	NA
Consumption After	30624	NA	NA	NA
Investment (Rs in Lakhs)	0.4	NA	NA	NA
Tariff (Rs per unit)	3.94	NA	NA	NA
Saving (RS in lakhs)	0.82	NA	NA	NA

### **Stock loader provided with VFD– Calendar Line**





## OPTIMISING THE LIGHTING SYSTEM

Different projects are taken up for lighting energy conservation; this includes optimizing supply voltage to the lights, replacing HPMV lamps with CFL

### 16. Lighting Supply voltage reduction

All lights in Plant#4 were fed with 230 Volt, this was reduced to 210 Volts by introducing separate light supply transformer.

PARAMETERS ( annual basis)	KWh	Oil	Gas	Others
Consumption before	247800			
Consumption After	201600			
Investment (Rs in Lakhs)	1.5			
Tariff (Rs per unit)	3.94			
Saving (RS in lakhs)	1.8			

### Light supply transformer & Distribution panel





## 17. PROVIDING TASK LIGHTS: -

Lights above tyre curing Presses were relocated from top of the machines to exact work place where light is essentially needed. With these 15 nos lights could be eliminated.

PARAMETERS (annual basis)	KWh	Oil	Gas	Others
Consumption before	67200			
Consumption After	33600			
Investment (Rs in Lakhs)	0.10			
Tariff (Rs per unit)	3.94			
Saving (RS in lakhs)	1.32			





## 18. Replacing MV lamps with CFL

Few of the 400 W High bay lights were replaced with 65 W CFL

PARAMETERS ( annual basis)	KWh	Oil	Gas	Others
Consumption before	16800			
Consumption After	10920			
Investment (Rs in Lakhs)	0.50			
Tariff (Rs per unit)	3.94			
Saving (RS in lakhs)	0.23			

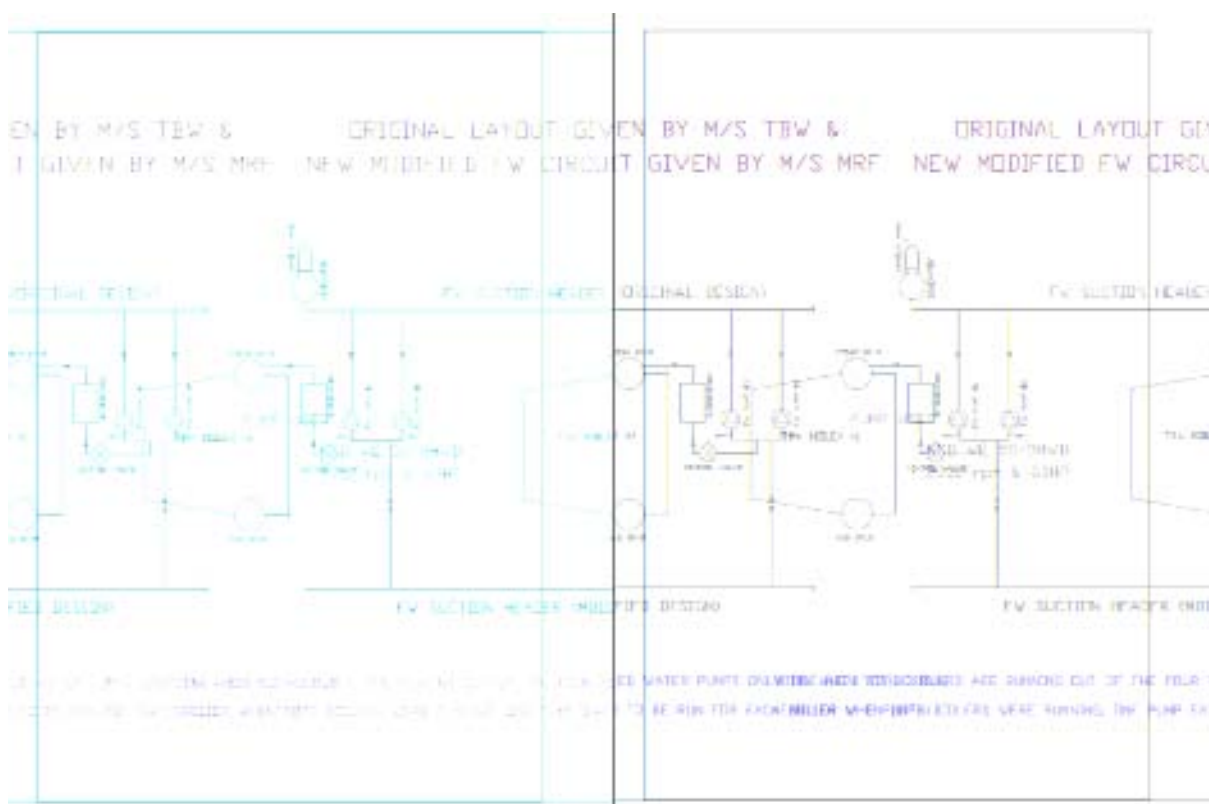




### 18. COMMON FEED WATER PUMP FOR 15 TON BOILERS

Two numbers of 15 Ton boilers are run to generate steam for curing. Both boilers have its own feed water pumps. Rating of the pump is 60HP. A common header is laid and connected to both boilers. Through this modification we could able to run both boilers with one feed water pump.

PARAMETERS ( annual basis)	KWh	Oil	Gas	Others
Consumption before	288000			
Consumption After	16800			
Investment (Rs in Lakhs)	0.50			
Tariff (Rs per unit)	3.94			
Saving (RS in lakhs)	4.73			





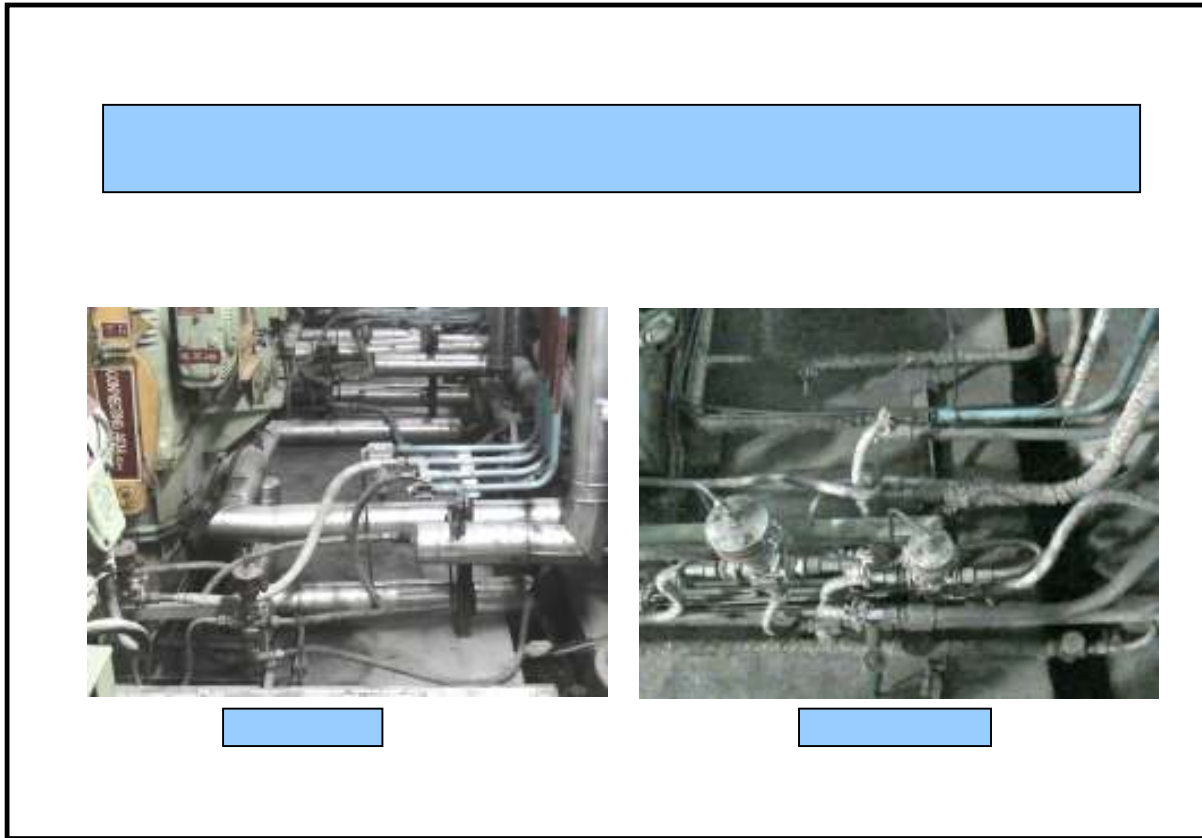
## MAJOR INITIATIVES IN FUEL CONSERVATION

### 1. ALL 45" TUBE CURING PRESSES (24 NOS.)

Previously all steam lines to these presses were insulated with asbestoses rope. As a policy to eliminate asbestoses and to improve the insulation, all these lines were insulated with 50 mm thick rock wool insulation with aluminum cladding.

Result- reduced heat losses due to conduction and improved environment.

PARAMETERS ( annual basis)	KWh	Oil	Gas	Others
Consumption before		NA	NA	NA
Consumption After		NA	NA	NA
Investment (Rs in Lakhs)		NA	NA	NA
Tariff (Rs per unit)		NA	NA	NA
Saving (RS in lakhs)		NA	NA	NA



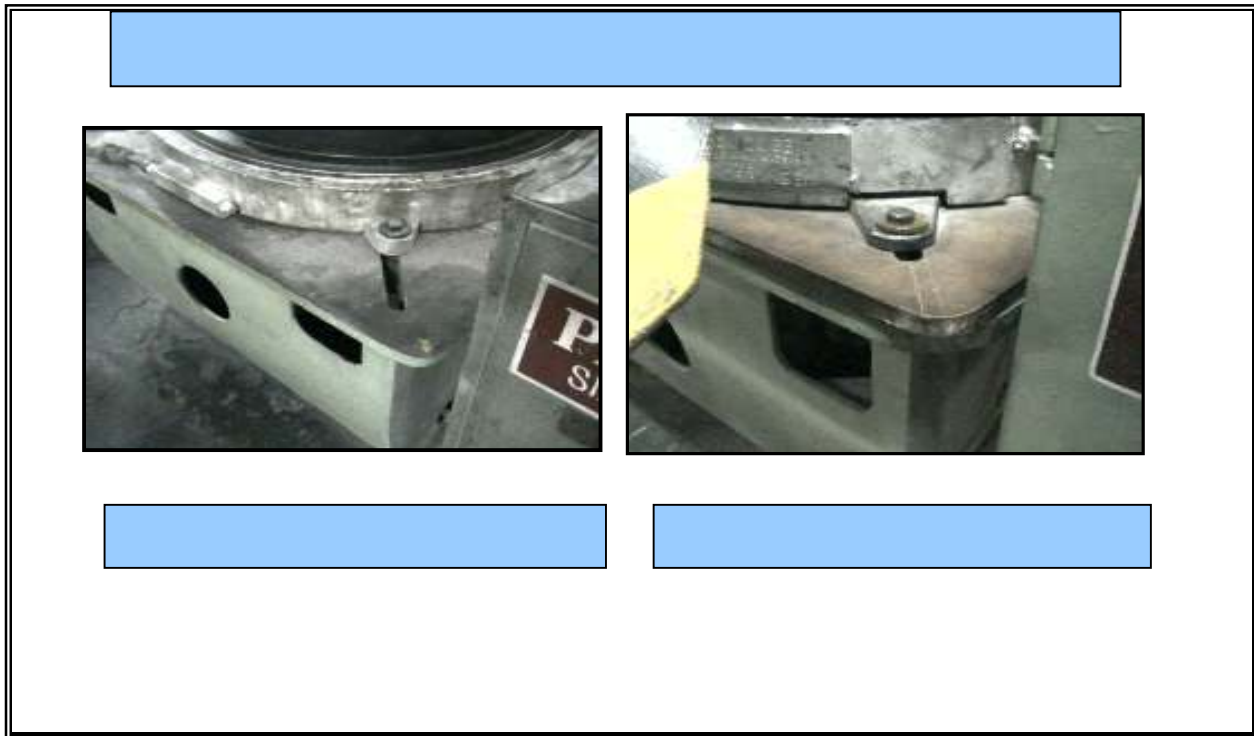
## 2. ZINDANIA SHEET FIXED BELOW THE TUBE PRESS MOULD

In all Tube curing presses, the mould is directly fixed on the chamber. Trail was conducted by providing 25 mm thick Zindania sheet between the chamber and the mould. The result was encouraging with reduced conduction losses to the chamber and consequent reduction in steam consumption also. Horizontal deployment of this modification on all presses is underway.

Before:	Condensate collected for 10 cure cycles is 14.3 Kg	Saving in F.O: 3.74Kg/day
After:	Condensate collected for 10 cure cycles is 12.3 Kg	



PARAMETERS ( annual basis)	KWh	Oil	Gas	Others
Consumption before		NA	NA	NA
Consumption After		NA	NA	NA
Investment (Rs in Lakhs)		0.06	NA	NA
Tariff (Rs per unit)		NA	NA	NA
Saving (RS in lakhs)		0.5	NA	NA



### 3. ADDITIONAL DE- AERATOR FOR BOILER FEED WATER

An additional de aerator of 25 cum / hr provided for boiler feed water. De aeration is the process of removing dissolved impurities from water by heating it above 105 deg C. This has resulted in improving the boiler efficiency from 80.9 % to 82.9 % .Investment for this project is around Rs. 257500. Daily fuel saving achieved through this modification is 461 kg of furnace oil.

<b>Before:</b>	<b>Boiler efficiency 80.9%</b>	<b>Saving in F.O 461 Kg/day</b>
After:	Boiler efficiency 82.9%	



PARAMETERS ( annual basis)	KWh	Oil	Gas	Others
Consumption before	NA	NA	NA	NA
Consumption After	NA	N.A	NA	NA
Investment (Rs in Lakhs)	NA	25.75	NA	NA
Tariff (Rs per unit)	NA	NA	NA	NA
Saving (RS in lakhs)	NA	60.1	NA	NA



#### 4. USAGE OF RO WATER IN PLACE OF SOFT WATER IN BOILER

Instead of soft water, R.O water is used as feed water. This increases no of cycles of concentration of boiler, there by reducing quantity of blow down.  
 Separate chemicals are used for maintaining PH & phosphates. This gives better control of water parameters, so that surface blow down is eliminated

efore:	Soft water	Blow Down 9000L/day	Saving in F.O: 184 Kg/day
After:	R.O water	Blow Down 2000L/day	



PARAMETERS ( annual basis)	KWh	Oil	Gas	Others
Consumption before	NA	NA	NA	NA
Consumption After	NA	NA	NA	NA
Investment (Rs in Lakhs)	NA	9.0	NA	NA
Tariff (Rs per unit)	NA	NA	NA	NA
Saving (RS in lakhs)	NA	23.99	NA	NA

## 5. MODIFICATION IN CONDENSATE RECOVERY SYSTEM

Condensate collected from outlet of steam traps is flashed in flash vessels. This flash steam is used for heating feed water at de aerator. Condensate collected from High-pressure steam (210 PSI), Low Pressure steam & dome steam is taken to separate flash vessels, instead of common flash vessel. This modification improved the condensate recovery from 50% to 60%. Daily fuel saving achieved through this improvements is 251 kg.

Before:	Common flash vessel: for H.P & L.P Steam	Condensate recovery 50%	Saving in F.O: 257 Kg/day
After:	Separate flash vessel: for H.P & L.P Steam	Condensate recovery 60%	

PARAMETERS ( annual basis)	KWh	Oil	Gas	Others
Consumption before	NA	NA	NA	NA
Consumption After	NA	89.8	NA	NA
Investment (Rs in Lakhs)	NA	4.15	NA	NA
Tariff (Rs per unit)	NA	NA	NA	NA
Saving (RS in lakhs)	NA	33.43	NA	NA



## **6. RE ARRANGEMENT OF MACHINE TO REDUCE H.P STEAM**

Machinery layout changed to reduce length of High pressure steam lines, there by reducing heat loss by radiation.

<b>Before:</b>	<b>Steam required to maintain system pressure : 1.95 MT/hr</b>	<b>Saving in F.O: 253 Kg/day</b>
<b>After:</b>	Steam required to maintain system pressure : 1.80 MT/hr	

PARAMETERS ( annual basis)	KWh	Oil	Gas	Others
Consumption before-	NA	NA	NA	NA
Consumption After	NA		NA	NA
Investment (Rs in Lakhs)	NA	3.75	NA	NA
Tariff (Rs per unit)	NA	NA	NA	NA
Saving (RS in lakhs)	NA	33.02	NA	NA



## PROCESS MODIFICATION

### 7. TRE CURING: HOT WATER CIRCULATION TO HOT WATER HOLD.

High-pressure steam, Hot water & Cold water is used at various stages at various intervals in Tyre curing. Hot water circulation cycle is modified to hot water hold system. Because of this modification in process, make up water requirement in Hot water system reduced to 10 KL from 15 KL. Savings achieved through this change in fuel per day is 4618 liters.

<b>Before:</b>	<b>Hot water Circulation</b>	<b>Make up water requirement: 15 KL/day</b>	<b>Saving in F.O: 46 Kg/day</b>
After:	Hot water Hold	Make up water requirement: 10 KL/day	

PARAMETERS ( annual basis)	KWh	Oil	Gas	Others
Consumption before	NA	NA	NA	NA
Consumption After	NA	16.118 MT	NA	NA
Investment (Rs in Lakhs)	NA	NIL	NA	NA
Tariff (Rs per unit)	NA	NA	NA	NA
Saving (RS in lakhs)	NA	6	NA	NA

### 8.TYRE CURING: OPTIMISING HOT WATER RECOVERY CYCLE.

High-pressure steam, Hot water & Cold water is used at various stages at various intervals in Tyre curing.

Hot water recovery cycle is optimized to reduce fresh make up for hot water system.

<b>Before:</b>	<b>Fresh water make up is 15 KL/Day</b>	<b>Saving in F.O: 46 Kg/day</b>
After:	Fresh water make up is 10 KL/Day	



PARAMETERS ( annual basis)	KWh	Oil	Gas	Others
Consumption before	NA	NA	NA	NA
Consumption After	NA		NA	NA
Investment (Rs in Lakhs)	NA	NIL	NA	NA
Tariff (Rs per unit)	NA	NA	NA	NA
Saving (RS in lakhs)	NA	5.96	NA	NA

## **9. COLD WATER LINE – TYRE CURING TRENCH 4**

The Cold water line (6”) which replaced with new one to reduce friction loss .

## **10. CONDENSATE (8”) PIPE LINE**

Condensate (8”) pipe line replacement is being carried out periodically to reduce the friction loss.

## **MAJOR INITIATIVES IN CONSERVATION OF LUBRICANTS**

### **CHANGE IN LUBRICATION MEDIUM IN 11D2 MIXER**

Oil 220 was used for main bearing, discharge door, latch and hopper door bearings of 11D2 Mixer. Grease lubrication system introduced along with the mixer replacement work.

This has resulted in savings aspects.

- 1) Cost difference in oil and grease.
- 2) Electrical Energy saving through avoiding the 1.5HP Lubrication pump.

PARAMETERS ( annual basis)	KWh	Oil	Gas	Others
Consumption before	6300	2400 ltr	NA	NA
Consumption After	nil	NA	NA	150 kg grease
Investment (Rs in Lakhs)	nil	NA	NA	2 lakhs
Tariff (Rs per unit)	3.94	NA	NA	NA
Saving (RS in lakhs)	0.22680	NA	NA	NA