

**CASTROL INDIA LIMITED**  
**Tondiarpet Plant, Chennai, Tamilnadu.**

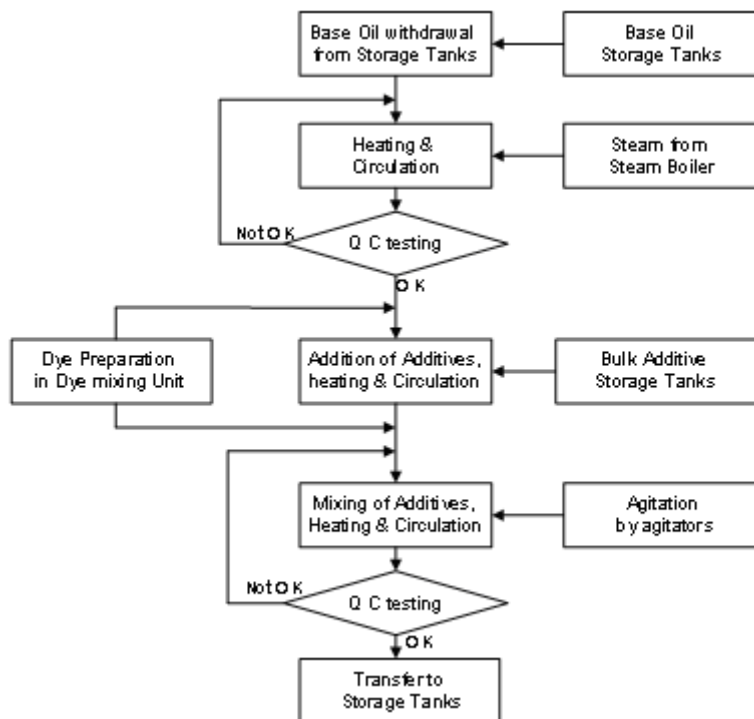
**Unit Profile**

Castrol India Limited, manufacturer of Lubricating Oils started its Tondiarpet Plant operations in the year 1962 at 10, Elaiya Mudali Street, Tondiarpet, Chennai. The plant is spread over 2 acres of land and carries out both blending and filling operations. The plant has an installed capacity to blend 4000 kl per month and supplies around 15 % of the overall lubricants manufactured by Castrol India Limited.

The plant is ISO 9001-2000, ISO 14001-2004 and OSHAS 18001 Certified.

The plant is a part of the global Lubricants Supply Chain business of BP Group with unique Quality and HSSE Policies.

**Process Flow Chart :**

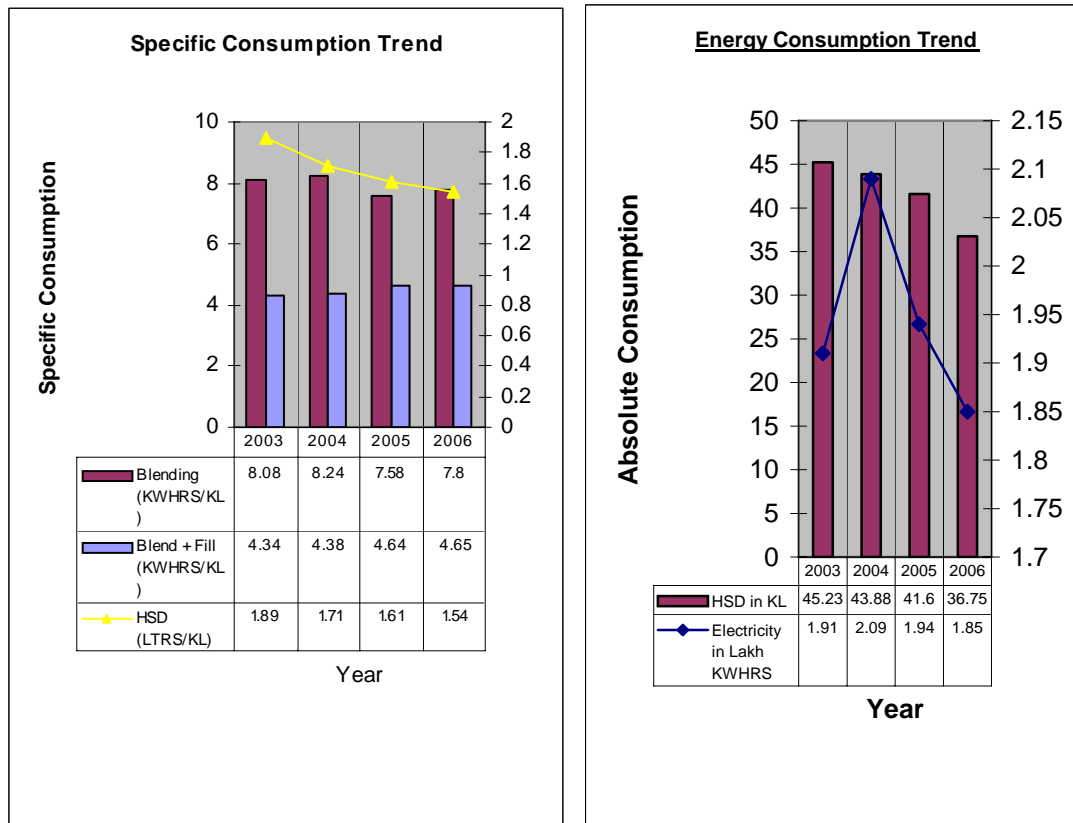


## Energy Consumption

By implementing various energy conservation projects there has been a consistent decrease in the specific Electrical & Thermal Energy consumption.

Description	Unit	2003	2004	2005	2006
1. Blending ( Auto + Indl.)	KL	24662	25941	26013	24038
2. Filling	KL	19520	20338	19269	18480
3. Total Electricity Consumption	KWHRS	190592	209860	194222	185125
4. Total Thermal (Fuel:HSD) Consumption	Ltrs.	45226	43886	41600	36745
5. Specific Consumption (Blend)	KWHRS/ KL	8.08	8.24	7.58	7.80
6. Specific Consumption (Blend+Fill)	KWHRS/ KL	4.64	4.65	4.34	4.38
7. Specific Consumption (Fuel)	Ltrs/KL	1.89	1.71	1.61	1.54

The graph below shows the Specific & absolute energy Consumption trend for the period 2003 to 2006.



## **Energy Conservation Commitment, Policy & Set Up.**

The Energy Conservation drive was started as an integral part of Environmental Management System with the objectives of improving environmental performance & reducing energy cost. It is the continual improvement measure undertaken by the plant to comply environmental management system requirements. Accordingly, various energy conservation projects were undertaken to reduce the use of natural resources, minimization of wastage and create awareness amongst employees on energy conservation.

The importance of energy conservation was emphasized through various forums. Kaizens, Small Group Activities, EMPs focus on energy conservation, elimination of wastage, process improvements and environmental performance.

## **Major Projects Executed in 2006**

### **1. VFD Systems for Pumps.**

The twin screw pumps connected to the finished product storage tanks transfers finished products from these tanks to four filling lines. The flow rate required varies depending on number of filling lines running, pack size and running time of machines. These positive displacement twin screw pumps are 500 to 850 lpm capacity and discharge line is connected to suction side through a by pass valve. The required flow rate was maintained by keeping the by pass valve either fully or partially open. To avoid this, we decided to install VFD under two schemes.

Scheme 1 : Installing 15 HP VFD for a single pump which runs almost every day with star delta by pass arrangement.

Scheme 2: Installing 15 HP VFD with selector switch for three pumps at one location as one out of three pumps usually runs. Provision was made to run the other pumps in bypass mode, if required. Star delta by pass arrangement was also made as a fall back option in case VFD fails.

Pressure transmitters are installed in the discharge line of the pump with pressure switches. The discharge pressure is maintained at 2.5 to 3 bar through VFD. The pressure switch set at 4 Bar acts as a safety measure.

This reduced the quantum of circulation, which was around 40 to 60%, depending on number of lines running and run / idle condition of filling machines. Apart from energy saving of around 50%, it also contributed in improving Productivity by maintaining a constant pressure and Process Safety improvement by eliminating excess pressure built up in the line, reduced noise level & wear and tear of pump.

( Please refer Photographs 1 to 4)

### **Before Installing VFD :-**

There was wastage of electrical energy due to circulation of oil. The by pass valve was required to be adjusted by trial and error. Process Safety issues such as pressure build up in the line were in existence. Filling machines were not getting the oil at required pressure, which was hampering production.

Total Power Consumption per annum :  
15 HP X 0.75 CFX 250 Days X 7 Hrs/Day X 2Nos. : **39,376 KWHRs.**

Note : 1. Two out of the four pumps runs everyday for 7 hrs.

### **After Installing VFD :-**

Wastage due to re-circulation fully avoided by keeping the by pass valve fully closed . Pressure in the oil transfer line is maintained between 2.5 to 3 bar through VFD. Increase in productivity and process safety by maintaining a constant pressure in discharge line.

Savings due to elimination of re-circulation is around 50%, which is evident from the reduction in frequency from 50 Hz to 25 Hz.

Hence, Power consumption per annum after installation: **19,688 KWHRs**

Hence, Savings per annum through VFD : **19,688 KWHRs.**

Total Monetary Savings = 19,688 KWHRs X Rs. 5/- per KWHR : **Rs. 98,440/-.**

### **2. Installed Back Pressure Control Valves for two nos. Transfer Pumps.**

The gear pumps connected to the finished product storage tanks transfers finished products from these tanks to two filling lines. The flow rate required varies depending on number of filling lines running, pack size and running time of the machine. These 200 lpm gear pump discharge line is connected to suction side through a by pass valve. The required flow rate was maintained by keeping the by pass valve either fully or partially open. To avoid this, back pressure control valves were installed on the discharge side of these pumps to maintain a uniform pressure of 2.5 to 3 bar. The pump pressure setting was done at 4 bar by adjusting the pressure relief valve and back pressure control valve was set at 3.5 bar. Only when the pressure exceeds 3.5 bar, back pressure control valve opens to bypass the oil to suction side.

This reduced the quantum of circulation, which was around 30 to 40%, depending on number of lines running, pack size and run/ idle condition of filling machines. Apart from energy saving of around 30%, it also contributed to improved Productivity by maintaining a constant pressure & Process Safety, by eliminating excess pressure built up in the line.

(Please refer Photographs 5 & 6)

### **Before installing Back Pressure Control Valves :**

Total Power Consumption per annum :

8 Amps X 400 Volts X 1 PF X 300 Days X 4 Hrs/Day : **3,840 KWHRs.**

Considering only one pump out of the two running everyday.

### **After installing Back Pressure Control Valves :**

Savings due to elimination of continuous re-circulation is around 30%, which is evident from the reduction in current drawn by the motor due to reduction in pressure setting.

Hence, Power consumption per annum after installation:

5.5 Amps X 400 Volts X 1 PF X 300 Dya x 4 Hrs/day : **2,640 KWHRs**

Hence, Savings per annum through BPCV : **1,200 KWHRs.**

Total Monetary Savings = 1,200 KWHRs X Rs. 5/- per KWHR : **Rs. 60,000/-**

### **3. Conventional Tubelights (40 Nos) replaced by Energy Efficient Tubelights.**

Electrical Consumption for Conventional Tube-light = 54 Watts

Electrical Consumption for Energy Efficient Tube-light = 28 Watts.

Hence, Savings per annum through Energy Efficient Tubelights :

26 Watts X 40 Nos. X 300 Days X 10 Hrs/ day : **3,120 KWHRs**

Hence, Monetary savings per annum = **Rs. 15,600/-**

### **4. Installed Auto Operated Damper at Boiler Exhaust.**

The steam requirement for process heating was met by a two tonne per hour capacity Boiler in the plant. The steam load on the boiler is highly uneven and plant runs in one shift. Since there is no damper existing in the chimney exhaust duct of the boiler, the steam pressure drops down due to induced draft created. This required air venting on the next day, before starting the boiler. The start up time used to be around 30 mts to build a pressure of 50 psi.

In order to eliminate air venting and loss of heat due to induced draft, an auto-operated damper was installed with all required safety features.

With this arrangement, 0 to 15 psi pressure is maintained in the boiler and we are able to start the boiler without air venting. This reduced the start up time by around 10 mts. and fuel saving resulting due to this arrangement is around 3 KL per annum.

( Please refer photos 7 & 8)

### Before installing auto operated damper :

Time required to build up a pressure of 50 PSI : 30 Mts.  
Fuel Consumption per Minute : 1 Ltr.  
Total fuel consumption to built up 50 PSI Pressure : 30 Ltrs.  
No. Of working Days in a year : 300 days  
Hence, fuel Consumption : 9,000 Ltrs.

### After installing auto operated damper :

Time required to build up a pressure of 50 PSI : 20 Mts.  
Total fuel consumption to built up 50 PSI Pressure : 20 Ltrs.  
  
Hence, fuel Consumption : 6,000 Ltrs.  
  
Reduction in fuel consumption per annum : **3,000 Ltrs.**  
Landed Cost of HSD per Ltr. : Rs. 37/-  
Hence, Monetary Savings per annum : **Rs. 1,11,000/-**

### 5. Installed Solar Street Lights.

We were using high pressure sodium vapour lamps for street lighting and general illumination in the open areas of the plant in the night. This used to consume large amount of energy and also whenever the power supply failed we had to either run the big D.G.Set to keep the area illuminated and use other inverter based lights. Now, we have replaced 33% of the Sodium Vapour lamps by Solar Lights and are planning to replace the other ones also in a phased manner. This has not only reduced the energy consumption but has protected the plant from darkness in case of electricity supply failures.

( Please refer photos 9)

### Before :

Energy Consumed by 6 Nos. Sodium Vapour Lamps per annum =  
 $0.15 \text{ KW} \times 365 \text{ Days} \times 10 \text{ Hrs.} = \mathbf{3,285 \text{ Units.}}$

### After :

As this consumption was totally eliminated after installation of Solar Street Ligts, the total savings in electricity will be 3,285 Units.

Hence, Monetary savings per annum : **Rs. 16,425/-**

## 5. Other energy conservation measures initiated.

- a. Solar Hot Water System.
- b. Automation of transfer pump.
- c. IGBT type welding machines.
- d. Modification of Induction Sealing Machines.

In order to preserve water, the plant has installed rain water harvesting system which covers around 55 Ft. X 100 Ft. Area. The water thus collected passes through a filter to fire hydrant tank and overflow of fire hydrant tank goes to rain water harvest pit.

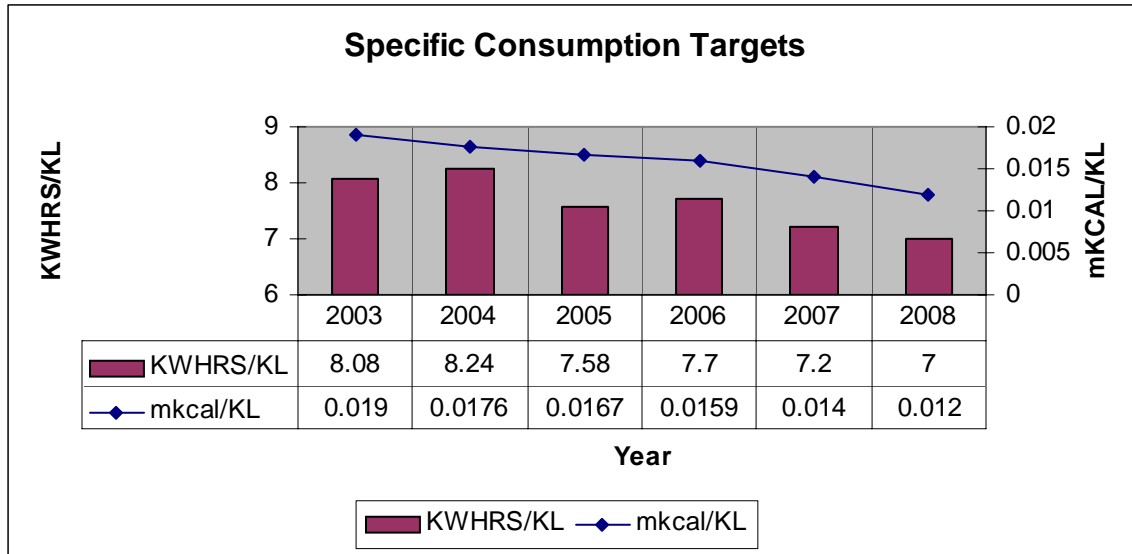
( Please refer photos 10 to 13)

## Energy Conservation Plans & Targets

The following are major Energy Conservation Projects under progress or streamlined for the year 2007.

<b>Proposed Energy Conservation Measures (Planned)</b>	<b>Anticipated Savings (Rs. Lakhs)</b>	<b>Approx. Investment (Rs.Lakhs)</b>	<b>Project commencement &amp; Completion Year</b>
1. Screw Type Air Compressor	0.45	7	Dec., 2007
2. Replacement of four nos. inefficient pumps.	0.28	0.65	Dec., 2007
3. Replacement of 3 nos. Split Air-Conditioners by energy efficient Air-Conditioners.	0.01	1	Completed. Sept., 2007
4. Replacement of conventional tube-lights by energy efficient tube-lights (28 watts X 30 Nos.)	0.03	0.22	Completed. July, 2007
5. Temperature Controllers for blenders.	0.68	10	Dec., 2007
6. Insulation Jackets for flanges.	0.18	0.45	Completed. April, 2007.
7. Solenoid Valves for air supply lines to filling line machines.	0.03	0.50	Dec., 2007

The Specific Energy Conservation targets set by the plant for the year 2007 & 2008, are as below.



### Safety & Environment

Various initiatives on safety awareness include safety audit, job risk analysis, monitoring & measurement, health check up of employees, road safety awareness programs, safety meeting, near miss reporting, golden safety rules, risk assessed permit systems, tool box meeting, safety week celebrations to meet our core objective:

**No Accidents, No Harm to People and No Damage to Environment.**

Safe Operating Procedures are in existence for Permit to Work, Energy Isolation, Ground Disturbance, Confined Space Entry, Hot Work, Management of Change, Lifting Operations & Vehicle Safety.

The plant uses Risk Assessed Permit System (RAP) for assessing and managing the risk associated with jobs and to monitor and control the work.

Focus is also given to Road Safety. All accidents are tracked, recorded, analysed and corrective action taken to prevent reoccurrence. Defensive Driving Training Programme and toolbox meetings are conducted regularly to increase defensive driving awareness amongst drivers and employees.

In the plant, Safety Slogan / Poster / Suggestion Competition were conducted during safety week celebration from 4<sup>th</sup> to 11 March.

The plant has won the Safety Appreciation Award for the year 2005 from National Safety Council, Tamilnadu Chapter.

The plant is ISO 14001: 2004 certified and various Environment Management programs & Operational Control Procedures are in place to improve environmental Performance. Environmental performance parameters are tracked and recorded. The plant celebrates environmental week every year. Employees and their families are encouraged to participate in drawing, slogan & essay competitions. Various environment awareness programs and tree plantations drives are undertaken in nearby schools.

The requirements related to various environmental legislations & environment protection are duly complied by the company.