

## Successful Implementation – Energy Conservation Measure

<b>Measure</b>
Temperature control in heat treatment furnaces
<b>Equipment</b>
Heat treatment furnaces
<b>Industry / Sector</b>
Engineering
<b>Year of Implementation</b>
1999
<b>Cost Benefit Analysis</b>
o Type of Measure: Nil
o Annual Energy Savings: 0.36 lakh kWh
o Actual cost savings: Rs. 1.8 lakh
o Actual investment : Nil
o Payback: Immediate
<b>Implementation Highlights</b>
<ul style="list-style-type: none"> <li>☞ Can be implemented in all types of Heat treatment furnaces, ovens, dryers, kilns, etc</li> <li>☞ Reduction in energy consumption</li> <li>☞ Increased heaters life due to reduction in frequent on and off the heaters</li> <li>☞ Resulted in reduction in surface temperature</li> <li>☞ On line settings can be made</li> <li>☞ Simple short term measure</li> </ul>

### Summary

Optimum temperature settings in the furnace will results in energy savings, maintenance of uniform temperature and increase the heating element life.

**Background**

A leading company has a one resistance-heating furnace is used for heat treatment applications.

The type of the furnace : Batch type  
 Energy Source: Electricity  
 Furnace capacity: 200 kg/cycle  
 Operating capacity: 160 kg/cycle

The furnace has sophisticated control systems to maintain the temperature by heating with elements and by cooling with air. The present temperature settings of air cooling with a blower and heating with elements are:

☰ Heater on temperature	:	161 °C
☰ Heater off temperature	:	167 °C
☰ Blower on temperature	:	168 °C
☰ Blower off temperature	:	165 °C

Due to narrow settings with overlapping temperatures for heating and cooling frequent on & off of heaters and blowers was observed. More over the control equipment for heaters is of on-off type, where precisely maintaining temperature was difficult.

☰ <b>Heater on time</b>	:	<b>30% of total time</b>
☰ <b>Blower on time</b>	:	<b>20-30%</b>

The temperature settings resulted in unnecessary heating and unnecessary cooling of the furnace

**Power consumption:**

☰ <b>Blower</b>	:	<b>11 kW</b>
☰ <b>Heater</b>	:	<b>49 kW</b>

**Energy consumption (After considering on & off times) per day:**



☰ <b>Blower</b>	:	<b>66 kWh</b>
☰ <b>Heater</b>	:	<b>353 kWh</b>
☰ <b>Total</b>	:	<b>419 kWh</b>

Proposal:

The energy consumption in the quenching furnace was reduced significantly by optimum setting of temperatures for cooling and heating wherein the overlapping of temperature range is avoided.

**The temperature ranges for settings after implementation are:**

☰ <b>Heater on temperature</b>	:	<b>160 °C</b>
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 <b>Heater off temperature</b>	:	<b>165 °C</b>
 <b>Blower on temperature</b>	:	<b>170 °C</b>
 <b>Blower off temperature</b>	:	<b>175 °C</b>

The revised temperature setting resulted in daily energy savings of 120 kWh.

### Principle

In furnaces energy conservation starts with the temperature setting and control of operating temperature. These play vital role on the energy consumption. At higher the temperatures heat losses will be more, i.e., the fixed losses such as exhaust, surface heat losses, thermal inertia of the furnace and ware will be increased.

### Details of techno-economics:

Particulars	Actual energy savings
Power savings	5 kW
Annual operating hours	7000
Annual Total energy savings, lakh kWh	0.36
Annual Cost savings, Rs. lakh	1.8
Cost of Implementation, Rs. lakh	00
Simple payback period, Year	Immediate