

Intervening Technique	Optimization of Combustion Efficiency of Melting Furnace in Container Glass Manufacturing Industries (Fuel : Natural Gas)																																			
Before CP	<p>Flue gas exhaust at the Furnace was monitored. The flue gas analysis for the Furnace was carried out at the exhaust of individual furnaces. Two furnaces were subjected to the exercise. The measured parameters are shown in tables below:</p> <ul style="list-style-type: none"> <li>• % O<sub>2</sub> in flue gas varies from 12 % to 13 %.</li> <li>• Flue gas temperature also varies from 518 °C to 525 °C. % O<sub>2</sub> in flue gases should be between 3– 4%.</li> </ul> <p style="text-align: center;">Flue Gas Monitoring Parameters at 95 TPD Furnace</p> <table border="1"> <thead> <tr> <th>Parameters</th> <th>Reading 1</th> <th>Reading 2</th> <th>Reading 3</th> </tr> </thead> <tbody> <tr> <td>Oxygen (%)</td> <td>12.4</td> <td>12.6</td> <td>12.8</td> </tr> <tr> <td>Carbon Monoxide (ppm)</td> <td>821</td> <td>408</td> <td>146</td> </tr> <tr> <td>Combustion Efficiency (%)</td> <td>44</td> <td>42</td> <td>42</td> </tr> <tr> <td>Carbon Dioxide (%)</td> <td>4.8</td> <td>4.6</td> <td>4.6</td> </tr> <tr> <td>Flue Gas Temperature (°C)</td> <td>518</td> <td>522</td> <td>525</td> </tr> <tr> <td>Access Air (%)</td> <td>148</td> <td>144.8</td> <td>151.8</td> </tr> <tr> <td>Pressure (mBar)</td> <td>0.18</td> <td>0.20</td> <td>0.21</td> </tr> </tbody> </table>				Parameters	Reading 1	Reading 2	Reading 3	Oxygen (%)	12.4	12.6	12.8	Carbon Monoxide (ppm)	821	408	146	Combustion Efficiency (%)	44	42	42	Carbon Dioxide (%)	4.8	4.6	4.6	Flue Gas Temperature (°C)	518	522	525	Access Air (%)	148	144.8	151.8	Pressure (mBar)	0.18	0.20	0.21
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### Flue Gas Monitoring Parameters at 55 TPD Furnace

Parameters	Reading 1	Reading 2
Oxygen (%)	13	12.1
Carbon Monoxide (ppm)	0.0	0.0
Combustion Efficiency (%)	42.8	46
Carbon Dioxide (%)	4.6	4.9
Flue Gas Temperature (°C)	525	525
Access Air (%)	151	140
Pressure (mBar)	0.17	0.21

#### Recommendation:

- The same can be maintained by regular monitoring of flue gas sample with the help of a portable flue gas analyzer or by installing O<sub>2</sub> sensor at the furnace exhaust for flue gases and a modulating motorized damper for combustion air control.
- The sensor will provide constant feedback of O<sub>2</sub>% to the damper which will in turn regulate the flow of combustion air to maintain the combustion efficiency at optimum level of 80 - 90% (Achievable combustion efficiency).
- Thus, it is recommended to operate the furnaces at optimum efficiency by controlling (manual/auto) air fuel ratio so that to get maximum combustion efficiency, the fluidised bed furnaces are known for generating maximum combustion

	<p>efficiency in principal more than 80 %, thus plant should target to achieve the same initially manual adjustment through frequency adjustment and monitoring oxygen percentage in flue gases and then putting the drives in auto with online O2 sensor in exhaust and feedback to supply air, although caution need to be considered with setting of minimum air requirement for pressure &amp; draft control within furnace.</p> <ul style="list-style-type: none"> <li>• By maintaining optimum combustion efficiency even upto 75 % from existing (average 45 %) in these two furnaces, plant can save approximately 280524 SCM per annum.</li> </ul>
Benefit	
Environmental	<ul style="list-style-type: none"> <li>• Per Day reduction in the gas consumption: 779 SCM.</li> <li>• Per Year reduction in gas consumption: 280524 SCM.</li> <li>• Per Day reduction in Greenhouse Gas (CO2) emission: 1.46 MT of CO2</li> <li>• Per Year Reduction in Greenhouse Gas (CO2) emission: 525 MT of CO2</li> </ul>
Economical	<p>Investment: Rs. 30,00,000/-for 2 nos. of Furnace</p> <p>Annual Savings: Rs. 50,49,000/- per annum</p> <p>Payback Period: 8 months</p>

