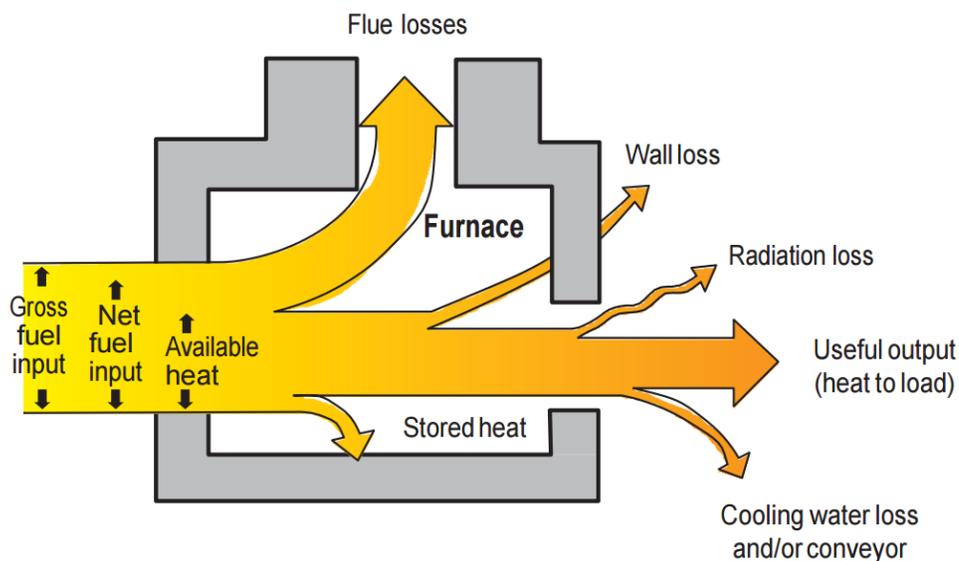
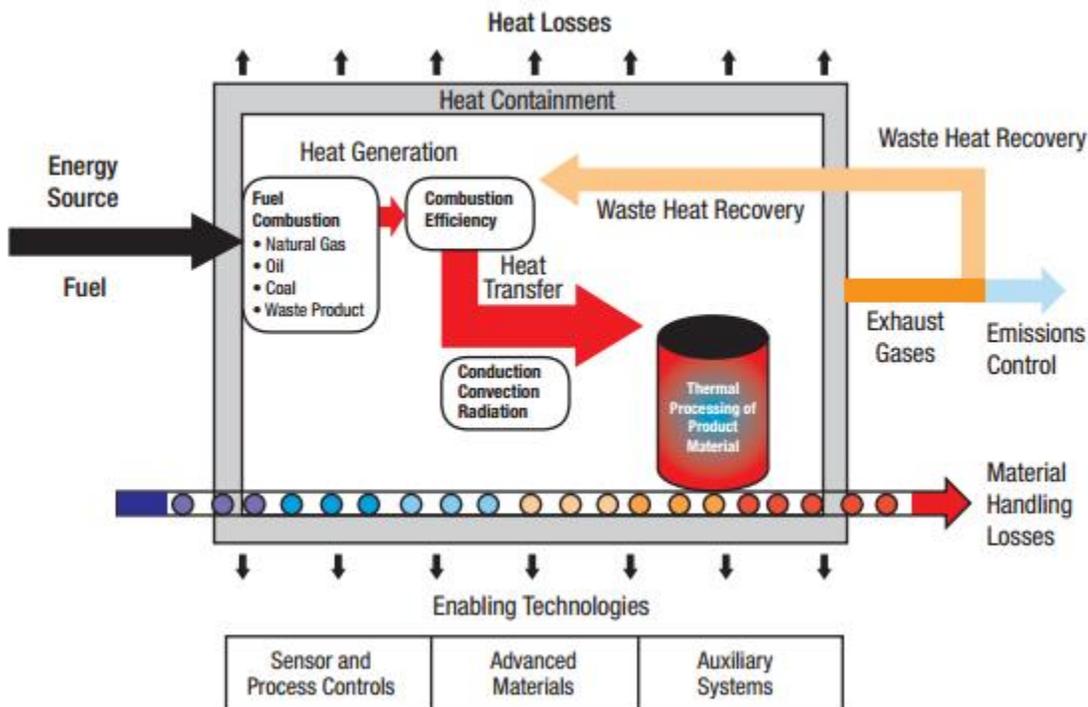


**Best Practices**

- 1.) Optimize oxygen level in flue (exhaust) gases or optimize combustion burner air-fuel ratio
- 2.) Reduce/eliminate openings and air leakage in the furnace
- 3.) Furnace scheduling, loading, shut down - avoiding delays, waits, cooling between operations etc.
- 4.) Clean heat transfer surfaces - radiant tubes, heat exchangers, heater tubes, electrical heating elements
- 5.) Use of flue or exhaust gas heat for combustion air preheating or waste heat recycling



Component	Things to Check	Comments
<b>Heat Generation</b>	<ul style="list-style-type: none"> <li>• Combustion air leakage</li> <li>• Opportunities with Fuel/Air ratio</li> </ul>	<ul style="list-style-type: none"> <li>• Does the combustion air leak downstream of control valve?</li> <li>• Linkage condition can lead to poor control of the fuel/air mixture over the range of operating conditions.</li> <li>• Excess oxygen in the furnace exhaust gases indicates unwanted excessive air</li> <li>• Flame un-stability indicates improper fuel/air control</li> </ul>
<b>Heat Containment</b>	<ul style="list-style-type: none"> <li>• Reduce Heat Losses</li> <li>• Opportunities with insulation</li> <li>• Opportunities with Waste Heat recovery</li> </ul>	<ul style="list-style-type: none"> <li>• Higher than necessary operating temperature leads to increased losses</li> <li>• Reduce/eliminate openings and air leakage in the furnace</li> <li>• Clean heat transfer surfaces</li> <li>• Insulate associated piping to avoid sagging and distortion.</li> <li>• Is the furnace properly insulated? Any cracks/ holes?</li> <li>• What is the temperature of the exhaust?</li> <li>• Can the heat from the exhaust be recovered and used?</li> </ul>
<b>Enabling Technology</b>	<ul style="list-style-type: none"> <li>• Opportunities with furnace operation/ scheduling</li> <li>• Opportunities with material handling</li> </ul>	<ul style="list-style-type: none"> <li>• Is there frequent and avoidable furnace starts and stops?</li> <li>• Are there long periods of idle time between batches?</li> <li>• Is there extended periods of low-capacity furnace operation?</li> <li>• Is batch production possible?</li> <li>• Can the conveyors be stopped during non-production?</li> <li>• Can the weight of the fixtures be reduced/ alternate fixtures removed?</li> <li>• What is the temperature of the components going out?</li> <li>• Can heat be recovered from the components?</li> </ul>

For more info – [Improving Process Heating System Performance – A Sourcebook for Industry, 3<sup>rd</sup> Edition](#).