



## CATALYTIC COMBUSTION

# Air Pollution Control Systems Analysis

Technology Equipment	Equipment Type	Process Description	Recommended Applications	Application Advantages	Application Disadvantages
<b>Rotary Concentrator</b>	Zeolite-based adsorption "wheel" used with a small thermal or catalytic oxidizer to destroy a higher LEL concentrated air stream. Capable of 95-99% total DRE of the process stream.	Collection of VOCs from high volume, low loading air streams by adsorption. The air stream is then concentrated into a reduced volume, high loading concentrate stream. Typically 8:1 to 24:1 concentration ratios are used.	<ul style="list-style-type: none"> <li>• Ideal for paint booth, oven production lines, circuit boards, semi-conductors, composites, fiberglass, halogenated vapors</li> <li>• Most high volume low VOC process air streams</li> </ul>	<ul style="list-style-type: none"> <li>• Hydrophobic/non-flammable</li> <li>• Very low operational cost</li> <li>• Long life expectancy for wheel</li> <li>• Small operational footprint</li> <li>• Easy future expansion</li> <li>• Easy to maintain and service</li> </ul>	<ul style="list-style-type: none"> <li>• Not for high LEL air streams</li> <li>• Not for use with liquids/aerosols</li> <li>• Requires lower process stream inlet temperature – typically below 150°F</li> </ul>
<b>Regenerative Thermal Oxidizer</b>	Thermal oxidation system capable of 95% heat recovery and 99%+ DRE of almost all process air streams.	Ceramic media used as a heat exchanger for high heat transfer efficiency. Ceramic media consists of structured packing or random saddles.	<ul style="list-style-type: none"> <li>• 5000 cfm &gt; air streams</li> <li>• 0 –10% lower explosive limit</li> <li>• Pharmaceutical, wood finishing, OSB manufacture, corrosive organics, chemical processing, paper coating, paint booth, web offset</li> </ul>	<ul style="list-style-type: none"> <li>• Very low operational/ maintenance cost</li> <li>• High heat transfer effectiveness ideal for high volume, low VOC air streams</li> <li>• Capable of handling high temperature at the inlet process streams</li> </ul>	<ul style="list-style-type: none"> <li>• Higher capital cost</li> <li>• Not for high LEL process airstreams</li> <li>• Two-chamber design typically yields only 98% max destruction efficiency</li> </ul>
<b>Regenerative Catalytic Oxidizer</b>	Catalytic oxidation system capable of 95% heat recovery and 99% DRE of select process air streams.	Precious metal catalyst used to destroy VOCs at low operating temperatures. Ceramic media used as a heat exchanger for high heat exchange efficiency. Ceramic media consists of structured packing or random saddles.	<ul style="list-style-type: none"> <li>• 5000 cfm &gt; air streams</li> <li>• Capable of handling 0 – 10% LEL process streams</li> <li>• Flexography, rotogravure, chlorinated compounds, circuit boards, electronics</li> </ul>	<ul style="list-style-type: none"> <li>• Very low operational cost</li> <li>• High heat transfer effectiveness ideal for high volume, low VOC air streams</li> <li>• Capable of handling high temperature inlet air streams</li> <li>• Low NOx, CO generation</li> </ul>	<ul style="list-style-type: none"> <li>• Medium capital cost</li> <li>• Susceptible to precious metal catalyst poisons (silicon, heavy metals, SO<sub>2</sub>)</li> </ul>
<b>Recuperative Thermal Oxidizer</b>	Thermal oxidation system that consists of a stainless steel heat exchanger with a high temperature oxidation chamber for 99%+ DRE.	Capable of achieving 70% heat transfer effectiveness with a shell and tube heat exchanger. One (1) second retention time at operating temperature (1400°F) typically guarantees 99% DRE of VOCs.	<ul style="list-style-type: none"> <li>• 0 – 100,000 scfm</li> <li>• Ideal for air streams containing over 15% LEL of VOCs. Can handle air streams with up to 40% LEL with heat exchanger bypass.</li> <li>• Adhesive coating, metal decorating, semi-conductor, heat offset printing, custom coating</li> </ul>	<ul style="list-style-type: none"> <li>• Low capital cost</li> <li>• Can handle high LEL air streams</li> <li>• Liquids, aerosols or particulate are not a problem</li> <li>• Good heat recovery options</li> <li>• High silicon loading design available</li> </ul>	<ul style="list-style-type: none"> <li>• High operating cost if air stream LEL is below 15%</li> </ul>
<b>Recuperative Catalytic Oxidizer (Monolith)</b>	Catalytic oxidation system that consists of a stainless steel heat exchanger and precious metal catalyst on a monolith substrate.	Oxidizes VOCs through a chemical reaction between the hydrocarbons and precious metal. Capable of achieving 70% heat transfer effectiveness and 99% DRE.	<ul style="list-style-type: none"> <li>• 0 – 100,000 scfm</li> <li>• Flexible in handling varying process stream applications while offering low operating costs</li> <li>• Graphic arts, fiberglass, paint finishing, composites, bakeries, coffee roasting, soil remediation, wire enameling, PTA/PE, chemical processing, chlorinated compounds</li> </ul>	<ul style="list-style-type: none"> <li>• Low capital cost</li> <li>• Low operating costs for process streams with low LELs and VOC loading</li> <li>• Good range of flexibility</li> <li>• Low NOx and CO generation</li> </ul>	<ul style="list-style-type: none"> <li>• Typically not capable of handling sustained operation with process streams above 25% LEL</li> <li>• Susceptible to catalyst poisons</li> </ul>
<b>Recuperative Catalytic Oxidizer (Spherical)</b>	Catalytic oxidation system that consists of a stainless steel heat exchanger and precious metal catalyst on a spherical (bead) catalyst.	Spherical catalyst offers greater poison resistance to phosphorus, silicon, heavy metals and such due to greater surface area of ceramic media and better dispersion of precious metals.	<ul style="list-style-type: none"> <li>• 0 – 100,000 scfm</li> <li>• Flexible in handling varying process stream applications while offering low operating costs</li> <li>• Heat offset printing, fiberglass, composites, soil remediation, paint finishing, bakeries, coffee roasting, wire enameling, PTA/PE, chemical processing, chlorinated compounds</li> </ul>	<ul style="list-style-type: none"> <li>• Excellent poison resistance</li> <li>• Low capital cost</li> <li>• Low operating costs for process streams with low LELs and VOC loading</li> <li>• Good range of flexibility</li> <li>• Low NOx and CO generation</li> </ul>	<ul style="list-style-type: none"> <li>• Typically not capable of handling sustained operation with process streams above 25% LEL</li> </ul>