Handout 1 – Panelist, Annette Sharp

THERMAL OXIDIZERS (TOs)

What a TO does.

Thermal oxidizers are used to modify product and process gas emissions into environmentally safe gasses. Typical TOs process contaminants by first preheating the gasses, then passing the gasses through a burner at a controlled and optimal temperature and produce environmentally safe gasses such as water and carbon dioxide.

How the Thermal Oxidizer Works.

Thermal oxidizers are sometimes divided into non-flame oxidizers, which use slow heating to incinerate pollutants, and direct flame thermal oxidizers, which use plumes of flame. Thermal oxidizers may also include a process called catalytic oxidization. In catalytic oxidization, organic compounds pass over a support material coated with a catalyst, commonly a noble metal such as platinum or rhodium, that encourages the pollutants in the air to burn. Catalytic oxidizers can break down pollutants at much lower temperatures than thermal oxidizers lacking catalytic action.

The most significant distinction between types of thermal oxidizers is whether they are regenerative or recuperative. Regenerative thermal oxidizers use ceramic heat transfer beds to recover as much energy as possible from the oxidization process -- often as much as 90% to 95%.

REGENERATIVE THERMAL OXIDIZERS (RTOs)

What a RTO does.

Regenerative Thermal Oxidizers (RTOs) destroy air toxics and Volatile Organic Compounds (VOCs) that are discharged in industrial process exhausts. VOC destruction occurs through the process of high temperature thermal oxidation, converting the VOCs to carbon dioxide and water vapor, recycling released energy to reduce operating costs.

How the Regenerative Thermal Oxidizer Works.

Process gas with VOC contaminants enters the Twin Bed RTO through an inlet manifold. A flow control valve directs this gas into an energy recovery chamber which preheats the process stream. The process gas and contaminants are progressively heated in the stoneware bed as they move toward the combustion chamber.

The VOCs are then oxidized, releasing energy in the second stoneware bed, thereby reducing any auxiliary fuel requirement. The stoneware bed is heated and the gas is cooled so that the outlet gas temperature is only slightly higher than the inlet temperature. The flow control valve switches and alternates the stoneware beds so each is in inlet and outlet mode. If the process gas contains enough VOCs, the energy released from their combustion allows self-sustained operation. For example, at 95% thermal energy recovery, the outlet temperature may be only 77° (25°) higher than the inlet process gas temperature.