

THERMAL OXIDATION SYSTEMS WITH DOWNSTREAM CATALYSTS ECO-FRIENDLY AND ENERGY-EFFICIENT

FITTING A THERMAL OXIDATION SYSTEM WITH A DOWNSTREAM OXIDATION CATALYST CUTS FUEL CONSUMPTION AND LOWERS CARBON MONOXIDE CONCENTRATIONS IN THE TREATED GAS.

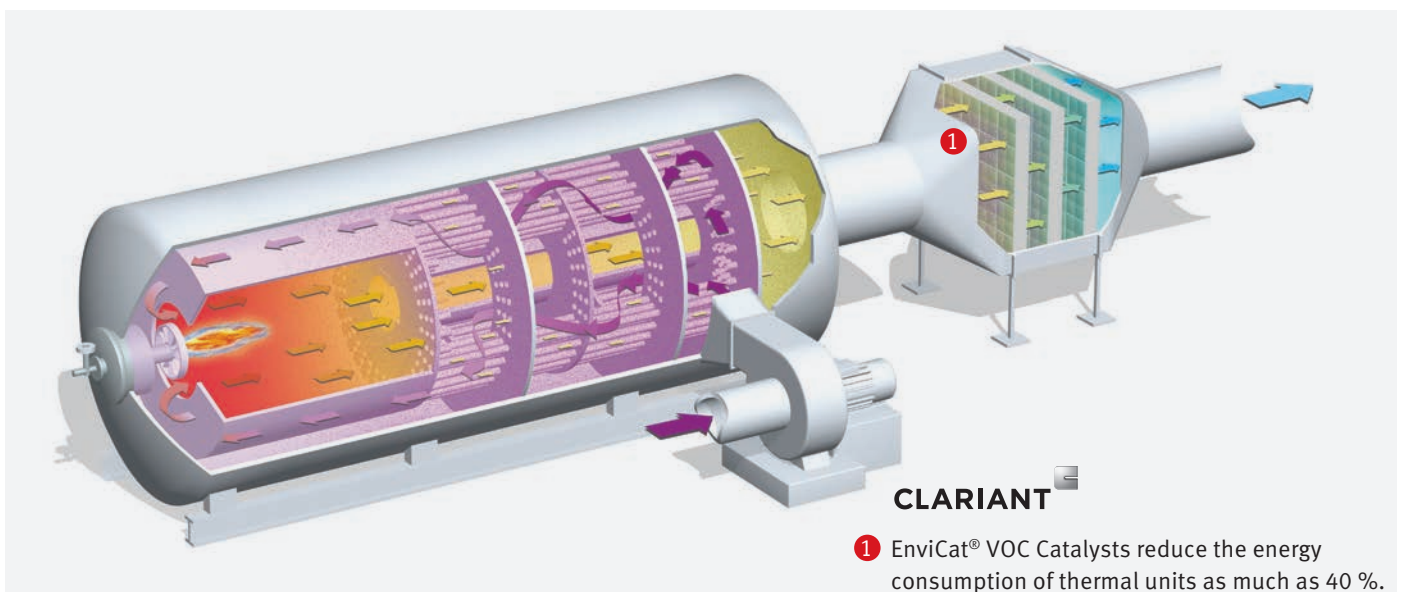
Thermal oxidation systems are employed to treat exhaust gases containing, for example, combustible organic compounds. They are typically deployed in painting and coating plants, roller offset printing shops, and by manufacturers of chemicals.

Conventional thermal oxidation: 700 to 750 °C

Initially, an integrated heat exchanger preheats the polluted air. The thermal energy for preheating is recovered from exhaust air from the combustion process. Once preheated, the polluted air enters a combustion chamber where it is subjected to a temperature of 700 to 750 °C. Depending on the pollutant concentration in the exhaust air and the degree of preheating that is possible, natural gas may be admixed. This has proven a reliable method for ensuring compliance with statutory thresholds for pollutant concentrations.

Less heat usually means higher emission concentrations

This method is especially attractive when there are processes in close proximity that can harness the waste heat generated by thermal oxidation. However, in practice, the oxidation combustion chamber often operates at temperatures that are far higher than those used by other manufacturing processes (such as drying systems). To overcome this problem, the combustion chamber would need to operate below 700 °C. But this would lead to non-compliance with statutory emission thresholds as complete combustion of the volatile organic compounds (VOC) and other pollutants would not be achieved.



Thermal oxidation system with downstream catalysts.

CLARIANT
 1 EnviCat® VOC Catalysts reduce the energy consumption of thermal units as much as 40 %.



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A catalyst: lower temperature, better oxidation

Eisenmann addresses this dilemma by optionally installing an oxidation catalyst from Clariant. It comprises a ceramic honeycomb doped with precious metals, and features two or three stages. The number of stages depends on the composition of the exhaust air to be treated. Positioned downstream from the combustion chamber, the oxidation catalyst reduces carbon monoxide concentrations in the treated gas to under 10 mg/Nm³. At the same time, the temperature in the combustion chamber can be lowered to 550 °C. This slashes the volume of admixed natural gas needed by up to 40 %.

A rapid return on investment through lower energy costs

The costs for the cat are rapidly recouped through energy savings. For example: a top-coat oven generates 12,000 Nm³/h of VOC-contaminated air per hour, and typically operates around 4,300 hours annually. A thermal oxidation system equipped with a catalyst saves almost 185,000 euros in natural gas costs per year compared to a conventional configuration. As a catalyst costs approximately 250,000 euros in total, including installation, the investment pays for itself within just 16 months.

Advantages at a glance

- Lower combustion-chamber temperature allows waste heat to be utilized by other processes
- Significantly lower carbon monoxide concentrations in treated gas (< 10 mg/Nm³)
- Rapid return on investment through lower energy costs (payback in < 3 years)
- EnviCat® VOC Catalysts reduce the energy consumption of thermal units as much as 40 %

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