Treating Gaseous Effluents

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The rendering industry is forced to continuously adapt to new challenges and meet the demands of new requirements in a constantly changing and evermore controlled sector. In Europe, as in the United States, there has been a period of consolidation of rendering activity to achieve an optimization of operational costs.

At the onset of any project to modernize or build a new greenfield rendering plant, the same fundamental question has to be asked: What is the best available technology to achieve the required process and environmental requirements?

For each project the answer can be different and contain many subtle differences due to the various project-specific factors and considerations that must be satisfied. In terms of the process requirements, today there is a wide variety of rendering systems that in turn influence the solutions governing the environmental requirements.

Specifically, when referring to process systems, they are batch systems, continuous dry systems, wet rendering systems, and slurry evaporator systems. In the same manner, various environmental systems for treatment of gaseous effluents (vapors and process air) are available, such as:

- direct contact (water) systems;
- indirect contact (water) systems;
- condensation systems using air cooled condensers;
- air treatment systems using biofilters;
- air treatment systems using chemical washers/scrubbers; and
- thermal oxidation systems (recuperative or regenerative).

Nowadays, the thermal oxidation of gases produced in rendering plants has been accepted as an effective solution for the elimination of odors coming from rendering processes for meat and fish rendering plants. It is no coincidence that the European Integrated Pollution Prevention and Control (IPPC) Bureau responsible for defining European law and best practices to minimize pollution has produced clear directives and delivered an industry-specific best available techniques reference document in which it identifies, among many other recommendations, that thermal oxidation is the best technology available for the purpose of reducing or eliminating odors and reducing wastewater from rendering plants.

By law in Europe, all new greenfield proposals or major changes to rendering plants must accurately respond to and follow the recommended best available technologies as defined by IPPC. Compliance to the IPPC regulations must be demonstrated by the operator of the plant via a comprehensive written submittal to the local authority in question. The local authorities in each case must assemble a team of experts who will study the submitted information, including detailed calculations, and ask for clarifications and any other necessary additional information before granting, deferring, or refusing the relevant environmental license.

Having defined that thermal oxidation is the best method to treat process effluents from European rendering plants, it is necessary to focus on a number of key elements in order to develop a fully integrated thermal oxidizing solution that perfectly matches and responds to the process system or systems being proposed. In each case, it is necessary to apply an evaluation protocol in order to specify the best thermal oxidizing solution. There are a number of key points that must be addressed in order to define the best solution.

First, it is important to establish the exact flows of process vapor and air needing treatment. In the case of a recuperative thermal oxidizer, consideration must be taken for the amount of steam production from the thermal oxidizer compared to the process system steam demand (calculating for and adjusting the designed steam producing capacity in terms of maximum steam demand, minimum steam generated, and average steam demand). Perhaps even just this simple quantification of the necessary flows to be treated and steam produced will show if the most efficient system in terms of energy balance is being chosen.

It is obvious that one must look for the perfect balance between the production of steam from the thermal oxidizer and the overall process system steam demand. In the case that this balance cannot be achieved, or that a cost-effective source for steam production already exists, then the regenerative thermal oxidizer may be considered as a suitable alternative due to the fact the advantages of the regenerative thermal oxidizer are still available, but the inherent production of steam is not.

There is an ongoing debate by business leaders and experts as to the suitability of installing either recuperative or regenerative oxidation systems. However, in each case it is fundamental to understand that the two systems are technically different in terms of energy usage, but achieve the same environmental goals.

A recuperative thermal oxidizer consists of a system for feeding cooking vapors and process air into a combustion chamber where the temperature is raised to 850 degrees Celsius (1,562 degrees Fahrenheit) and gases are oxidized into odor-free components. The hot oxidized reaction gases then pass through a boiler/heat exchange unit to recover energy and produce steam.

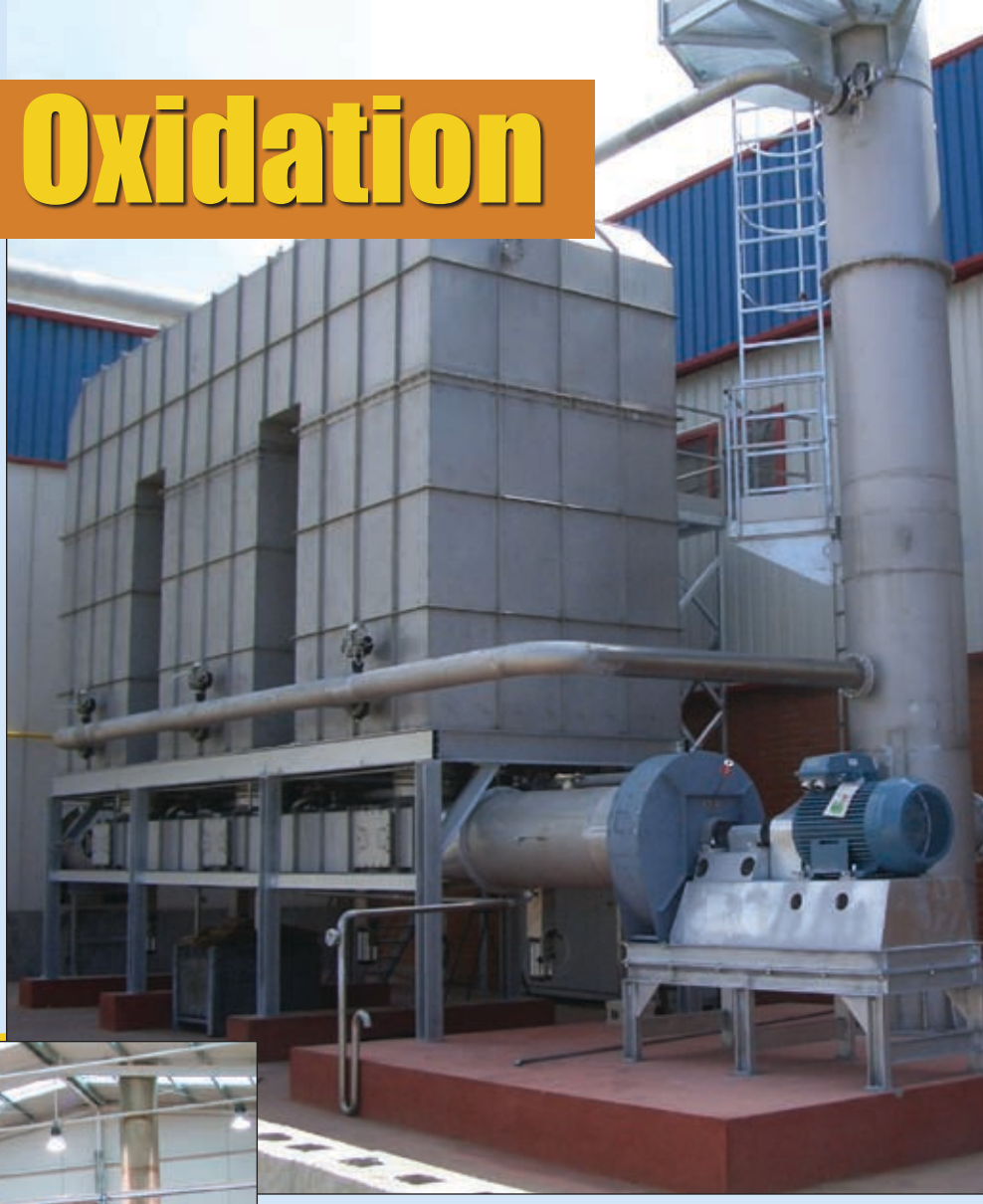
A regenerative thermal oxidizer consists of three chambers filled with a ceramic material. A specially designed burner heats one chamber to 950 degrees Celsius (1,742 degrees Fahrenheit). Cooking vapors and process air are fed into this chamber where they are oxidized into odor-free components. The hot oxidized reaction gases are then led into and preheat the second chamber. When this chamber has reached the reaction temperature, the gas flow is automatically changed so that cooking vapors and process air are oxidized in this chamber

by Thermal Oxidation

while the third chamber is preheated. This cycle continues thus ensuring low energy consumption and efficient oxidation.

Both systems are perfectly suited for use in the elimination of odors coming from rendering plants. However, the selection of one or other technology depends on a number of different reasons including energy efficiency, fuel type(s) available, cost of fuel, total flow of vapor and process air, and space available at site for installation of equipment.

Ultimately, each project must be judged on its own individual merits from which a decision on which technology option (recuperative or regenerative) can be clearly and decisively made. In fact, in Europe the two options have often demonstrated themselves to be complimentary technologies or alternative technologies leading to both types being installed at the same site.



Top, a regenerative thermal oxidizer at a rendering plant.

Left, a recuperative oxidizer seen from the combustion end.

Whatever type of oxidation technology is chosen, it is essential from the onset to put the project exclusively in the hands of experts with a proven track record in thermal oxidation technology applied in rendering processes. This will ensure the correct specification and application of proven solutions that encompass the entire interconnection of the equipment to be installed at the plant in terms of processes, pipe work, process regulation, and securities between the various systems.

The only way to guarantee total system functionality is by delivering a totally integrated productive unit thereby ensuring both production and legal environmental objectives are fulfilled. **R**