Selecting An Appropriate Thermal Oxidizer

Proven to be efficient, safe and reliable, thermal oxidation is widely accepted and a preferred method for the destruction of non-condensible gases (NCG) within pulp mills. With various types of thermal oxidizers available, selecting the proper equipment for specific processes is difficult. Through its experience providing air solutions to pulp & paper mills, ENVIRONAIR SIPA has developed an expertise in selection of thermal oxidizers.

The main requirements are the same for all types of NCG treatment: raise temperature to 1,600°F with a sufficient amount of oxygen for a minimum retention time of 0.75 seconds. Any gas thermal oxidizer can achieve this condition. But depending on the initial concentration of TRS and VOC in the gases, equipment can affect performances as well as operating and capital costs.

High Volume, Low Concentration gases (HVLC) form a lean mixture that cannot sustain combustion. Thus, an auxiliary fuel is needed. Raising the gases temperature to 1,600°F requires heating large amounts of inert air, which is costly. To minimize the amount of auxiliary fuel, the equipment should be designed to recover a proportion of the heat generated by the combustion. So, besides the existing equipments such as lime kiln or power boiler, the most cost-effective equipment for treating HVLC is a regenerative thermal oxidizer (RTO). With a heat recovery efficiency that can reach 85-90%, an RTO will efficiently destroy all contaminants with a minimum of auxiliary fuel.

Low-Volume, High Concentration gases (LVHC) and Stripper-Off Gases (SOG), on the other hand, generally contain insufficient air to sustain combustion. Thus, LVHC & SOG incineration requires additional oxygen to ensure they are completely oxidized. In this case, little or no auxiliary fuel is required and heat recovery is not necessary. A direct thermal oxidizer will provide superior performance cost-effectively for LVHC and SOG incineration.

ENVIRONAIR SIPA has developed an expertise in the selection of a thermal oxidizer to prevent the following difficulties:

- The first one is an inappropriate choice of equipment, which could lead to high capital and/or operating costs.
- The second one is the way the NCG (both LVHC and HVLC) and SOG are injected in the thermal oxidizer. If it is not done properly, explosion risks may be created.

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Integration and Experience Critical to Segregation and Stripping Systems

Condensate segregation and foul condensate stripping systems will be key components in many pulp mills' Cluster Rule compliance programs. Integration of these systems within the mill processes is critical to their successful and economical operation.

As the worldwide leader in black liquor evaporator and condensate stripping systems, USFilter's HDP Products is uniquely qualified to help mills meet the challenges of the Cluster Rule. HDP Products offers proven experience backed by years of actual mill operations. At a Southeastern U.S. pulp mill, HDP Products condensate segregation and stripping system illustrate this unmatched knowledge.

**CONDENSATE SEGREGATION/STRIPPING KEY TO MILL’S CLUSTER RULE COMPLIANCE PROGRAM**

Built in the late 1960's, this mill has undergone several expansions and environmental upgrades, making it one of the most efficient linerboard production facilities in the industry. So, it was important to dedicate resources both internally and externally to ensure a smooth environmental upgrade without disturbing plant production. After detailed evaluation of the mill's operation, it was decided condensate segregation and stripping technology were ideal steps toward early Cluster Rule compliance.

USFilter's HDP Products, supplied process engineering support and key process equipment for the modification of several existing evaporator trains to provide adequate condensate segregation. HDP Products also provided a new stand-alone stripping system.

Each evaporator set was upgraded with the addition of external heaters on the #5 and #6 effects as well as secondary condensers and a new vacuum system. The liquor flow scheme was revised, allowing for optimum methanol evolution from the liquor. Overall, more than 70% of the methanol evolved during black liquor evaporation can be collected in the condensate from the external heaters and secondary condenser, which amounts to no more than about 15% of the total evaporator condensate.

The foul condensate streams collected at the evaporators are then combined with other foul streams from the pulp mill and fed into the new stripping system. This steam driven unit relies on HDP Products unique steam generator concept for heat recovery. With this arrangement, the stripping operation has a minimum impact on the mill steam balance. The stripping system achieves methanol removal efficiencies in excess of 98%, well above the target set by the Cluster Rule.

For more information on HDP's steam stripping experience, see the article on page 4.

Selecting An Appropriate Thermal Oxidizer

(from page 1)

- The third one is corrosion caused by the acid condensation. This problem occurs mainly in RTO and other type of heat recovery devices.
- The fourth one is the appropriate back up strategy. The switching from the main destruction equipment to the back-up system must be done without transition venting to the atmosphere.

In most mills, the “Cluster Rule” compliance programs require the destruction of all types of NCG. In which case a more detailed analysis of the streams composition and flow rate is required. ENVIRONAIR SIPA and the Cluster Rule Compliance team have the expertise to evaluate and design the right equipment and process as well as integrate the system for efficient operation.
CLUSTER RULE UPDATE

Environmental and Health Benefits
The Cluster Rule achieves significant reductions in the amount of wastewater pollutants discharged by the affected mills:
- 96% reduction in dioxin and furan
- 96% reduction in dioxin and furan loading to sludges (for land disposal)
- 99% reduction in chloroform

The rule also requires the significant reduction of air pollutants emitted from pulp and paper mills. These changes include:
- 59% reduction of all toxic air pollutants
- 47% reduction in reduced sulfur
- 49% reduction in volatile organic compounds
- 37% reduction in particulate matter

Incentives to Surpass Baseline Requirements
An important program within the Cluster Rule encourages mills to install advanced pollution prevention technologies or make process changes that reduce pollutants beyond the limits set by the rule. Through the Advanced Technology Incentives Program, mills will be granted additional time to incorporate new technologies or changing manufacturing processes in return for more advanced pollution prevention and control technologies.

Cluster Rule Compliance Impact on Mill Steam Stripping Operations

In “A Snapshot of Current State of Compliance of Kraft Mills,” an article published in the April 1998 issue of TAPPI Journal, Steve Dowe* identified out of the 124 U.S. pulp mills, 40 facilities currently using steam stripping. Dowe emphasizes that many of these mills may still need to increase stripping capacity to meet the Cluster Rule regulations. As most of these systems are integrated with process operations, stripping upgrades should be considered relative to the rest of the facility.

USFilter’s HPD Products, has provided systems at more than one-third of the stripping installations in North America. HPD Products has the knowledge and process experience to help affected mills meet the Cluster Rule regulations efficiently and cost effectively.

* Steve Dowe is senior staff engineer at Jacobs-Sirrine Engineers in Greenville, South Carolina.

TAPPI Pulping Conference & CRC Team Reception

At the annual TAPPI Pulping conference held October 25-29, 1998 in Montreal, Canada, the Cluster Rule Compliance team (CRC) hosted a reception to highlight the team’s capabilities.

Industry consultants and representatives attended the reception, which allowed USFilter and ENVIRONAIR SIPA to discuss the CRC team’s expertise to help mills comply with the Cluster Rule.

The TAPPI Pulping conference included technical papers and round table discussions regarding complex pulping issues.

Steven Enz of Consolidated Papers Inc. at Wisconsin Rapids, Wisconsin receives congratulations from Éric Tremblay of ENVIRONAIR SIPA, and Ron Davis of USFilter for winning Callaway golf irons at the CRC team’s reception.

CRC Team Products Available for Cluster Rule Compliance

- Condensate Segregation Systems
- Condensate Stripping Systems
- NCG/SOG Treatment Systems
- Activated Sludge Treatment Systems
- Anaerobic Treatment Systems
- SOx Treatment

Meet us at:

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<td>EXFOR - CPPA</td>
<td>Montreal, Palais des Congres</td>
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<tr>
<td>TAPPI '99</td>
<td>Atlanta, Georgia World Congress Center</td>
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Best Wishes

USFilter and Environair SIPA wish you and your families a joyous holiday season and a Happy New Year. May this New Year, at the dawn of the new millennium, be one of great achievements.

"The RULE" is a quarterly newsletter published by USFilter and ENVIRONAIR SIPA. For more information, please contact us:
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