A USFilter and Environair SIPA newsletter
published for Pulp and Paper Professionals

The RULE

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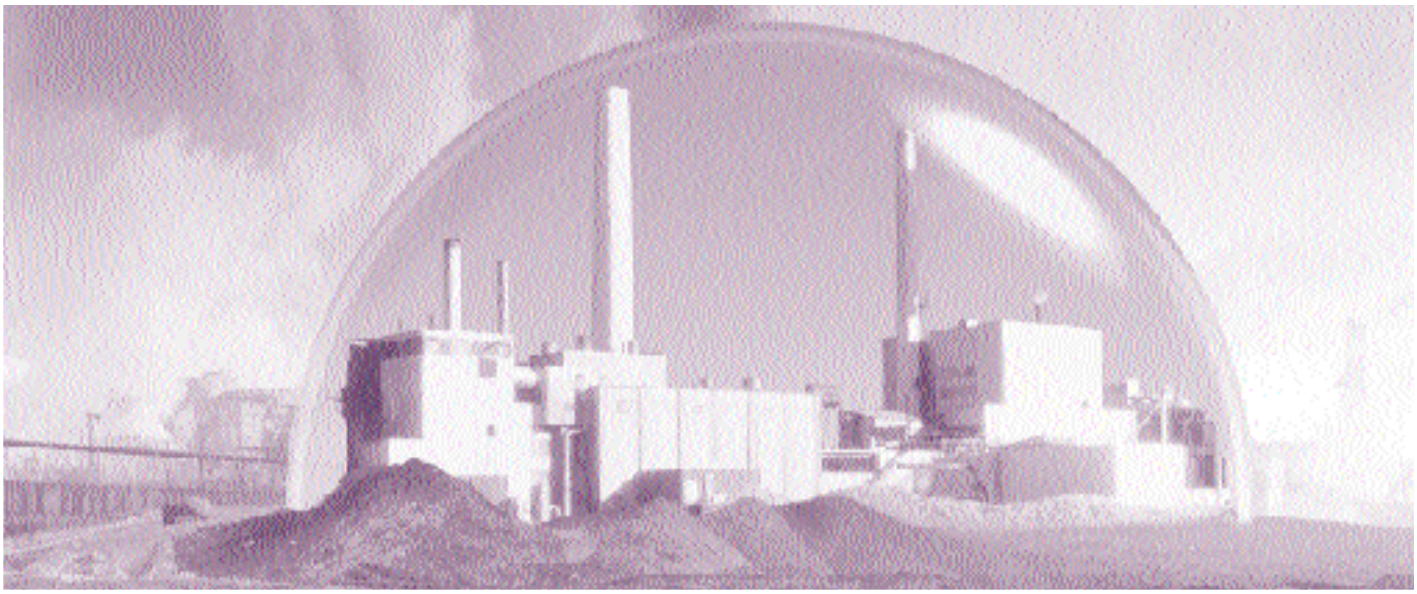

Selecting An Appropriate Thermal Oxidizer

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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Cluster Rule Compliance Team Members

Environair S.I.P.A.
2270 Leon Harmel
Quebec, QC, Canada, G1N 4L2
Phone: 418-688-7475
Fax: 418-688-0482
Web: www.environair.com

USFilter
Aquaflow Products
181 Thorn Hill Road
Warrendale, PA 15086
Phone: 724-772-0044
Fax: 724-772-1360

USFilter
Envirex Products
1901 South Prairie Avenue
Waukesha, WI 53186-7360
Phone: 414-547-0141
Fax: 414-547-4120
Web: www.usfilterenvirex.com

USFilter
HPD Products
55 Shuman Blvd
Naperville, IL 60563
Phone: 630-357-7330
Fax: 630-717-2247
Web: www.hpd.usfilter.com

USFilter
Jet Tech Products
1051 Blake
Edwardsville, KS 66111
Phone: 913-422-7600
Fax: 913-422-7667

Send comments or address changes to The Rule at USFilter's HPD Products or Environair SIPA

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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 HPD Products, is uniquely qualified to help mills meet the challenges of the Cluster Rule. HPD Products offers proven experience backed by years of actual mill operations. At a Southeastern U.S. pulp mill, HPD 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 HPD Products, supplied process engineering support and key process equipment for the modification of several existing evaporator trains to provide adequate condensate segregation. HPD 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 HPD 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 HPD's steam stripping experience, see the article on page 4.

Selecting An Appropriate Thermal Oxidizer

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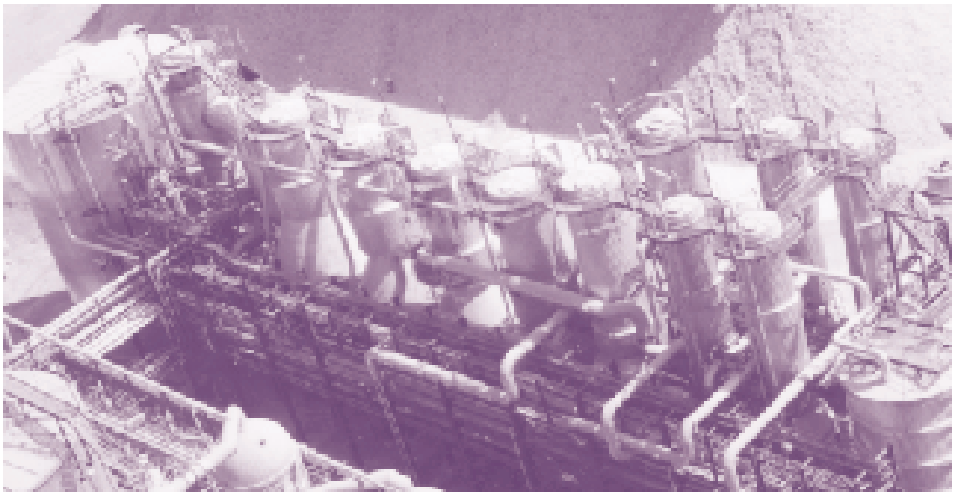
- The third one is corrosion caused by the acid condensation. This problem occurs mainly in RTO and other type of heat recovery devices.
- The fourth one is the appropriate back up strategy. The switching from the main destruction equipment to the back-up system must be done without transition venting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

Seamless Integration of Foul Condensate & Collection

Part II of Segregation Technologies



In a series of articles, we have discussed the principles of condensate segregation along with various process approaches as an important component in many pulp mills' Cluster Rule compliance programs. In the second part of this two part series about segregation technologies, the benefits of pre-evaporation in condensate segregation will be examined.

Older mills, after undergoing several expansions, often rely on multiple evaporator trains to process, in parallel, their entire weak black liquor flow. Rather than retrofitting these evaporator trains, it is usually more economical to install a new pre-evaporator train for condensate segregation. In addition, the pre-evaporator provides the mill with additional black liquor processing capacity to potentially satisfy Best Management Practices and/or provide relief for existing trains.

The pre-evaporator train, typically double or triple effect, is designed to process the mill's weak liquor flow and provide sufficient evaporation to maximize methanol evolution. Condensate segregation is performed in each evaporator heating element and in the condenser, capturing a maximum amount of methanol in the smallest volume of foul condensate. Each shell is equipped with a low plenum vapor entry and vertical baffling to achieve, internally to the shell, the two-stage condensing approach required for segregation. Clean condensate with minimal contamination collects on one side of the baffle while foul condensate collects on the other. The vent rate between condensing steps, which governs the segregation effectiveness, is then a simple "internal rate" directly related to the ratio of heat transfer areas on each side of the baffling.

The economical viability of a pre-evaporator depends on its proper energy integration within mill operations. The use of waste heat, such as blow-heat from batch digesters or flash-heat from continuous digesters, can provide, essentially, a "free" energy source to drive the pre-evaporator train. The overheads from a stripping column or the vapors from a stand-alone concentrator are other potentially "wasted" heat sources. Only a detailed review of the mill's energy balance can assess an optimum energy input to the pre-evaporator train.

A similar review should be performed on the cooling water side to minimize overall mill usage. In some very specific cases, the pre-evaporator can be designed as a mechanical vapor recompression (MVR) system. The MVR pre-evaporator imposes very little additional demand on the steam and cooling water circuits of the mill. Essentially all the pre-evaporator's energy requirements are provided by electrical power to the mechanical compressor.

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*

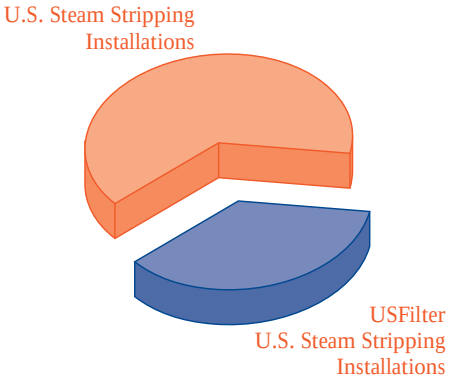
Incentives to Surpass Baseline Requirements

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 change manufacturing processes in return for more advanced pollution prevention and protection controls.

Information Source: Excerpted from "The Environmental and Health Benefits of the Final Pulp and Paper 'Cluster Rule' and the Incentives Program", EPA, United States Environmental Protection Agency, www.epa.gov

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:

WHAT	WHERE	WHEN
EXFOR- CPPA	Montreal, Palais des Congres	January 26 – 28, 1999
TAPPI '99	Atlanta, Georgia World Congress Center	March 1-3, 1999

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.

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

Don Boudreau, USFilter, Phone: 630-357-7330 or E-Mail: boudread@usfilter.com • Eric Tremblay, ENVIRONAIR SIPA, Phone: 418-688-7475 or E-Mail: info@environair.com