JANSEN
Combustion and Boiler Technologies, Inc.

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Recovery & Power BOILER NEWS

Simpson Tacoma Kraft Awards Jansen Contract for Recovery Boiler Three-Level Air System Upgrade

Simpson Tacoma Kraft (STK) has awarded Jansen the contract for the Engineering, Procurement and Construction (EPC) supply of the three level air conversion of the Combustion Engineering Recovery Boiler in operation at the mill in Tacoma, Washington.

Jansen will supply High Energy Combustion Air Nozzles™ for the project. No. 4 Recovery Boiler at STK was built in 1972 with an MCR black liquor dry solids (BLDS) capacity of 2.6 million lb/day. Of note is that the Tacoma No. 4 Recovery Boiler is one of four units left in North America that operates with so-called Ljungstrom Laminaire Air Heaters (LAHs) in service. LAHs were a common design feature on CE Recovery Boilers built in the late 1960s to early 1970s to preheat combustion air from waste heat in the flue gas.

In recent years, the STK unit has typically operated near 20% over MCR solids throughput. At this firing rate, the capability of the unit's conventional two-level air delivery system was limited, as further increases in the solids firing rate cannot be sustained while at the same time continuously meeting regulatory levels for TRS stack emissions.

The upgraded three-level air system will be designed to support BLDS throughput of 3.7 million lb/day, while keeping stack TRS levels well below 5 ppm.

In the early phases of the design, Jansen used Computational Fluid Dynamics (CFD) modeling to evaluate different design features of the air system upgrade and to demonstrate to STK that the objectives of the project can be met.

On the new, overbed secondary air, High Energy Combustion Air Nozzles™ will be installed on the front and rear walls. Key aspects of the project were that the efficiency of the Jansen air nozzles eliminated the need for additional forced draft fan capability and that outage time could be kept to a minimum.

For this EPC project, STK selected Jansen over four competitors. Besides the attractiveness of the price offering, STK's selection of Jansen was based on technological advantages in its design of the convergent High Energy Combustion Air Nozzle™, as opposed to air ports equipped with "constant velocity" dampers.

Installation of the air system upgrade on Simpson Tacoma Kraft's No. 4 Recovery Boiler is scheduled for the January 2000 annual outage. For additional information on this project, at Jansen, please contact Arie Verloop at 425.825.0500 ext. 111, or e-mail: Arie.Verloop@jansenboiler.com.

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CASE HISTORY

Customized Engineered Solutions

No. 2 Bark Boiler Overfire Air System at Mead Coated Board Inc. Phenix City, Alabama

Project Scope

Jansen provided the engineering and supply of the new overfire air (OFA) system for the No. 2 Bark Boiler at the Mead Coated Board Inc. mill in Phenix City, Alabama. The No. 2 Bark Boiler is an early 1980s vintage CE VU-40, waste wood boiler with a traveling grate and five pneumatic fuel feeders. The boiler burned a combination of waste wood and primary mill sludge, and had difficulties consistently meeting carbon monoxide emissions levels without the use of auxiliary fuel (natural gas).

The old "cyclonic" overfire air system was removed and ten Jansen High Energy Combustion Air Nozzles™ were installed on the side walls of the furnace (five on left wall and five on right wall). The large, aerodynamically efficient nozzles provide high momentum, high energy jets that penetrate well past the center of the furnace.

The nozzles were arranged to provide interlaced overfire air jets that create a plane of turbulent combustion several feet above the fuel distributor spout elevation. This combustion zone provides the necessary mixing to burn out the volatiles and fines that rise up off the grate, or are released in suspension by the fuel feeders. Jansen used Computational Fluid Dynamics (CFD) modeling to optimize the design of the system.

Because the Jansen nozzle has very low pressure loss, the existing forced draft fan was more than adequate to supply the necessary flow and pressure to the new overfire air system without modifications.

Results

The Jansen overfire air system was installed in September 1999, as scheduled. Performance trials run in October showed that the boiler can now consistently operate well below the permit carbon monoxide limit of 0.4 lb per million Btu while burning waste wood/sludge mixtures at full steaming rate of 300,000 lb/hr. Also, the boiler has exhibited a significant reduction in the amount of ash and char carryover out of the furnace.

A new control system was installed at the same time as the new overfire air system. With these modifications, the boiler has been able to follow mill steam demand on waste wood fuel only (no auxiliary fuel) from 50,000 lb/hr up to 290,000 lb/hr.

For additional information on this project, at Jansen, please contact Ned Dye at 425.825.0500, ext. 125, or e-mail: Ned.Dye@jansenboiler.com.

New E-mail Addresses

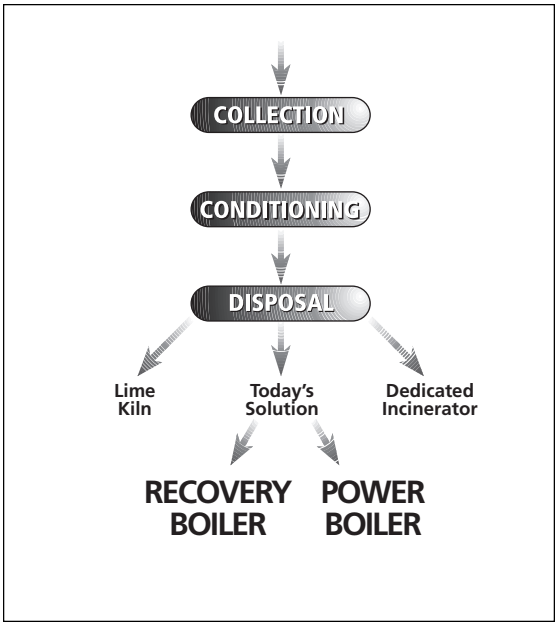
Jansen's e-mailing capabilities have been expanded and now include individual e-mail addresses for all employees. The format for our new e-mail addresses is: FirstName.LastName@jansenboiler.com. For example, Mark Leffler, our in-house computer expert, can be reached at Mark.Leffler@jansenboiler.com.

As before, check out our website at http://www.jansenboiler.com.

Problem / Solution

Disposal of HVLC DNCG in Power and Recovery Boilers – an Update

Customized Engineered Solutions



In the past year, several mills have contracted Jansen to conduct process and design engineering evaluations for the disposal of High Volume Low Concentration Noncondensible Gases (HVLC NCG), sometimes called Dilute Noncondensible Gases (DNCG) in existing boilers. Proper mixing of these gases with the balance of combustion air, followed by injection and rapid, full thermal oxidation in a furnace has been proven to solve disposal problems. This disposal method does not cause additional emissions problems nor does it require expensive capital and operating costs, such as is the case for a dedicated incinerator.

Cluster Rule legislation is in effect and kraft pulp mills must collect and incinerate HVLC NCG before the year 2006. Many mills are now initiating efforts to understand the ramifications, disposal options, and associated costs for the collection, conditioning, and subsequent incineration of these gases.

With proper HVLC NCG conditioning equipment, these gases can be mixed with "regular" combustion air at the level of the tertiary air on a recovery boiler, or at the level of overfire air (OFA) delivery on a wood-waste power boiler.

In the Fall 1999 meeting, the BLRBAC membership voted to accept the newly formulated *Recommended Good Practice for the Thermal Oxidation of Waste Streams in a Black Liquor Recovery Boiler*. In addition to guidelines for the thermal oxidation of DNCG, the document also provides guidelines for the thermal oxidation of Concentrated Noncondensible Gases (CNCG) and Stripper Off Gas (SOG).

Several key elements in the design of a safe HVLC NCG disposal system using the kraft recovery boiler are:

- Proper cooling of the combined HVLC NCG stream to reduce the moisture content of the mostly saturated gases.
- Reheating of the HVLC NCG stream to a temperature equivalent to a maximum of 50% humidity.
- Special treatment of chip bin gases.
- Incorporation of *Permissive Starting Logic* and *Protective Tripping Logic* in the boiler's control system.

Jansen High Energy Combustion Air Nozzles™ are used for leak-free injection of HVLC NCG/air mixtures into recovery and power boiler furnaces. This air nozzle provides high velocity and high momentum air jets that promote rapid thermal destruction of the HVLC NCG compounds, such as TRS and methanol.

In disposing of HVLC NCG in existing recovery and/or power boilers, Jansen provided process and/or detail engineering services for the following mills:

- Mead Paper - Chillicothe, Ohio
- Domtar, Inc. - Windsor, Quebec
- Eddy Specialty Papers - Espanola, Ontario
- Smurfit-Stone Container Corporation - Portage-du-Fort, Quebec
- Appleton Papers - Roaring Spring, Pennsylvania

For additional information about how Jansen can assist your mill in making decisions regarding HVLC NCG disposal options, please contact Arie Verloop at 425.825.0500 ext. 111, or e-mail: Arie.Verloop@jansenboiler.com.

Patent Awarded to Jansen for Methods of Improving Productivity of Black Liquor Recovery Boilers

In November, the United States Patent Office granted Patent No. 5,992,337 to its co-sponsors, Jansen Combustion and Boiler Technologies, Inc. and Air Liquide. The new patent describes ***Methods of Improving Productivity of Black Liquor Recovery Boilers*** through the application of Oxygen Enrichment of Combustion Air (OEA).

Inventors of the newly issued patent are: Louis C. Philippe, Eric L. Duchateau, and David R. Scheeff, all of Air Liquide, and Jansen's Edward "Ned" C. Dye and Arie Verloop.

The patent describes ways to increase the oxygen concentration in the combustion air that is supplied to the secondary and tertiary air levels, thereby displacing "dead-load" nitrogen input to the furnace and also reducing the volume of combustion air that is supplied below the liquor guns. This results in a reduction in (1) flue gas quantities, (2) carryover of liquor, char and smelt, as well as (3) boiler plugging rates. In consequence, additional black liquor input is allowed, without increasing the need for cleaning boiler convection passages.

Jansen and Air Liquide, who have formed an alliance to develop and commercialize the use of OEA in chemical recovery boilers, jointly applied for the patent. Air Liquide's expertise in on-site oxygen production, handling and delivery, combined with Jansen's expertise in recovery boilers and combustion air delivery systems, forms a unique alliance for the safe application of OEA. OEA can significantly increase the throughput on recovery boilers and improve profitability of pulp mills.

The mixing of oxygen (O_2) with combustion air takes place in existing ductwork, after the forced draft fan, and prior to the furnace. Therefore, fully mixed air/O_2 jets will enter the furnace through the air nozzles. Because there is only a moderate increase in O_2 concentration, fully mixed OEA behaves like "plain air," and existing components of the combustion air delivery, such as ductwork, windboxes, and expansion joints do not require modification.

For the safe and efficient injection of the OEA mixture into the furnace at the levels of the secondary and tertiary air, the Jansen High Energy Combustion Air Nozzle™ is used. The Jansen air nozzle, equipped with a flow control damper, is uniquely suited for this application because of its capability to develop high velocity and high momentum OEA jets that have shown to have excellent penetration across the furnace plane. These jets optimize mixing of enriched air with combustible materials. In OEA applications, this makes efficient use of the O_2 supplied to the combustion air. The previously patented Jansen air nozzle (US Patent No. 4,940,004, with other patents in Canada and Brazil) is in use in numerous recovery boiler and power boiler installations.

In addition to boosting solids burning capacity, other benefits of application of OEA in recovery boilers are:

- Lower sulfur emissions (TRS and SO_2)
- More stable operation
- Higher thermal efficiency
- Higher reduction efficiency
- Minimum outage time needed for installation
- Low capital cost

Prior to the installation of an OEA system on any specific recovery boiler, a thorough engineering evaluation is conducted first to address the specific design and operating conditions of the individual unit, with specific focus on safety issues, instrumentation and controls, oxygen usage and expected benefits.

For further information about the application of OEA on recovery boilers, including the safety aspects, please contact Arie Verloop, phone 425.825.0500, ext. 111, or by e-mail: Arie.Verloop@jansenboiler.com.

Year 2000 Recovery Boiler Operations Training Seminars (RBOTS)

Upon demand, Jansen will again be scheduling the popular two-day ***Kraft Recovery Boiler Operations Training Seminars*** for the new year 2000.

These seminars have benefited operators, foremen, helpers, and others with operating responsibility, as well as personnel from other departments to better understand the recovery boiler process and equipment.

Over 1100 persons have participated in these seminars. The seminars listed below are for the "generic" course in 2000. Customized, mill-specific seminars are also available.

Tentative dates and locations for the year 2000 include the following:

Montgomery, Alabama.....	April 26-27
Raleigh, North Carolina.....	May 17-18
Portland, Oregon.....	September 7-8
Atlanta, Georgia.....	October 5-6 (following BLRBAC)
Prince George, British Columbia.....	November 1-2
A location near your Mill.....	Upon request

For additional seminar information, sign-up, and costs, or price quotation for Jansen to conduct this seminar at/near your mill, please call Lynn Dee Bauer at 425.825.0500 ext. 132, or e-mail: LynnDee.Bauer@jansenboiler.com.

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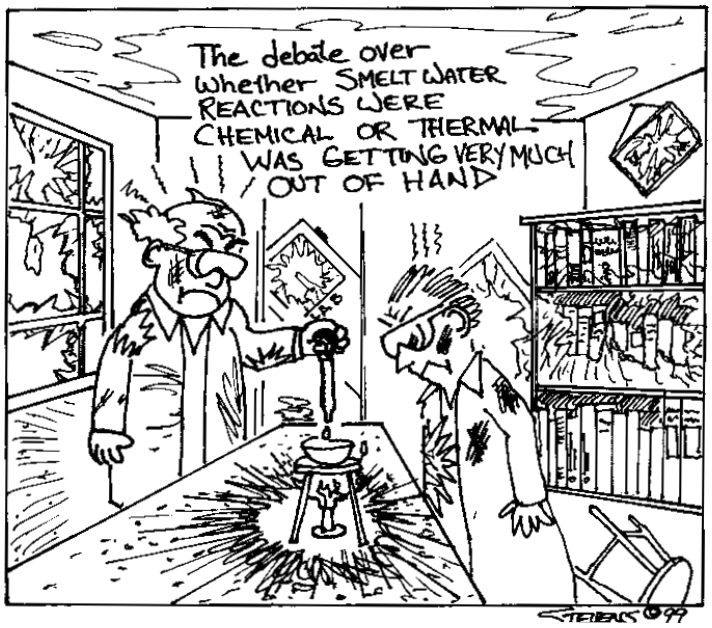

OUR MISSION

Our Company provides combustion and boiler technology, products, and services.

We are dedicated to working with our clients to achieve their production, reliability, efficiency, safety, and environmental goals.

We accomplish this by:

- Listening and understanding.
- Providing a flexible approach to problem solving.
- Developing creative and innovative solutions.
- Working with clients to implement these solutions.

Our team of talented and experienced individuals is committed to the highest standards of professional ethics.

We commit ourselves to creating a challenging and supportive work environment that fosters opportunity for professional growth, fulfillment, and rewards.

Customized Engineered Solutions

Capabilities Update

In operation since 1976, Jansen Combustion and Boiler Technologies, Inc. delivers the highest standards of professional engineering services for power plants. Recognized as experienced specialists who provide full-service process and design engineering, equipment procurement, construction management, start-up and training, and maintenance support. We improve the performance and up-time of chemical recovery, biomass, and fossil fuel-fired boilers.

Jansen has the capability to function as your one-source solution for boiler retrofit projects. With the ability to define, engineer, contract and manage design-construct projects, we offer full-service Engineering-Procure-Construct (EPC) capabilities. In addition, we provide a broad range of highly technical and specialized services, including:

- Power and recovery boiler performance evaluations and operational reviews
- Boiler water side circulation analyses
- Computational Fluid Dynamics (CFD) modeling of combustion processes
- Oxygen enrichment of combustion air (OEA)
- Recovery boiler audits, inspections and surveys
- Project scope definition, equipment specifications and cost estimating
- ASME Boiler and Pressure Vessel Code Section I "S" stamp for power boiler design and NBIC "R" stamp
- Boiler downtime and pressure part failure analysis
- Boiler outage management
- Piping stress analysis
- Operations support and training
- Feasibility studies and cost/benefits analyses
- Incineration of dilute noncondensible gases (DNCGs) in power and recovery boilers
- Primary and secondary sludge incineration
- Full-service engineering design for steam, power and combustion systems

For further information about how Jansen can assist your facility in improving the operation and performance of power and recovery boilers, please call Ned Dye at 425.825.0500 ext.125, or Arie Verloop at ext.111.

Visit our web site at www.jansenboiler.com

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