

OUR MISSION

Our Company provides combustion, boiler, and energy technologies, products, and services.

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

We accomplish by:

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

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

Our team is dedicated to the highest standards of professional ethics and integrity.

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Jansen Acquires Lundberg, LLC

Jansen is excited to announce the acquisition of Lundberg, LLC, formerly a division of LDX Solutions. The combination of the Lundberg and Jansen teams, together with their complementary product lines, results in a company of industry experts well positioned to continue offering solutions throughout the pulping and recovery areas in the pulp and paper industry. The combined company has offices located in the Seattle, Washington area and Bilbao, Spain, which allows us to support our clients worldwide.

Jansen and Lundberg have remarkably similar histories. Both were founded in 1976 (A. H. Lundberg Associates, Inc. by A. Halvar Lundberg and J. H. Jansen Company by Johan Jansen). Mr. Jansen and Mr. Lundberg had both been employed by major pulp mill equipment OEM's and realized that there was a place for third party companies to offer more specialized solutions beyond what was being offered by the OEM's. From humble beginnings, the companies grew to be respected suppliers in the pulp and paper industry. Their success was a result of listening to customers, evaluating problem areas, and developing cost effective and reliable solutions to



resolve specific issues. Both companies share DNA and continue to honor the legacy of their founders by focusing on effectively analyzing problem areas and providing optimal engineering, equipment, and installation solutions.

While Jansen's products are focused primarily on boilers in the power and recovery area, Lundberg's products bridge both the pulping and recovery areas of pulp mills. The Lundberg products focus on the following areas:

- Environmental products to help meet mill's pollution control requirements, including Noncondensable Gas (NCG) Collection and Destruction, Foul Condensate Stripping and Black Liquor Oxidation systems.
- Evaporation products for pulp mill black liquor including a variety of available equipment technologies (falling film, long tube vertical (LTV), forced circulation and lamella plates).

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- Energy Savings products to optimize energy efficiency including Blow Heat Recovery, Digester Heat Recovery, Thermomechanical (TMP) Heat Recovery, Mechanical Vapor Recompression (MVR) and Indirect Black Liquor Heating systems.
- Chemical Processing systems to address pulp mill byproduct recovery and processing including Turpentine Recovery, White Liquor Oxidation, Sulfur Burner, Tall Oil Soap Recovery, Crude Tall Oil (CTO) Acidulation and Recovery Boiler Ash Treatment systems for Chloride/Potassium removal.

We encourage you to visit the Lundberg website (lundbergtechnologies.com) to explore the Lundberg product line and learn more about Lundberg's history and capabilities.

We look forward to celebrating 50 years of service in the pulp and paper industry for both companies in 2026, and we are excited about continuing our work in pulp and paper and other process industries for many years to come.

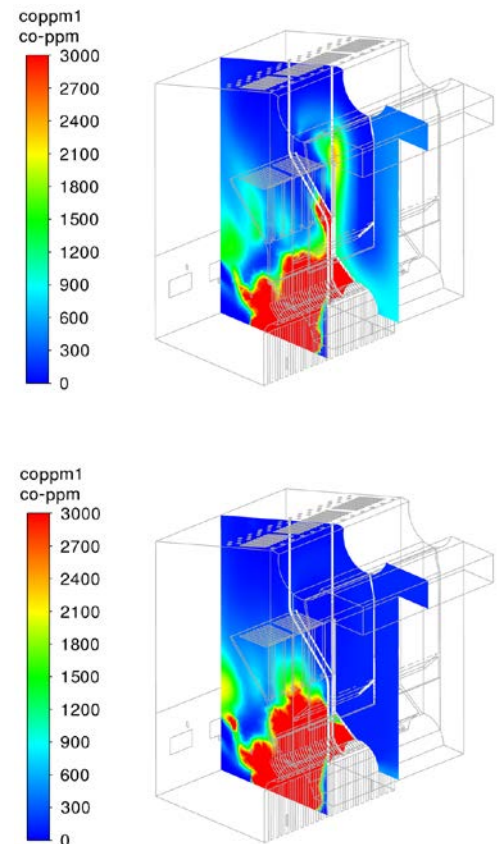
Use of FGR in Improving Biomass Combustion

Flue gas recirculation (FGR) is a well-known tool for a variety of boiler applications. One of the first uses of FGR was to supplement flue gas leaving the furnace at low firing conditions to maintain consistent steam temperatures. Currently, it is typically associated with nitrogen oxides (NO_x) control in boilers firing fuel oil, coal, or natural gas. Introducing FGR with combustion air dilutes the oxygen content with low-oxygen flue gas to lower the flame temperature, thus inhibiting thermal NO_x formation. FGR is also utilized to mitigate bed material agglomeration in bubbling fluidized bed boilers by slowing combustion while maintaining sufficient mass flux for fluidization.

Jansen has recently evaluated the novel use of FGR to support a client in the wood products sector. The client operates several boilers with small furnace volumes. Consistent control of carbon monoxide (CO) emissions from one of these boilers was proving to be a challenge, which ultimately affected its availability. The client wished to improve CO compliance and increase availability to consume the growing fuel inventory.

The small furnace size and relatively low overall air demand posed a unique challenge. After allocating the required combustion air to the various air levels, the excess air level was significantly higher than required for a stoker fired biomass boiler. High excess air coupled with the small furnace volume significantly reduced furnace residence times which resulted in diminished combustion conditions in the furnace. Initial computational fluid dynamics (CFD) modeling results from Jansen's proposed air system upgrade predicted CO levels that were roughly 25% below permitted limits. However, these results considered ideal fuel and stable operating conditions which are not always achievable during operations.

To provide additional operational margin, Jansen analyzed utilizing FGR for the pneumatic fuel distributors and ash reinjection system. Using FGR at these levels resulted in lower total combustion air flow, which in turn reduced overall excess air and generated more uniform furnace



CFD Modeled CO Levels for Existing System (top) and Using FGR (bottom)

Recent Jansen Recovery Boiler Projects

Whether it's an underperforming boiler or keeping up with an inability to keep up with mill upgrades, recovery boilers are often times the bottleneck. Below are three recent examples where Jansen has worked to analyze and improve recovery boiler performance around the world.

Boiler A, located in Asia, was designed to fire 7.7 million lb/day of as-fired black liquor dry solids (BLDS) with a solids content of 80%. The original predicted performance specified a steam/virgin BLDS ratio of 4.2, but the boiler had never been able to achieve this ratio. Jansen performed a parametric evaluation and found that, even with various parameters restored to the original design settings, the boiler still underperformed and failed to reach the target ratio. The results of the evaluation concluded that the original design was optimistic. While achieving this ratio is not feasible, Jansen was able to provide guidance to incrementally improve boiler efficiency and steam generation.

Boiler B, located in Canada, was originally designed for 3.0 million lb/day of BLDS throughput at 64% solids. The mill is currently planning to increase the boiler throughput and steam demand and contracted Jansen to perform a circulation evaluation to evaluate the maximum steam flow and throughput limits. Results from the circulation model identified limits based on the steam separation capacity and maximum allowable drum pressure. The mill is incorporating the study results into their plans to achieve their production increase goal.

Boiler C, located in the US Midwest, was originally designed for 785,000 lb/day of BLDS throughput at 62% solids. The mill is planning to upgrade the boiler and increase liquor throughput and the solids content. Jansen was contracted for boiler tuning followed by an evaluation aimed at defining future flue gas flow rates for upgrading the boiler's electrostatic precipitator. The tuning focused on improving efficiency and optimizing air delivery. While tuning the boiler, Jansen identified air system limitations that will need to be addressed as part of the boiler upgrade.

These examples illustrate our diverse skillsets in evaluating and maximizing recovery boiler performance. As pulp mills are upgraded, recovery boilers need to perform optimally and sometimes receive upgrades as well. Jansen can help with optimization tuning, performance evaluations, and design of upgrades needed to reach our client's goals.

News Briefs

Jansen's experience in the pulp & paper, forest products, agricultural, and waste-to-energy industries and with independent power producers is extensive. Services recently provided include the following, many of which are in progress:

- Engineering evaluations of biomass, recovery, waste-to-energy, and coal-fired boilers.
- Recovery boiler capacity and condition assessments.
- Combustion air system upgrades.
- Economizer and superheater upgrades.
- Boiler steam/water-side circulation studies.
- CFD modeling of boiler processes.
- Emissions control evaluations.
- Boiler operational tuning and optimization support.
- Boiler MACT compliance review and tune-ups.



A collection of boiler house cartoons by Gordon Stevens shown previously in our newsletter can be viewed on our website: www.jansenboiler.com.

For further information on Jansen's projects and capabilities, contact Mark McCabe at 425.736.9758 or by e-mail at mark.mccabe@jansenboiler.com. Additional information and specific project references can be found on our website at www.jansenboiler.com.

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oxygen profiles. With the resulting air demand decreased, fractionally more air could be delivered as OFA. CFD modeling results for this condition predicted improved furnace turbulence and 65% lower CO emissions compared to using fresh air for fuel delivery and ash reinjection. The use of FGR coupled with a modern OFA system will be an integral part of the boiler's ability to sustain operation while maintaining CO emissions compliance.

With this study, Jansen has shown that utilizing FGR can be an effective strategy to minimize CO concentrations, especially when the boiler design, operation, or steam requirements prevents operation at lower excess air levels. These results will become even more important as lower CO limits become the norm across the industry.

Spring 2025 Biomass Boiler Workshop

April 30 and May 1 | Charlotte, North Carolina

Since Jansen's workshops began in 2000, they have been attended by over 1,000 engineers, operators, and managers from numerous plants in the pulp & paper, forest products, waste-to-energy, independent power, and food processing industries.

The workshops consist of presentations about new technological developments and results of upgrades to improve the operating performance, burning capacity, and thermal efficiency of biomass- and other solid fuel-fired boilers. In addition, the program will include opportunities for troubleshooting discussions. Participants will benefit by:

- 🔥 Learning from industry experts about the latest retrofit technology for biomass and other solid fuel fired boilers and associated equipment.
- 🔥 Seeing how other boiler owners solve their boiler problems.
- 🔥 Discussing potential solutions for their specific issues.

For sign-up and to receive a detailed program of the technical presentations, workshop location, and hotel information, please contact **Cathy Thomas**
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The Biomass Boiler Workshop is presented and co-sponsored by:



Heat Management



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