

# BOILER NEWS

Number 42, Spring 2016

## 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 this 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.*

## Jansen Celebrates 40 Years!

*We are pleased to announce that Jansen Combustion and Boiler Technologies, Inc. celebrated its 40th anniversary in January 2016. From humble beginnings to its current well established role in the industry, Jansen has grown and diversified, while always keeping sight of its core mission of customer-focused engineered solutions. Now, at such an auspicious occasion, it seems appropriate to take a look back at how we got here.*

### The Early Years

The J.H. Jansen Company was founded in 1976 by Johan Jansen, a young Dutch engineer who had come to the United States in 1959 to further his career by working for C.C. Moore and Babcock & Wilcox. Johan recognized a niche that was not well served by the boiler OEMs, namely upgrading and improving performance for existing industrial boilers. So Johan aimed to fill that niche, building on his own experience in boiler design and operation.

The company's early projects focused on energy efficiency of recovery and power boilers in the North American pulp and paper industry, and included boiler evaluations and audits in half a dozen major mills. These endeavors helped to establish Johan's expertise in the field and allowed for some gradual growth in the company. Johan was contracted by the American Paper Institute (API, currently the AF&PA) to write the Recovery Boiler Reference Manuals, Volumes I, II, and III, followed by developing the Recovery Boiler Tutor (RBT).

Soon, clients began approaching Jansen to supply not only studies or evaluations, but to design and supply boiler upgrades. Two such cases, one in Quebec and another in Wisconsin, saw Jansen perform engineering evaluations and conceptual design, but design engineering and equipment supply fell to outside

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## RECENT BIOMASS UPGRADE Passes Performance Test

*Jansen finished 2015 on a high note with the successful performance test of an air system upgrade for a biomass boiler in Washington State.*

The boiler is a CE VU-40, supplied in 1975 with original design steam flows of 250,000 lb/hr when co-firing wood and oil and 200,000 lb/hr on wood alone. Current typical fuels are a variety of wood-based fuels, plus mill sludge, OCC rejects, and char separated from the boiler's ash handling system. Due to poor grate fuel combustion, the boiler also tended to co-fire a significant amount of recycled fuel oil to maintain load.

Jansen had provided an in-depth study in 2010 as part of a proposed co-generation project. After that project fell through, things were quiet until June 2014 when the mill issued an RFQ for a boiler upgrade. The mill's goals were to increase the boiler's reliable steaming rate on grate fuels to 250,000 lb/hr, meet the Boiler MACT limit for CO emissions, as well as the mill's Title V limit for NOx emissions, and increase thermal efficiency by reducing excess air and carryover of unburned carbon.

In late 2014, the mill awarded Jansen the contract to upgrade the boiler's combustion system. Jansen kicked off the upgrade project with a boiler



**Multi-Range OFA nozzles in fab-shop being readied for shipment to client.**


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## Recovery Boiler **PROJECT BRIEFS**

Although Jansen's upgrade work in 2015-16 focused mainly on biomass power boilers, there was plenty of activity on the recovery boiler side. Jansen engineers carried out the following studies and evaluations on recovery boilers:

- **NOx evaluation** for a black liquor recovery boiler in Virginia. The mill was targeting an increase in liquor throughput, and was concerned that NOx levels, which were already close to the mill's limit in current operations, would exceed the limit at higher firing rates. Jansen performed a study incorporating CFD modeling to predict NOx levels at the target liquor throughput rate. The study identified air system upgrades that would allow future NOx levels to be only slightly higher than current levels, even at the target increased firing rate.
- **Burner conversion study** for a spent sulfite liquor recovery boiler in the southeast. The mill was interested in replacing the boiler's oil burners with natural gas burners capable of displacing a significant amount of liquor firing, but wanted to avoid boiler pressure part modifications. Jansen performed a study that included boiler circulation analysis and superheater temperature analysis to define parameters for burner size and operation.
- **Boiler tuning and performance** evaluation for two black liquor recovery boilers in Mississippi. The mill had recently been experiencing boiler plugging and air system operation issues. Jansen spent several days on site tuning the boilers, and later provided an evaluation of plugging causes and remedies, as well as current boiler performance.
- **Capacity study** for a black liquor recovery boiler in Wisconsin. The mill was interested in defining upper limits in the boiler's steam generation capacity, both with and without major modifications. Jansen conducted a study that included circulation analysis and CFD modeling to determine possible increases in steam generation and to define any necessary upgrades in the air system, liquor firing hardware, or pressure parts. Jansen's study concluded that substantial additional liquor throughput is achievable. Mill personnel reported being very pleased with the quality of Jansen's work. 



Jansen UFM instrumentation for measuring water velocities in main downcomer.



[www.jansenboiler.com](http://www.jansenboiler.com)

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## ANNOUNCING OUR ALLIANCE



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## High Efficiency NOx Removal for Biomass Applications

- ▶ Combustion optimization to minimize CO and achieve low baseline NOx
- ▶ Patented gasified urea SNCR system reduces reagent consumption by more than 50%
- ▶ CFD modeling to determine optimum injection locations in the furnace
- ▶ Patented spray nozzles enhance reagent distribution in the boiler for maximum pollutant interaction



Combine Optimum Combustion with High Efficiency SNCR

By The Leaders in  
Biomass Boiler Combustion  
System Upgrades



[CONTACT US FOR ADDITIONAL INFORMATION](#)

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## Jansen Celebrates 40 Years!

contractors due to our lack of these capabilities. Johan and the other Jansen engineers realized that an in-house design team could allow the company to take on large jobs, get into new markets, and further grow the company.

### Adding Design Capability

The need for design capabilities came to a head in 1986 when a mill in Florida approached Jansen to design and supply a new secondary air system for a recovery boiler. Spurred by that project and other similar opportunities, Jansen bought a small company called Omicron, which was well versed in plant and boiler design. With the addition of a top-notch design team, Jansen entered into several major upgrade projects.

A key advancement was our development of the Jansen High Energy Combustion Air Nozzle™. Unlike other air ports on the market, the design of the Jansen nozzle created high velocity air jets with effective furnace penetration with minimal pressure loss. This design was unique enough to be awarded a US patent.

In the late 80s and early 90s, Jansen took on many successful projects, including a recovery boiler low-odor conversion at a mill in British Columbia. As our reputation spread, we secured more international work, and found ourselves traveling to destinations such as New Zealand, Slovakia and Brazil for boiler evaluations. Jansen also expanded its process engineering toolbox around this time to include boiler circulation studies and Computational Fluid Dynamics (CFD) modeling.

### Up and Down and Up Again


The pulp and paper industry's fickle nature took a bite out of Jansen's good fortune with a major contraction in 1992-1993, forcing staff reductions. Fortunately, we soon secured a complete EPC rebuild of a recovery boiler in Georgia, including a lower furnace replacement with a new three-level air system. The industry soon rebounded, and Jansen's work load shot back up with it, including a three-level air system upgrade for a recovery boiler in Washington State.

In the early 2000s, rapid increases in oil prices led many boiler owners to pursue more biomass combustion. This ushered in new work in biomass boiler upgrades in the pulp and paper industry and with independent power producers. Between 2000 and 2010, Jansen installed air system upgrades on more than 45 biomass boilers, and completed several superheater upgrade and economizer installation projects. Jansen also began evaluating and supplying upgrades for waste-to-energy boilers in this period.

After another slow down beginning in 2008, business soon bounced back to pre-recession levels. The announcement of the Industrial Boiler MACT rulings gave Jansen the opportunity to conduct dozens of boiler evaluations, and numerous upgrade projects. In all, to-date, Jansen has evaluated more than 350 large industrial boilers (worldwide) that burn difficult fuels and have design/supplied hardware upgrades for more than 110 units.

### Looking to the Future

Johan Jansen retired in 1997, and a shift in the company's management and ownership followed. The company was sold to a select group of employees and Jansen continued on as a privately owned corporation. The continuity in ownership and management is a key reason why Jansen has maintained its original mission of quality engineering and customer-centered service.

With 40 years of business experience, a staff of seasoned veterans and sharp newcomers, and a well-earned reputation for quality engineering, Jansen is poised to maintain its position as an industry leader for years to come. 

For general information or specific inquiries, please contact John La Fond at 425.952.2832 or by e-mail at [john.lafond@jansenboiler.com](mailto:john.lafond@jansenboiler.com).

## NEWS Briefs

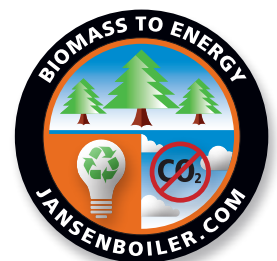
Since our previous newsletter (No. 41, Winter 2015), Jansen was contracted for the following new process and design engineering projects in the Paper, Forest Products, Agricultural, Energy-from-Waste Industries and Independent Power Producers, as well as other industries (many projects are in progress):

- Boiler natural gas (co)-firing feasibility evaluations and cost estimating.
- Chemical recovery and biomass boilers engineering evaluations.
- Combustion system upgrades for chemical recovery and biomass boilers.
- Chemical recovery boiler capacity assessments, diagnostic evaluation, and tuning.
- Boiler steam/water-side circulation studies.
- CFD modeling of biomass, chemical recovery, and W-t-E boilers.
- BFB, CFB, and stoker-fired boiler operational tuning and optimization support.
- Boiler MACT compliance review and operational tuning.

This work was completed, or is currently in progress for the following companies:

- |                                   |                                   |                             |
|-----------------------------------|-----------------------------------|-----------------------------|
| • Alabama River Cellulose LLC     | • Finch Paper LLC                 | • Port Townsend Paper Corp  |
| • Cariboo Pulp and Paper          | • Georgia-Pacific LLC             | • PurEnergy LLC             |
| • Carvajal Pulpa y Papel          | • Greenleaf Power LLC             | • Roseburg Forest Products  |
| • Catalyst Paper                  | • International Paper Company     | • Suzano Papel e Celulose   |
| • Daishowa Marubeni International | • Kapstone Paper and Packaging    | • West Fraser - Hinton Pulp |
| • Dominion Virginia Power         | • Mackenzie Pulp Mill Corporation | • WestRock                  |
| • Domtar Inc.                     | • MeadWestvaco Corporation        | • Wheelabrator Technologies |
| • Doyon Utilities                 | • Mondi SCP                       |                             |

For further information on these types of projects, contact John La Fond at 425.952.2832 or by e-mail at [john.lafond@jansenboiler.com](mailto:john.lafond@jansenboiler.com). Additional information and specific project references can be found on our website at [www.jansenboiler.com](http://www.jansenboiler.com)



# Jansen WELCOMES

**Tim Wilson.** We are pleased to announce the addition of Timothy Wilson to our Design team. Tim graduated high school in 2013 with interest in becoming an engineer. During high school he was a member of a team that designed, built, and raced a super-efficient car in the Shell Eco Marathon Americas. This led to a year of study at Western Washington University's vehicle design program. Along the way he got a job at a pet store, where he learned a lot about aquarium keeping; he is still an avid aquarist with multiple planted aquariums.



In September of 2014 Tim enrolled in ITT Technical Institutes Drafting and Design Technology program and is on track to earn a degree in March of 2017. Tim plans to move into a full time drafter position with Jansen after graduation from ITT, and hopes to continue his education and travel at some point thereafter. In the meantime, Tim continues to work part time for Jansen, go to school at ITT, and on a daily basis walk a five-mile route encompassing the small town of Granite Falls where he lives.

Tim is working as drafter in Jansen's Design Engineering department. 

Tim can be reached by phone at: 425.952.2842 or e-mail: [tim.wilson@jansenboiler.com](mailto:tim.wilson@jansenboiler.com). Please join us in welcoming Tim.


## Jansen Busy with Startups in 2016

*This year is a busy one for Jansen's startup crews, with the company contracted for no fewer than six startups following biomass boiler upgrades between April and June. In each case, Jansen is providing operator training prior to the startup, several days of support on site during the startup for tuning, and in some cases during a later guarantee test.*

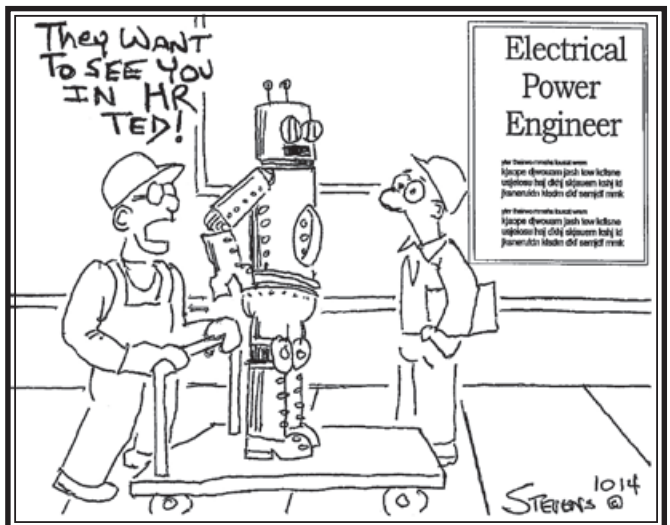
### Here are some highlights of three of these upgrades, located in the southeastern United States:

- **Boiler A** is a biomass boiler designed for a maximum steaming rate on biomass plus oil of 400,000 lb/hr. Jansen installed a side wall overfire air system on the boiler in 2006. Jansen is now installing two new burners sized for a total steam load of 100,000 lb/hr, plus supporting hardware and duct modifications, so the owner can convert the boiler's auxiliary firing from oil to natural gas.
- **Boiler B** was designed for a maximum steam load of 250,000 lb/hr on natural gas or oil or 232,000 lb/hr on biomass plus natural gas co-firing. The boiler had issues with high excess air, heavy char carryover, and CO emissions greater than Boiler MACT limits. Jansen's solution to ensure improved combustion conditions on maximum biomass firing included a new side wall OFA system consisting of eight multi-range OFA nozzles, plus an OFA booster fan and ductwork.
- **Boiler C** is a biomass boiler for which Jansen had supplied an overfire air system in 2006. Jansen is now replacing the original single level, hand dampered overfire air nozzles with new multi-range level nozzles including automatic damper actuators. The modified system will support the same biomass steam generation as the original system (350,000 lb/hr on biomass), but with much greater overfire air control to handle variations in steam demand and fuel quality.

### Meanwhile, on the other side of the continent, three upgrades in western Canada:

- **Boiler D** is a former chemical recovery boiler converted to biomass firing with a maximum steam generation rate of 300,000 lb/hr on biomass firing. Jansen's boiler evaluation, which included Computational Fluid Dynamics (CFD) modeling, concluded that the boiler's biomass firing capacity was limited by an inadequate overfire air system. The new Jansen side wall overfire air system will promote improved biomass combustion as well as incineration of dilute non-condensable gases.
- **Boiler E** has a maximum steaming rate on biomass of 287,000 lb/hr and up to 397,000 lb/hr on natural gas or oil. The owner wanted to increase the boiler's reliable steam output to 309,000 lb/hr, 90% of which would come from biomass combustion, and to increase thermal efficiency and reduce char carryover. Following Jansen's boiler evaluation, again including CFD modeling, the owner awarded Jansen a contract to supply air system upgrades, including multi-range overfire air nozzles.
- **Boiler F** was installed in the mid-1960s with original design steaming rates of 450,000 lb/hr on oil and biomass co-firing and 250,000 lb/hr from biomass alone. The boiler currently fires hog fuel, sludge, and recycled char on a stationary pinhole grate. The client wants to generate 320,000 lb/hr steam flow from biomass only, while reducing the quantity of unburned char carryover. Jansen conducted a boiler evaluation in late 2015 and was subsequently awarded the contract to supply a new overfire air system for the boiler. 

For further information and specific inquiries, please contact Matt Henderson at 425.952.2844 or by e-mail at [matt.henderson@jansenboiler.com](mailto:matt.henderson@jansenboiler.com).



# New EPA Regulations

## Impact Mills and Plants

The US Environmental Protection Agency (EPA) introduced two major new emissions regulations in the second half of 2015. Although the new rules differ widely in scope and purpose, both will impact the power and pulp and paper industries.

### Clean Power Plan

In August 2015, EPA and President Obama introduced the federal Clean Power Plan (CPP). The goal of the plan is to reduce emissions of carbon dioxide from fossil fuel-fired power plants to 32% below 2005 levels by 2030, and to promote renewable energy sources. Fossil fuel-fired power plants account for nearly one third of US CO<sub>2</sub> emissions (compared to around 20% from the industrial sector), which are widely believed to contribute to climate change.

As part of the plan, EPA has established interim and final goals for CO<sub>2</sub> emissions. Each state must develop plans to achieve the interim goals between 2022 and 2029 and the final goals by 2030. States must submit final plans by September 6, 2016, or by September 6, 2018, for states granted extensions. The CPP also allows multi-state approaches such as emissions trading.

The CPP allows for emissions reduction credits to offset emissions from fossil fuel-fired power sources, within certain guidelines. Credits are available for power generation from renewable sources (e.g., solar and wind), as well as qualified biomass, waste-to-energy (WTE, biogenic portion only), and nuclear power.

That “qualified” label attached to biomass power may prove to be problematic. What exactly is a qualified biomass power facility? The answer involves determining the sustainability of the biomass source and its potential to be CO<sub>2</sub>-neutral. EPA is working with its Science Advisory Board to establish firmer guidelines in this area. In the meantime, states are responsible for demonstrating that a biomass source is qualified, and thus eligible for emissions reduction credits.

As for the WTE industry, WTE plants are not classified as affected sources under the CPP, meaning they are not subject to CO<sub>2</sub> limitations. WTE generation can be used for obtaining emissions reduction credits, but only for the biogenic portion (for instance, from food and yard waste rather than from plastics). In addition, states must demonstrate that WTE generation does not negatively impact local recycling or composting activities. Landfill gas is not considered renewable, and is therefore not eligible for inclusion in emissions reduction credits.



### New Ground-Level Ozone Standards

EPA introduced new National Ambient Air Quality Standards (NAAQS) in October 2015. The new rules tighten the limit on ground-level ozone from 75 parts per billion (ppb) to 70 ppb. In addition, EPA is extending the ozone monitoring season for 32 states and the District of Columbia.

Ground-level (tropospheric) ozone is distinct from atmospheric ozone, which protects the planet from harmful solar radiation. Ground-level ozone is formed when NO<sub>x</sub> and VOCs from cars, factories, and power plants react in sunlight. It's a major component of “smog” and, due to association with sunlight, is a problem mainly during the warmer months.


Similar to the CPP, the new NAAQS rules allow states flexibility in meeting the new standards. Compliance dates would range from 2020 to 2037 to comply, depending on the severity of their existing ozone levels. In issuing the ozone limits, EPA noted that various pollution control technologies have reduced ozone levels by 33% since 1980. EPA stated that existing and new technologies should allow states to meet the new limits.

The tightening of allowable ground-level ozone concentrations is expected to significantly increase the number of “non-attainment” regions throughout the country. A likely response by states will be to impose stricter NO<sub>x</sub> emissions limits on NO<sub>x</sub>-producing facilities and mobile sources, which could mean tighter NO<sub>x</sub> limits in Title V permits. Consequently, more industrial boilers are expected to need NO<sub>x</sub> emissions reduction technology in the future.

### Challenges and Opportunities

For boiler owners, these new regulations present new challenges as well as new opportunities. The CPP will require diligent efforts from states to earn emissions credits from biomass and WTE sources. This may result in opportunities for boiler owners to secure attractive renewable energy credits in the future. Another obvious challenge could be meeting new emissions limits, such as tighter NO<sub>x</sub> limits in Title V permits.

Although the potential for delays from litigation and presidential administration changes may emerge, it's not too early to begin assessing the impacts of the new regulations on your plant. JANSEN's 40 years of experience in biomass combustion and emissions control can provide boiler owners with the resources to handle the technical aspects of the regulations. In addition, JANSEN is developing a teaming relationship with Ecospray, a European company with years of experience in control technologies for NO<sub>x</sub> and other pollutants.

Contact JANSEN to learn how our engineering expertise and design capabilities can help you meet these new challenges and take full advantage of new opportunities. 

For further information and specific inquiries, please contact John La Fond at 425.952.2832 or by e-mail at [john.lafond@jansenboiler.com](mailto:john.lafond@jansenboiler.com).

# ATTEND OUR SECOND 2016 Biomass Boiler Workshop

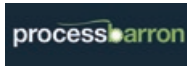
## Seattle, Washington, September 22-23, 2016

Since 2000, these workshops have been attended by over 1,100 representatives of numerous plants in the Pulp/Forest Products and Food Industries, Power Sector, Independent Power Producers and Energy-from-Waste Industry.

The workshops consist of presentations about new technological developments and results to improve the operating performance, fuel burning capacity, efficiency, and fuel economy of biomass-fired boilers (mostly stoker-fired). In addition, the program will include troubleshooting and problem solving discussions of challenges that attendees bring to the workshop. Participants will benefit by: 1) learning about current retrofit technology for biomass boilers and associated equipment; 2) seeing how other plant operations solve their biomass boiler area problems; and 3) receiving information and solutions to their specific problems. Attendance to the workshop is free of charge; space is limited.

Stay tuned at [jansenboiler.com/biomass-boiler-workshops](http://jansenboiler.com/biomass-boiler-workshops) for information on our 2017 workshops!

The workshops are presented and co-sponsored by:



For sign-up and to receive a detailed program of the technical presentations, workshop location, and hotel, etc., please contact Cathy Thomas by phone at 425.952.2835 or by e-mail at [cathy.thomas@jansenboiler.com](mailto:cathy.thomas@jansenboiler.com).




Participants take notes during a past Biomass Boiler Workshop

Continued from page 1

## Recent Biomass Upgrade Passes Performance Test


evaluation that included Computational Fluid Dynamics (CFD) modeling as a design tool for the new air system. The final design incorporated eight new Multi-Range Jansen High Energy Combustion Air Nozzles, and utilized the boiler's existing forced draft fan and two OFA booster fans for OFA supply. Jansen also supplied three new Detroit Stoker pneumatic fuel distributors to replace the boiler's mechanical distributors.

The upgrade was installed in October 2015, and, after a successful startup, the performance test was scheduled for early December 2015. Just to keep things interesting, Mother Nature stepped in and buried the mill and surrounding area with heavy rain in the days leading up to the test. This led to unusually high moisture and low heating value in the biomass fuel fired in the boiler. As a result, the boiler was unable to generate the target steaming rate of 250,000 lb/hr on grate fuels, even with the fuel delivery system working at full capacity. But at the stack, measured CO and NOx emissions showed that the Jansen upgrade performed well, reducing emissions to well within the required limits and lowering excess air, all with zero oil co-firing. Overall, the boiler performance is vastly improved! 

For further information and specific inquiries, please contact Matt Henderson at 425.952.2844 or Samit Pethe at 425.952.2838 or by e-mail at [firstname.lastname@jansenboiler.com](mailto:firstname.lastname@jansenboiler.com).

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