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

• Chemical recovery boiler performance evaluations and capacity studies.
• Biomass, RDF, and MSW boilers engineering evaluations.
• Superheater/attemperator system capacity upgrades and/or new supply.

Additional information and specific project references can be found on our website at: www.jansenboiler.com.

For further information on these types of projects, please contact Arie Verloop at 425.952.2825 or by e-mail at arie.verloop@jansenboiler.com.

• Dominion Virginia Power
• Connecticut Resources Recovery
• Coastal Carolina Clean Power
• Cascade Pacific Pulp LLC
• Minnesota Power
• MeadWestvaco
• KapStone - Longview Fibre
• Weyerhaeuser Company
• Wheelabrator Technologies, Inc.

NEWS Briefs


3. An Improved Method for Modeling NOx Emissions from Recovery Boilers; co-authored by John La Fond and presented at the 2014 Biomass Conference & Trade Show in Louisville, Kentucky.

2. Biomass Combustion Principles and Boiler Optimization; presented by Allan Walsh at the annual Jansen Conference Presentations and Technical Papers.

1. Superheater Modifications and Boiler Upgrades to Maximize In-House Power Generation; and industry meetings. These presentations were:

In recent years, Jansen personnel have made many technical presentations at conferences and industry meetings including:


3. An Improved Method for Modeling NOx Emissions from Recovery Boilers; presented by Dr. Allen Walsh at the annual ABBm Ecosystem Recovery Boiler Conference, Atlanta, Georgia, February 5, 2010.


(If you have an interest in receiving an electronic copy of one or more of these papers or have a specific inquiry, please contact Arie Verloop at arie.verloop@jansenboiler.com.)
Multi-Level OFA Systems for Biomass Boilers – Less Effective at Unnecessary Expense

In the past decade, the Paper industry has faced environmental and economic challenges with the use of alternative fuels. Unlike fossil fuels, in their purest forms, Biomass, biocombustibles (biomass, bark, hog fuel, chip screen rejects, etc.) has been favored over fossil fuels for economic reasons and the need in many mills to dispose of available biomass flux. With the newly approved biomass MACT emissions requirements, mills have to determine how best to optimize their fuel-rich and combustion control.

Biomass has several advantages as a fuel and many mills would like to review their steam generation process and consider the use of biomass. Some confusion appears to be emerging about how many air levels to use on a biomass boiler. This confusion stems clearly from experiences on Chemical recovery boilers that burn fuel with very different combustion characteristics in much larger furnaces. For decades, these boilers have used relatively small levels of combustion air and Jansen is no exception. Please refer to the lead article on the subject in this Newsletter regarding NOx reduction.

A biomass boiler is different in the design, fuel method, and burning characteristics. As biomass is burned, it will provide approximately 70% volatile matter and 30% fixed carbon, the main process occurring on the grate is to drive off the volatile matter while the fixed carbon is combusted in the upper furnace. In addition, the presence of load burners in power boilers may be compromised.

Knowing air pressure and temperature, the OFA flow can be calculated for each nozzle and summed for total OFA. Due to the constant size of the nozzle opening, each nozzle acts as an individual air flow measurement device. In the system shown, actuators mounted on nozzles with a single discharge opening into the furnace. Several load burners in power boilers are used to adjust loads as they swing to maintain steam header pressure. The dampers, mounted at the inlets to the OFA nozzles, are manually set up during initial startups and are not typically adjusted as normal operations proceed.

If you have an interest in automated dampers or have a specific inquiry, please contact John La Fond or Arie Verloop by e-mail at firstname.lastname@jansenboiler.com.

Multi-Level OFA Systems for Biomass Boilers – Less Effective at Unnecessary Expense

To improve the recovery boilers’ BLDS throughput capacity and offset potential increases in NOx, Jansen designed upgrades for existing combustion air systems. The vapor delivery system of the boiler and all staging after combustion air supply was oriented, the solution was to add a fourth level of air, named quality air (QA), to allow for better control of air to supply to both furnaces.

Jansen and solutions for the steam that is associated with NOx emissions before and after and make the air system modifications. The steps in this process are typically: (1) evaluate the coal, process data and heat balances and calculations, and (3) Operational Fluidized (CFD) modeling. CFD modeling allows the furnace combustion conditions to be simulated for individual with different BLDS in order, heating values, fuel compositions (including nitrogen content), and configurations of combustion air supply. CFD modeling is carried out by computer software and provides guidance to the design engineer. The end result is an air system design configuration that best meets the client’s needs and project goals.

Table: NOx Reduction in Recovery Boilers...? Jansen has the Answer...!

- BILO
  - BLDS Throughput (%): 100
  - SO2 (ppm on dry gas at 8%O2): <23
  - NOx (lb/ton BLDS): 1.64
  - NOx (lb/ton BLDS): 1.64
  - NOx (lb/ton BLDS): 1.22
  - NOx (lb/ton BLDS): 0.82
  - SO2 (ppm on dry gas at 8%O2): 1.0
- BILO
  - BLDS Throughput (%): 109.0
  - SO2 (ppm on dry gas at 8%O2): 0.7
  - NOx (lb/ton BLDS): 0.3
  - NOx (lb/ton BLDS): 0.1
  - NOx (lb/ton BLDS): 1.4
  - NOx (lb/ton BLDS): 1.3

For further information and specific inquiries, please contact John La Fond at 425.952.2832 or Arie Verloop at 425.952.2825 or by e-mail at firstname.lastname@jansenboiler.com.

NEW PRODUCT DEVELOPMENT

Actuated Dampers on Individual OFA Nozzles

Jansen has supplied manual dampers on our High Energy Combustion Air Nozzles: on biomass, RDF, and chemical recovery boilers for many years (more than 700 boilers upgraded, with more than 1000 nozzles in operation). Recently, at a Canadian 生灭末尾の技術にあたる技術を用いることにより、NOx reduction projects will be presented at the annual Recovery Boiler Committee Conference of the American Forest and Paper Association (AFPA).

Notes:
- BILO = Biomass industrial boiler
- NOx = Nitrogen Oxide
- SO2 = Sulfur Dioxide
- BLDS = Boiler Loading and Steam Demand

For general information or specific inquiries, please contact Air Ventek at 425.952.2830, or State of Idaho at 425.952.2825 or by e-mail at firstname.lastname@jansenboiler.com.

Tyler Kimberlin. We are pleased to announce that Tyler Kimberlin has joined Jansen in August of the year. Tyler is a Senior Mechanical Engineer in the process and design department.

Tyler’s experience ranges from R&D to engineering and design, construction, start-up, and performance/operations testing. Tyler first started work at fabrication/boiler shops before internships lead to 9 years of employment with a technology company, Energy, where he played a key role in the development and implementation of waste-to-energy combustion and air pollution control technologies. Prior to taking employment with Jansen he worked for Renewable Resource Consultants providing combustion and boiler consulting to W-T facilities.

Tyler graduated from Colorado State University with a B.S. in Mechanical Engineering and is a registered Professional Engineer.

Tyler can be reached at 404.952.2825 or tyler.kimberlin@jansenboiler.com. Please join us in welcoming Tyler.

Boiler MACT & CISWI Rulings Are Here

The US EPA officially published final Boiler MACT and CISWI rulings in January 2013. The permitted levels of several emission species, particularly carbon monoxide (CO) and nitrogen oxides (NOx), were reduced dramatically. Specifically, the levels of these emissions on the newly Arrival of the American Forest and Paper Association (AFPA) for the year 2013. For general information or specific inquiries, please contact Air Ventek at 425.952.2830, or State of Idaho at 425.952.2825 or by e-mail at firstname.lastname@jansenboiler.com.

A collection of boiler models is available on our website: www.jansenboiler.com/biomass. Over 30 copies at Gordon Stevens shown previously in this newsletter were sent out to equipment on the site. Each cartoon depicts a humorous situation with people and equipment in the boiler house. New cartoons are available on our site on a 2013 calendar, a full colour reflection of Boiler House Cartoons here: showing 26 of Gord's best. Please drop us a line if you would like to receive one of these copies.
In the past decade, the paper industry has faced environmental and economic challenges with the increased use of biomass and fuels in their power boilers. Historically, biomass (dah, hog fuel, chip screen reject, etc.) has been favored over fossil fuels for economic reasons and the need in many mills to dispose of available biomass fuels. With the newly approved Boiler MACT emission requirements, mills have to determine how best to optimize their fuel mix and combustion performance.

Biomass has several advantages as a fuel and many mills would like to review the opportunity of changing or increasing burnout quantities. In some cases, it requires upgrading the fuel delivery (e.g., feed bins or fuel feed systems) and for the combustion air delivery system (e.g., fans, Undergrate Air, and/or Overfire Air (OFA)).

In the past, most biomass boilers were designed to use low quantities of OFA and many mills have been operating at very low OFA levels (e.g., 20%-30% of total combustion air supply). The overwhelming design choice for many different boiler types and sizes was the ‘plain’ or simple nozzle dampers where the OFA nozzles are typically mounted at the furnace side walls (usually four nozzles per wall in an islet pattern). The systems are generally more labor intensive to operate and maintain because of the difficulty in controlling air delivery with the OFA requirements. This approach has resulted in both excellent combustion performance and low emissions.

Some mills appear to understand how many air levels it takes to achieve a biomass boiler. This concern seems likely stems from experience on Chemical Recovery Boilers that burn fuel with different combustion characteristics in much larger furnaces. For decades, these boilers have used multiple levels of combustion air and Jansen is no exception. Please refer to the lead article on the subject in the Newsletter, relating to NOx reduction.

A biomass boiler is different in the design, fuel feed method, and burning characteristics in biomass that are typically very different from fossil fuels. With variable volatile matter and typically 30% fixed carbon, the main process occurring on the grate is to drive off the volatile matter as fuel gas. Undergrate Air (UGA) is the most commonly used air for biomass boilers and burned in the upper furnace. The key to good supply and burning biomass is to have a fuel gas blow-through rate to the upper levels that is low, and compared with the “Before” results. (Note: stack testing was conducted by independent third party). Both of these two projects continue Jansen’s successful history with over 30 recovery boiler upgrades in more than 25 years, and never missing one single guaranteed performance parameter.

For more information on these recent NOx reduction projects will be presented at the annual Recovery Boiler Committee Conference of the American Forest & Paper Association (AFPA) in May.

For general information or specific inquiries, please contact Air Valve at 425.952.2365, or table at 425.952.2825 or by e-mail at firstname.lastname@jansenboiler.com.

To improve the recovery boiler’s BLDS throughput capacity and offset potential increases in NOx, Jansen designed upgrading existing combustion air delivery system (i.e., the diesel generator) further clarification of combustion air supply was required; the solution was to add a fourth level of air, named quaternary air (QA), to allow for better control of air supply to both furnaces.

Jansen has solutions that are custom designed for each boiler pit. Jansen will evaluate combustion understanding of the boiler’s burner locking and associated NOx solutions before and after making the system modifications. The steps in the process are typically: 1) site visit to collect data, process evaluations and heat balance calculations, and 3) Computational Fluid Dynamics (CFD) modeling. CFD modeling allows the furnace combustion conditions to be simulated for individual with different BLDS supply rates, heating values, fuel compositions (including nitrogen content), and configurations of combustion air supply. CFD modeling is carried out in-house by Jansen and provides valuable data for the engineering design. The end result is an air system design configuration that best meets the client’s needs and project goals.

The objective of automatically modulating selected OFA nozzle dampers is to maintain good supply pressure at the OFA nozzle even when flow decreases significantly. The automated dampers adjust to maintain a back pressure on the supply duct so that high pressure is maintained through the nozzle with full damper open.

The system shown has actuators mounted on nozzle with a single discharge opening into the furnace. Several years ago, Jansen began to offer a split nozzle (e.g., 66%/34% open area split) for seasonal or daily variations in loads and operating conditions, as well as reduce the amount of operator attention required to manually adjust nozzle dampers.

The result is smooth operation and effective OFA mixing over a wide range of loads.

The system shown has actuators mounted on nozzle providing a single discharge opening into the furnace. Several years ago, Jansen began to offer a split nozzle (e.g., 66%/34% open area split) for seasonal or daily variations in loads and operating conditions, as well as reduce the amount of operator attention required to manually adjust nozzle dampers.

Due to the constant size of the nozzle opening, each nozzle acts as an individual air flow measurement device. Knowing the air pressure and temperature, the OFA flow can be calculated for each nozzle and summed for total OFA supply.

If you have an interest in automated dampers or have a specific inquiry please contact John Lada at 425.952.2832 or Arie Verloop at 425.952.2825 by e-mail at firstname.lastname@jansenboiler.com.
Multi-Level OFA Systems for Biomass Boilers – Less Effective at Unnecessary Expense

In the past decade, the paper industry has faced environmental and economic challenges with respect to energy use in their furnaces. Historically, biomass (bark, hog fuel, chip screen rejects, etc.) has been favored over fossil fuels for economic reasons and the need in many mills to dispose of available biomass fuels. With the newly adopted boiler MACT emissions requirements, mills have to determine how best to optimize their fuel rate and combustion performance.

Biomass has several advantages as a fuel and many mills would like to reduce their fossil fuel burning quantities. In some cases, it requires upgrading the fuel delivery (e.g., feed bins and/or fuel distributors) and for the combustion air delivery (e.g., fans, Underburner Isolation Damper/OverFire Air (OFAs)). In the past, most biomass boilers were designed to use low quantities of OFA and the OFAs were typically a single level of conventional OFA supply. The overwhelming design choice for many different boiler types and sizes was to install one single level of OFA. The new OFA nozzles are typically located on the furnace side walls (usually four nozzles per wall in an intermittent pattern). The system is designed with capacity to supply 40% to 60% of the total combustion air requirement with the OFA system. This approach has resulted in both excellent combustion performance and low emissions. Some believe this approach simply appears to allow for more air pressure levels at any air-feeding biomass level. This concern stems largely from experiments on Chemical Recovery Boilers that burn fuel with different combustion characteristics in much larger furnaces. For decades, these boilers have used multiple levels of combustion air and Jansen is no exception. Please refer to the last article in the subject of this newsletter, to NOx reduction!

A biomass boiler is different in the design, fuel feed method, and burning characteristics of the biomass fuel. The US EPA officially published final Boiler MACT and CISWI rulings in May of this year without signs of plugging.

Continued from page 1

For further information and specific inquiries, please contact Tyler Kimball at 425-952-2837 or email: Tyler.Kimberlin@jansenboiler.com. Please join us in welcoming Tyler.

Tyler Kimberlin. We are pleased to announce that Tyler Kimberlin has joined Jansen in April of this year. Tyler is a mechanical engineer who gained experience working in the biomass market and in design departments.

Tyler’s experience ranges from R&D to engineering design, through construction, start-up, and performance/emissions testing. Tyler first started work at fabrication/boiler shops before internships lead to 9 years of employment with a technology process firm, Energy, where he played a key role in the development and implementation of waste-to-energy combustion and air pollution control technologies. Prior to taking on employment with Jansen he worked for Removable Resource Consultants providing combustion and boiler consulting to W-T facilities. Tyler graduated from Colorado State University with a B.S. in Mechanical Engineering and is a registered Professional Engineer.

Tyler can be reached at 405-952-2837 or email: tyler.kimberlin@jansenboiler.com. Please join us in welcoming Tyler.

Jansen WELCOMES

Tyler Kimberlin

New Product Development

Actuated Dampers on Individual OFA Nozzles

Jansen has supplied manual dampers on our High Energy Combustion Air Nozzles: on biomass, RDF, and chemical recovery boilers for many years (more than 700 boilers upgraded, with more than 1000 nozzles in operation). Recently, at a Canadian pulp and paper mill on the West Coast, we provided actuators in mount on selected nozzles to allow automated supply pressure control (See photo below).

Boiler MACT & CISWI Rulings Are Here

The US EPA officially published final Boiler MACT and CISWI rulings in January 2013. The permitted levels of several emission species, particularly carbon monoxide (CO) and nitrogen oxides (NOx) were set for existing and new boilers. The European Commission has also published MACT and CISWI regulations that will come into force in January 2015. Jansen has been assisting clients with determining how the new Boiler MACT and CISWI regulations will impact their boilers and by providing solutions for units that would exceed the new limits.

How does this impact your operations? Jansen assists boiler owners/operators by offering an evaluation of the boiler’s combustion characteristics, including

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How does this impact your operations? Jansen assists boiler owners/operators by offering an evaluation of the boiler’s combustion characteristics, including
Jansen Conference Presentations and Technical Papers
In recent years, Jansen personnel have made many technical presentations at conferences and industry meetings. Meetings included:
2. Biomass Combustion Principles and Boiler Optimization; presented by Air Vent at the annual TAPPI R1 Recovery Conference, January 2012, Savannah, Georgia.
3. An Improved Method for Modeling NOx Emissions from Recovery Boilers; presented by Dr. Allen White at the annual ABBCA Recovery Boiler Committee Conference, Atlanta, Georgia, February 2012.
7. Recovery Boiler Combustion System Upgrade for Improved NOx Emissions Performance; presented by John LaFord at the ABBCA, April 10, 2013, Atlanta, Georgia.

NOx Reduction in Recovery Boilers… Jansen has the Answer...!

In our last Newsletter (No. 39, available on our website), we promised actual results from an upgrade that had just been completed. In summary, modifications to change combustion produce more recovery boiler combustion system modifications necessary. This is because the need to process more black liquor solids while at the same time meeting NOx emissions. We are pleased to report on two recent successful projects.

Historically, chemical recovery boilers have experienced relatively low NOx emissions, due to design features of the furnaces and characteristics of the fuel. Research on NOx in recovery boiler exhaust gas has shown experience where NOx emissions begin to rise as the load is increased on almost any type of boiler. This problem also exists for chemical recovery boilers. Environmental regulations for chemical recovery boilers have tightened, at times on a regional basis. For example, the December 2011 regional NOx rule CO-1, NOX-1, NOX-2. The main factors affecting NOx formation are furnace heat input rates, nitorgen content of the fuel, and residence time of the NOx in the furnace. With market trends favoring different pulp grade products, the mix of wood species may change. Sometimes, the use of hardwood (vena cava) is increased, up to 100%. The chemical recovery boiler is designed for hard wood, but addition, mills may also be planning to increase production rates, which further increases in the BLC supply to the recovery boiler to maintain annual maximum burning (known as the “perfect storm” for NOx emissions). 1) Higher heat boiler firing rates and 2) higher nitrogen content in the black liquor. At one large mill, the cl, ferent to have the solution for the two recovery boilers.

With the CRDF Boiler, fortunately, this plant had the right kind of boiler to burn a variety of fuels. CRDF operation has several design advantages which allow it to burn a mixture of different fuels and produce low emissions. The problem was getting the mixture of fuels into the boiler! The new fuel handling system is designed to process various fuel streams which have a wide range of properties, including ash content, moisture content, and Btu content. To improve the reliability and effectiveness of the different fuel streams, the boiler can be co-fired for over ten years on a variety of successful projects in North America. For this project, PB will also assist with the installation of the new fuel handling system. Since 2004, Jansen and PB have been co-sponsored by the popular bi-annual Biomass Workshops Brochure. For 2014 dates and locations, please see below.

In addition to the design and supply of the new fuel handling system (bins, conveyors, feed chutes, etc.), the scope of supply also includes a modification of the superheater and air plenum systems. This will allow better control of the superheater steam temperature and fuel burns. This upgrade, and the ongoing work of the workshop participants, will result in increased efficiency, reduced NOX emissions, and reliability, efficiency, safety, and environmental benefits.

As written about our workshops:
1) Learning and networking
2) Providing a friendly approach to problem solving
3) Developing and creating solutions
4) Facilitating and delivering the best opportunities for all participants.

We cannot wait to bring to participants to our recovery boiler combustion system modifications necessary. This is because the need to process more black liquor solids while at the same time meeting NOx emissions. We are pleased to report on two successful recent projects.

Jansen to Reduce Fossil Fuel Firing in CFB Boiler
A major packaging producer in the Southeastern US was facing a challenge with the fuel mix they desired to burn in their existing fluidized bed boiler. The plant was burning a variety of existing fluid fuel handling system. The boiler is located at a recycle plant and currently burns a variety of wood waste, including hardwoods and mixed mill generated pulping con. The boiler was in need of an upgrade to handle the mix made up of wood, waste paper, and some mill generated pulping con. The waste paper con was currently facing a successful superheater modification in the CFB Boiler earlier this year. This modification reduced the superheater tube metal temperatures which were limiting the ability of the boiler to operate at higher loads. The photo above shows the superheater tubes ready to be installed in the boiler. The plant’s goal for changing the fuel mix was increasing the boiler steam rating, reducing coal finer to a minimum, reducing landfill cost by burning all mill generated...
This work was conducted, or is currently in progress for the following companies:

- Chemical recovery boiler performance evaluations and capacity studies.
- Biomass, RDF, and MSW boilers engineering evaluations.
- Superheater/attemperator system capacity upgrades and/or new supply.

Additional information and specific project references can be found on our website at: www.jansenboiler.com.

For further information on these types of projects, please contact Arie Verloop at 425.952.2825 or by e-mail at arie.verloop@jansenboiler.com.

• Dominion Virginia Power
• Cascade Pacific Pulp LLC
• Cariboo Pulp & Paper
• MeadWestvaco
• Ingenio Madre Tierra
• Graphic Packaging International
• Domtar Inc.
• Packaging Corporation of America
• Xcel Energy
• RockTenn
• ReEnergy Holdings LLC
• Sonoco Products Co.
• RockTenn North America
• Canfor

Since our last newsletter (No. 39, Spring 2012), Jansen has conducted the following process and design engineering projects in the Forest Products, Independent Power Producers, and renewable energy sectors:

1. Superheater Modifications and Boiler Upgrades to Maximize In-House Power Generation;
2. Biomass Combustion Principles and Boiler Optimization;
3. An Improved Method for Modeling NOx Emissions from Recovery Boilers;
4. Recovery Boiler Combustion System Upgrades for Improved NOx Emissions Performance;
5. Biomass Combustion Troubleshooting;

The workshops consist of presentations on new technological developments and results to improve the operating performance of present and future boilers. The seminars also include fuel feed system modifications and a discussion on the fuel economy of biomass-fired boilers (mostly stoker-fired).

In addition, the program will include troubleshooting and problem solving discussions of challenges that attendees may bring to the workshop. Participants will benefit by:

1. Learning about the current retrofit technology for biomass boilers and associated equipment;
2. Using these mill operations to solve their biomass boiler area problems; and
3. Receiving information and solutions to their specific problems. Attendance to the workshop is free of charge, is limited.

This newsletter, No. 49, Winter 2014, is again being sent by e-mail to our contacts for whom we have an e-mail address. We will also be sent via e-mail a copy of the newsletter including the electronic distribution list for our newsletter.

For sign-up and to receive a detailed program of the technical presentations, workshop locations, and dates, etc., please contact Fall Atherton or Cathy Thomas by phone at 425.952.2944 or by e-mail at falp@blrbac.com/cathys@blrbac.com.

ATTEND OUR 2014 Biomass Boiler Workshops

• Raleigh/Durham, North Carolina, May 8-9, 2014
• Memphis, Tennessee, September 18-19, 2014

To see the full list of presenters, please contact Arie Verloop at 425.952.2825 or by e-mail at arie.verloop@jansenboiler.com.