Jansen Projects in Waste-to-Energy Industry

**Municipal Solid Waste and Refuse Derived Fuel**

The U.S. EPA has defined solid waste as any material that has been discarded, or abandoned, and is not hazardous, and it has developed a list of 200 eligible material categories for disposal in waste-to-energy (WtE) plants.

In recent times, the WtE Industry has experienced a surge in activities that is caused by both the rapid and rapid increase in the use of energy from renewable energy sources. However, to reduce landfill, it is crucial to produce energy from renewable energy sources. Jansen can help meet these goals with its WtE project, which is focused on improving the economic disposal of these waste fuels in combustion furnaces. For this purpose, Jansen has proposed a series of techniques that can be implemented to improve the waste fuel burning capacity in existing furnaces.

**Jansen Supplies Multi-Level Air System Upgrades on Four Recovery Boilers**

Our company provides turnkey solutions for the biomass, chemical recovery & waste-to-energy industries. We have a team of talented and experienced professionals and offer a supportive work environment. Our services include biomass, chemical recovery, and waste-to-energy projects.

**Biomass, Chemical Recovery & Waste-to-Energy**

Since our previous newsletter last year, Jansen has supplied combustion air delivery system upgrades on four (4) recovery boilers in the US. All four units had originally been included in the performance, in the period 1967 to 1976 and three had been operating with their original two level air system. The upgrade was installed in the fall of 2006 and has resulted in the following advantages:

- **Improved combustion:** With this installation, the mill had the following advantages:
  - Further increase the BLDS throughput capacity to 5 million lb/day at solids content between 68% and 75%.

**Our Mission**

We are dedicated to working with our clients to achieve their goals in the areas of process optimization, environmental, safety, and emergency controls.

**Our Company**

Our company provides turnkey solutions for the biomass, chemical recovery, and waste-to-energy industries. We have a team of talented and experienced professionals and offer a supportive work environment. Our services include biomass, chemical recovery, and waste-to-energy projects.

**Biomass, Chemical Recovery & Waste-to-Energy Industry**

**Jansen Projects in Waste-to-Energy Industry**

**Recovery Boiler A**

- **Biomass Boiler Workshops**
- **O&M Training**

**Jansen’s Hi-Energy Combustion™**

- **O&M Training**
- **Recovery Boiler Upgrades**

**Arie Verloop at 425.952.2825 or by e-mail at Arie.Verloop@jansen.com**
**Superheater Upgrades and Replacements to Increase Power Generation**

In recent years, Jansen has provided superheater modifications, upgrades, and replacements to many clients in the forest products industry. Outstanding superheaters, replacement and new boilers. With increased emphasis on power generation, many plants wish to improve the performance of their existing turbines by maximizing final steam flow, temperature, and/or pressure. A brief synopsis of some of the more recent Jansen projects are:

**Boiler “F”**
Jansen designed and supplied a superheater replacement on a vintage 1967 combustion fog boiler and natural gas fired boiler with the purpose to increase the final steam boiler’s temperature. The unit was installed in 1991. High steam pressure and temperature increases were achieved.

**Boiler “B”**
Jansen designed and supplied a superheater upgrade replacement on a vintage 1991 Zurn boiler in the South. The unit burns mainly hog fuel as well as a small amount of natural gas. The unit had originally been designed for an IRC rate of 500,000 lb/hr at 1,250 psig and 900°F. However, the unit had always been operated at a steam outlet pressure of 600 psig and 975°F.

In order to achieve a maximum of the use of a new turbine generator (the old unit was retired), the client wished to operate the boiler at actual steam outlet conditions of 1,250 psig and 965°F. In addition, emission control and well engineering had been found mainly in the existing secondary superheater, thus making the superheater unsuitable for continued use at the higher pressure and temperature conditions.

In order to meet the customer’s goals, Jansen designed new primary and secondary superheater sections.

The superheater was a replacement-in-kind with the exception that wall thickness was increased to provide better corrosion allowance. The secondary superheater included additional surface area to meet the higher operating temperature. Portions of the secondary section included alloy 625 weld overlay for corrosion resistance and the wall thickness was increased to provide greater corrosion allowance. New thermocouples were also supplied.

The new superheater was installed last May and has achieved the guaranteed operating performance.

**Boiler “C”**
(In progress) In 2009, one of the oldest forest products companies on the west coast intends to bring on line a new 35 MW-megawatt biomass cogeneration facility, called by one source the largest and oldest forest products companies on the west coast.

As part of the co-generation project, Jansen is providing engineering and materials and construction services to the Righi & Sons Company for their new fuel-fired power boiler. The unit was installed in 1991 with a maximum allowable working pressure of 1,050 psig. However, it has been operated at an actual operating outlet of 300,000 lb/hr at 440 psig and 900°F. In order to maximize the use of the new turbine generator, the mill wishes to increase the steam outlet pressure and temperature to 875 psig and 902°F.

The superheater upgrade will be installed during an upcoming outage later this summer. Jansen is also supplying a new economizer for the unit.

**NEWS Briefs**
Since our last newsletter, Jansen has conducted the following process and design engineering projects in the Forest Products, Waste-to-Energy, and other industries (with some still in progress):

- Chemical recovery boilers multi-level air system upgrades.
- Combustion system upgrades for biomass and RDF boilers.
- Superheater upgrade or replacement design and supply for biomass boilers.
- Biomass boiler economizer design and supply.
- Tunbury design, supply, and installation responsibility (“EPC”).
- Biomass and waste fuel boiler engineering evaluations (bank, MSD, RDF).
- Chemical recovery boiler performance evaluations (capacity, emissions, performance, superheater corrosion).
- Boiler fuel conversion feasibility study and cost estimating.
- Recovery, biomass, and WI-6 boiler circulation studies and UFM data collection.
- CFD modeling of biomass, chemical recovery, MSD, and RDF-fueled boilers.
- Boiler operating fine-tuning and optimization.

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

- Asian Pacific Resources (APRIL)
- Baile
- Bissag s.a.
- Confor Pulp and Paper
- For a superheater upgrade of the Righi & Sons Facility
- Confor Products Corporation
- Coventia Energy Corporation
- Dartam Inc.
- Enbridge Energy & Paper Company
- Flambeau River Papers
- Great Northern LCC
- Great River Energy
- Hyme Timber
- International Paper Company
- Kapitone Papers
- Kimberly-Clark
- The Nine Ips
- NewPage Corporation
- Norwest WTP
- Monticello Inc.
- Nueva Papel
- Plum Creek MDF
- Rayonier Inc.
- Roseburg Forest Products
- Smurfit-Stone Container
- Sunport Enterprises, Inc.
- Vero Paper
- West Lynn Paper
- Weyerhaeuser Company
- Xcel Energy
- York Pulp and Paper

**UPDATE ON Biomass Boiler OFA System Upgrades**

In the past ten years, Jansen has completed over five (5) OFA delivery system upgrades on forty-six (46) biomass boilers for forest products and non-forest products Industries and established a database of over seventy (70) upgrades and currently under contract for install-ation in the remarber of this year or early 2009. With this record, Jansen continues to supply the most biomass OFA system upgrades to the midpoint.

The rising cost of fossil fuels and stricter regulatory emissions performance requirements have been the common motivation for many of these projects. Considered improvements in boiler performance and fuel economy have provided confidence to many of Jansen’s customers to have them come back for repeat business.

Typical reasons why OFA delivery system upgrades are being installed on biomass boilers are:

- To increase the biomass (i.e., bark, hog fuel, wood residue) burning capacity of the unit. Typical increase range from 3 to 20 ton per hour, depending on boiler size.
- To improve the furnace and OFA air delivery efficiency and/or capacity.
- To control the need for excess fuel co-firing (oil, natural gas, coal).
- To improve the unit’s thermal efficiency by reducing excess air gas temperatures in the stack and unburned carbon levels in the ash.
- To reduce carryover of ash and other inert material to minimize the abrasive erosion on pressure parts, ducting, and ID fans.
- To reduce stack emissions of CO, NOx, and particulate matter (PM).

Jansen has designed/supplied OFA upgrades for units originally manufactured by a variety of OEMs, namely: Babcock & Wilcox, Combustion Engineering, Foster Wheeler, Hare, Riley Stoker, A. Zurn, Kipper, and Jensen Iron Works.

The boiler’s original installation dates range from mid-1950 to 1991. Jansen clients for biomass boiler OFA system upgrades (both small and large horizontal and vertical) had been supplied.

The steam superheaters for these projects were also supplied. A few representative clients for biomass boiler OFA system upgrades are:

- Asian Pacific Resources
- Covanta Energy Corporation
- Corn Products Corporation
- Carter Holt Harvey
- Canfor Pulp and Paper
- Minneapolis, Minnesota, September 11-12, 2008

Since 2006, these workshops have been attended by some 400 representatives of numerous plants in the Pulp/Forest Products Industries and Independent Power Producers.

The workshops consist of presentations about new technological developments and results to improve the operating performance, waste fuel burning capacity, efficiency, and fuel economy of biomass-fired boilers. (Majorly-stoked fire units are currently offered). The workshops will include troubleshooting and problem solving, discussions of current and future challenges that attendees bring to the workshop.

Participants will benefit by:
- Learning about the current retrofit technology for biomass boilers (for replacing equipment);
- Seeing how other mills’ operations solve their biomass boiler area problems; and
- Receiving information and solutions to some of their own specific problems.

The workshops are co-sponsored by:

**Announcing Our 2008 Biomass Boiler Workshop**

**Remarking on Mark Leffler**
Mark Leffler (1958-2008). With great sadness we inform our readers of the passing of Mark Leffler this past June. Mark was a senior designer working in Jansen’s Design Engineering Department and he had been a valued employee since 1988. During his twenty years with the company, he worked on numerous power and recovery boiler projects and held several key positions.

Mark was fifty years of age and is survived by his wife Kaye.

Mark was fifty years of age and is survived by his wife Kaye.
Superheater Upgrades and Replacements to Increase Power Generation

In recent years, Jansen has provided superheater modifications, upgrades, and complete replacements to numerous plants, including small, medium, and large boilers. With increased emphasis on power generation, many plants wish to improve the performance of their existing boiler systems. One area frequently addressed is the replacement of worn out superheater sections. When the superheater is the critical heat exchanger for the steam generation process, any improvement in steam temperature can provide significant improvements in boiler efficiency.

The primary superheater was installed during the plant’s annual outage in late 2006. The secondary superheater was installed during the plant’s annual outage in 2007.

The new superheater was installed last May and has achieved the guaranteed performance.

Biomass Boiler “A” — To reduce carryover of fly ash and other inert material to minimize the abrasive impact of erosion on pressure parts, and to improve the unit’s thermal efficiency by reducing excess air, flue gas temperature in the stack and unburned in the ash.

Jansen has supplied/upgrade designs for units originally manufactured by a variety of OEMs, namely: Babcock & Wilcox, Combustion Engineering, Foster-Wheeler, Erie City, R. Stoker, Zurn, Kipper, and Jensen Iron Works.

Superheater Upgrade

The unit burns mainly hog fuel as well as small amounts of woodresidues. The unit had originally been designed for an MCR of 500,000 lb/hr of 1,250°F. In order to meet the emission of 700°F. In order to achieve the higher operating temperature, Portions of the secondary section included alloy 625 weld overlay for corrosion resistance and the wall thickness was increased to provide greater corrosion allowance. New thermocouples were also supplied.

In order to meet the customer’s goals, Jansen designed new primary and secondary superheater sections. The primary superheater was a replacement-in-kind with the exception that wall thickness was increased to provide better corrosion allowance. The secondary superheater included additional surface area to meet the higher operating temperature. Portions of the secondary section included alloy 625 weld overlay for corrosion resistance and the wall thickness was increased to provide greater corrosion allowance. New thermocouples were also supplied.

The new superheater was installed last May and has achieved the guaranteed performance.

Biomass Boiler “C” — To achieve the required performance.

The unit was installed in 1991 with a maximum allowable working pressure of 1,050 psi, however, has been operated at 850 psi with a steam capacity of 300,000 lb/hr of 440 psi and 700°F. In order to maximize the use of the new turbine generator, the mill wishes to increase the steam outlet pressure and temperature to 875 psi and 785°F.

Biomass Boiler “D” — To reduce carryover of fly ash and other inert material to minimize the abrasive impact of erosion on pressure parts, and to improve the unit’s thermal efficiency by reducing excess air, flue gas temperature in the stack and unburned in the ash.

Jansen has supplied/upgrade designs for units originally manufactured by a variety of OEMs, namely: Babcock & Wilcox, Combustion Engineering, Foster-Wheeler, Erie City, R. Stoker, Zurn, Kipper, and Jensen Iron Works.

Superheater Upgrade

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The new superheater was installed last May and has achieved the guaranteed performance.
The new superheater was installed during the plant’s summer outage that was recently completed.

The new superheater was installed last May and has achieved the guaranteed operating performance.

Since our last newsletter, Jansen has conducted the following process and design engineering projects in the Forest Products, Waste-to-Energy, and other industries (with some still in progress):

- Chemical recovery boiler multi-level air system upgrades.
- Combustion system upgrades for biomass and RDF boilers.
- Superheater upgrade or replacement design and supply for biomass boilers.
- Biomass boiler economizer design and supply.
- Tunney design, supply, and installation responsibility ("EPC").
- Biomass and waste fuel boiler engineering evaluations (bank, MSD, RDF).
- Chemical recovery boiler performance evaluations (dual capacity, emissions performance, superheater performance).
- Boiler fuel conversion feasibility study and cost estimating.
- Recovery, biomass, and W-E boiler circulation studies and UFM data collection.
- CFD modeling of biomass, chemical recovery, MSD, and RDF-fueled boilers.
- Boiler operational fine-tuning and optimization.

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

- Asian Pacific Resources International (APRIL)
- Baiki
- Baseal s.a.
- Canfor Pulp and Paper
- Chino Superheater Technology
- Comprod Corporation
- Coventa Energy Corporation
- Damitco Inc.
- Danfoss Inc.
- Jamestown Boiler Paper Corporation
- Flamborough River Papers
- Great Northern LLC
- Great River Energy
- Hyme Timber
- International Paper Company
- Kapitaine Pointes
- Kimberly-Clark
- NewPage Corporation
- NewPage Packaging
- NovaWit Inc.
- Monetary Inc.
- New Life Urban Pulp
- Plum Creek MDF
- Plum Creek
- Plum Creek MDF
- Pulp’twicklung

Since our last newsletter, Jansen has conducted the following process and design engineering projects in the Forest Products, Waste-to-Energy, and other industries (with some still in progress):
Municipal Solid Waste and Refuse Derived Fuel

Feasibility Study for Solid Waste-to-Energy (SW-E)

The W-t-E Industry has experienced a surge in activities that is caused by both the increase in municipal solid waste (MSW), refuse derived fuel (RDF), and some biomass fuels in order to dispose of these waste materials. Typically, these facilities also convert combustion heat to electricity, with an overall efficiency of these systems ranging between 68% and 74%.

In recent times, the W-t-E Industry has experienced a surge in activities that is caused by both the increase in municipal solid waste (MSW), refuse derived fuel (RDF), and some biomass fuels in order to dispose of these waste materials. Typically, these facilities also convert combustion heat to electricity, with an overall efficiency of these systems ranging between 68% and 74%.

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Jansen Projects in Waste-to-Energy Industry

Municipal Solid Waste and Refuse Derived Fuel

The Jansen OFA System upgrade was installed in May of this year and Jansen’s performance guarantees have been met.

MSW Boiler “B”. Jansen conducted Phase 1 conceptual engineering for alternative combustion air preheating on three MSW mass burning units in an 800 bpd facility on the east coast. The existing boiler air cleaners on the units have experienced accelerated metal wear due to acid dew point corrosion. The customer wishes to remedy current design deficiencies and evaluate options to replace the boiler air cleaners by other types of combustion air pre-heating that have a better HSP life, are technically feasible, and economically viable. Jansen completed conceptual engineering to evaluate four alternative air pre-heating concepts, generation of alternative air pre-heating capital, and determination of operating performance as well as challenge testing. After completing full scale challenge testing, we priced the digester gas and presented a quote with contingency.

Waste Fuel Boiler “C”. Jansen carried out an engineering evaluation of a 40,000 tons/day liquid and solid mass burning unit at a new plant project to be limited in its capital investment capacity to hydrocarbon fuels. Analyses of combustion parameters and subsequent CFD modeling identified the presence of several opportunities to improve operation and fuel burning capacity by implementing operational changes and making hardware modifications of the combustion equipment. The following remediation opportunities were identified: (1) an improved quench design to maximize the thermal efficiency of the quenching system and (2) an increased oxidant flow to maximize the burnout of the fuel. In addition, Jansen has recommended a reconfiguration of the fuel feed system to increase the flexibility of the boiler system.

RDF Boilers “D”. Jansen has conducted an engineering evaluation of combustion air supply to several identical RDF boilers in the Southeast. Symptoms of inadequate and/or incomplete combustion that are experienced include elevated CO emissions, the need for propene co-financing, side-to-side fuel-air imbalances causing stratification in the furnaces, and underventilation of the quench chamber (FEGT) exit gas. Jansen has identified properly designed and executed modifications of the existing combustion systems will result in greatly reducing, if not eliminating, the above mentioned operational issues. Moreover, the improved combustion installations will not only improve fuel burnout, but it will also help in effectively handling combustion instabilities caused by incontinencies and interruptions in RDF supply, as well as fuel moisture content and composition variation.

Jansen’s evaluation work consists of site data collection, engineering analyses, CFD modeling, developing conceptual modifications, and providing budgetary pricing for the modified proposals to upgrade the OFA delivery system and meet the plant’s goals.

MSW Boiler “E”. (in progress) Jansen is conducting an engineering evaluation of combustion conditions in several MSW mass burning units in western Canada. The customer wishes to improve the units’ combustion performance, particularly in reducing NOx emissions. Several NOx control technologies are being reviewed, namely: 1) optimization of secondary air supply; 2) injection of fuel gas recirculation, and 3) improving the performance of the existing non-catalytic reduction (SNCR) system. The engineering scope includes CFD modeling, combustion performance and NOx generation/reduction rates, developing design concepts, and providing budgetary pricing for the recommended modifications and upgrades to meet customer’s needs.

For further information on this recent work and specific inquiries about potential future projects, please contact Arne Verloot at 450-952-2605, or by e-mail at arne.verloot@janensen.com.

Jansen Projects in Waste-to-Energy Industry

Jansen Supplies Multi-Level Air System Upgrades on Four Recovery Boilers

Since our previous newsletter last year, Jansen has supplied combustion air delivery system upgrades on four (4) recovery boilers in the US.

All four units had originally been built prior to the period 1967 to 1976 and three had been operating with their original two-level air systems.

The upgrade involved implementing a number of modifications and upgrades to meet the unit’s best performance.

Jansen has taken on a number of these projects for boilers in the W-t-E Industry. The following is a brief synopsis of a few Jansen Projects in Waste-to-Energy Industry.

RDF Boiler “A”. An overview of OPA delivery system upgrade was supplied by Jansen for a RDF Boiler in the north-west. This Riley Stoker unit had been converted to burn RDF in a growing ten to twelve year period and has a maximum continuous steam capacity of 175,600 lb/hr. Prior to the OPA upgrade, natural gas was co-fired with the RDF to control CO emission. The purpose of the OPA delivery system upgrade was to lower the RDF burning capacity to 80% while maintaining a comparable air and fuel burning capacity.

Reduction of metal corrosion rates and improve the oxygen distribution and composition variation.

In addition, the OFA delivery system upgrade has been designed to minimize NOx generation/release rates, developing design concepts, and providing budgetary pricing for the modified proposals to upgrade the OPA delivery system and meet the plant’s goals.

Jansen has conducted an engineering evaluation of combustion air supply to several identical RDF boilers in the Southeast. Symptoms of inadequate and/or incomplete combustion that are experienced include elevated CO emissions, the need for propene co-financing, side-to-side fuel-air imbalances causing stratification in the furnaces, and underventilation of the quench chamber (FEGT) exit gas. Jansen has identified properly designed and executed modifications of the existing combustion systems will result in greatly reducing, if not eliminating, the above mentioned operational issues. Moreover, the improved combustion installations will not only improve fuel burnout, but it will also help in effectively handling combustion instabilities caused by incontinencies and interruptions in RDF supply, as well as fuel moisture content and composition variation.

Jansen’s evaluation work consists of site data collection, engineering analyses, CFD modeling, developing conceptual modifications, and providing budgetary pricing for the modified proposals to upgrade the OPA delivery system and meet the plant’s goals.

RDF Boilers “D”. Jansen has conducted an engineering evaluation of combustion air supply to several identical RDF boilers in the Southeast. Symptoms of inadequate and/or incomplete combustion that are experienced include elevated CO emissions, the need for propene co-financing, side-to-side fuel-air imbalances causing stratification in the furnaces, and underventilation of the quench chamber (FEGT) exit gas. Jansen has identified properly designed and executed modifications of the existing combustion systems will result in greatly reducing, if not eliminating, the above mentioned operational issues. Moreover, the improved combustion installations will not only improve fuel burnout, but it will also help in effectively handling combustion instabilities caused by incontinencies and interruptions in RDF supply, as well as fuel moisture content and composition variation.

Jansen’s evaluation work consists of site data collection, engineering analyses, CFD modeling, developing conceptual modifications, and providing budgetary pricing for the modified proposals to upgrade the OPA delivery system and meet the plant’s goals.

RDF Boilers “E”. (in progress) Jansen is conducting an engineering evaluation of combustion conditions in several MSW mass burning units in western Canada. The customer wishes to improve the units’ combustion performance, particularly in reducing NOx emissions. Several NOx control technologies are being reviewed, namely: 1) optimization of secondary air supply; 2) injection of fuel gas recirculation, and 3) improving the performance of the existing non-catalytic reduction (SNCR) system. The engineering scope includes CFD modeling, combustion performance and NOx generation/reduction rates, developing design concepts, and providing budgetary pricing for the recommended modifications and upgrades to meet customer’s needs.

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