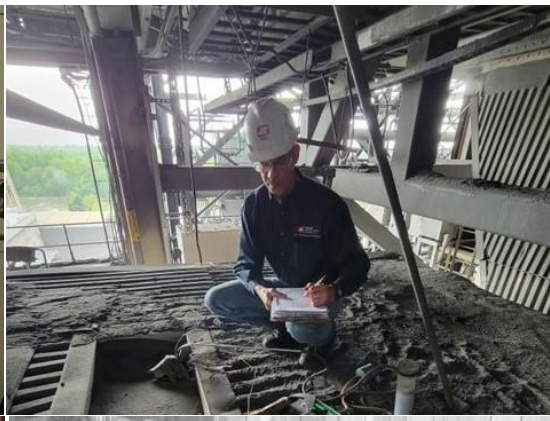
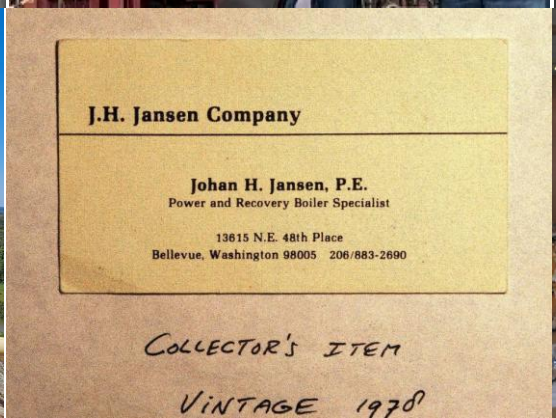
Jansen Celebrates 50 Years!

Jansen is thrilled to announce that as of January 2026 we are 50 years old! From our humble beginnings to our current well-established position in the industry, we have never wavered from our commitment to provide customer-focused engineering solutions.

This issue of the Jansen newsletter dives into our history, shows what we're up to these days, and tells how we can serve you.





JANSEN

Boiler News

Number 59 I Spring 2026

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.

INSIDE THIS ISSUE:

Jansen's Acquisition of Lundberg: What Does it Mean?

The spring 2025 edition of this newsletter announced Jansen's acquisition of the Lundberg, LLC division of LDX Solutions, and the re-branding of our company to Lundberg Jansen Technologies, Inc. Since then, we have received many questions about our new organization and the products and services we provide. This article will focus on what the Lundberg brand offers and how this acquisition came about.

Jansen has acquired Lundberg, LLC, which for 5 years was a division of LDX Solutions. When they decided to sell the company, they split off the Lundberg, LLC division which Jansen then acquired. Lundberg, LLC (previously known as A. H. Lundberg Associates) has been providing technologies to the pulp and paper industry since 1976. All of these technologies were included in the sale to Jansen. These technologies include:

- Environmental products to meet a pulp mill's pollution control requirements; including Noncondensable Gas (NCG) Collection and Incineration, Dedicated Incinerators with downstream SO_2 Scrubbing (with optional sodium bisulfite

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Remembering Johan H. Jansen

This story was contributed by Arie Verloop, who joined the J.H. Jansen Company in 1980 and retired as vice-president in 2016.

Johan H. Jansen was born in the Netherlands and, with his wife Didi, immigrated to the United States in 1960. With a degree in mechanical engineering, he started working as a field service engineer for Babcock & Wilcox (B&W) in the San Francisco Bay area. He quickly moved up the ranks and became a regional sales engineer and manager in B&W's Seattle office. After some ten years he switched jobs and for a few years headed up the local office of a Finnish consulting firm specializing in the pulp & paper industry. Johan quickly realized that the firm's marching orders coming out of Finland were not well matched with the needs of the American market and its customers.

Johan Jansen, 1937-2025

Continued on page 4

Highlights from Jansen's First 50 Years

From the beginning...

1976 Johan Jansen founds company

1984 Johan co-authors RB blue books

1985 First power boiler upgrade project

1989 Jansen air nozzle awarded US patent

1990 CFD modeling capability

1992 First major recovery boiler EPC project

1997 Ned Dye becomes president

2003 First superheater design + supply

2008 Multi-Range OFA Nozzles introduced

2011 John La Fond becomes president

2014 First Central America boiler upgrade

2019 Doug Giarde becomes president

2021 First power boiler furnace rebuild EPC

LUNDBERG JANSEN TECHNOLOGIES

2025 Lundberg Jansen Technologies is born

And on to the future!

Jansen's Acquisition of Lundberg: What Does it Mean, continued from page 1

scrubber) and Foul Condensate Stripping (as well as methanol liquefaction and rectification).

- Evaporation products for pulp mill black liquor (evaporators, concentrators, pre-evaporators); including a variety of available equipment technologies (falling film, long tube vertical (LTV), forced circulation and lamella plates).
- Energy Savings products to optimize energy efficiency; including Blow Heat Recovery, Digester Heat Recovery, Thermomechanical (TMP) Heat Recovery, Mechanical Vapor Recompression (MVR), Indirect Heavy Black Liquor Heating, and green liquor cooling systems.
- Chemical Processing systems to address pulp mill by-product recovery and processing; including Turpentine Recovery, White Liquor Oxidation, Black Liquor Oxidation, Bleach Plant Scrubber, Sulfur Burner, Sulfuric Acid plant, Soap Separation and Collection, Crude Tall Oil (CTO) and Recovery Boiler Ash Treatment systems for Chloride/Potassium removal.

While Jansen and Lundberg are now one company, we are continuing to promote both the Jansen and Lundberg brands that the industry has become familiar with over the past 50 years. The same industry experts that have been assisting Jansen and Lundberg customers for many years are working together in our main (newly expanded!) engineering office in Kirkland WA, USA and our international engineering office in Bilbao, Spain. We also continue to have engineering and sales personnel throughout the USA and worldwide providing prompt service to our clients.

We encourage you to visit our main website (www.lundbergjansen.com). From there you can choose to visit the unique website for either our Lundberg brand (www.lundbergtechnologies.com) or the Jansen brand (www.jansenboiler.com) to learn more about the products and services that are available from Lundberg Jansen.

Combustion Efficiency and CO_2 Emissions

Improving boiler efficiency through tuning or upgrades is a common goal for boiler owners as a means of reducing operating costs. But it can also reduce greenhouse gas emissions, especially in boilers that fire or co-fire biomass. Carbon dioxide (CO_2) emissions from biomass are considered carbon-neutral, because the carbon released in combustion is balanced by the carbon contained in biomass growth. On the other hand, burning fossil fuels like oil, natural gas, or coal releases CO_2 into the atmosphere that otherwise would have continued to be stored in the earth. Improving biomass combustion to increase efficiency results in reduced fuel consumption, and therefore reduced fossil fuel CO_2 emissions.

Currently, expensive and complex technologies are being developed to separate and capture CO_2 from stack gas irrespective of the emissions source (i.e. fossil fuel or renewable fuel generated CO_2). This collected CO_2 would then be "sequestered" in storage facilities. Jansen's work on optimizing boiler performance has consistently shown that improving boiler efficiency reduces fuel firing for the same steam generation rate and thus reduces CO_2 emissions, thereby minimizing the CO_2 load that future removal and sequestration systems will encounter.

Increasing boiler efficiency requires optimization of combustion efficiency and heat capture efficiency. Combustion efficiency is addressed by tuning the boiler's existing air and fuel delivery systems or through boiler upgrades.

Impact of Combustion Efficiency Improvement: For boilers firing biomass, a good measure of combustion improvement is the combustible content of the boiler's fly ash, usually described as loss on ignition (LOI). Improving combustion in the lower furnace reduces the amount of unburned fuel leaving the furnace and consequently the fly ash LOI. By reducing fly ash LOI from 50% to 25% in a boiler generating 250,000 lb/hr of steam on biomass, required fuel firing can drop by almost 2,000 lb/hr. This yields a drop in CO_2 emissions of 943 metric tons per year, assuming 330 days of operation annually.

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Remembering Johan H. Jansen, continued from page 1

In January of 1976 Johan founded the J.H. Jansen Co. He had recognized a niche in the market after realizing that original boiler equipment manufacturers had no real interest in repairing or improving operation of existing older units; they just wanted to sell new units. This became the mission of the company. He went on to serve as the company's president until 1997.

The first couple of years he had his office above the garage at his home - a true American entrepreneurial beginning! The company's early work included teaming with a group of independent specialists to conduct power plant energy surveys for a dozen mills operated by International Paper Company. At that time, oil prices were going through the roof and mills were looking for opportunities to reduce operating costs. Johan's surveys identified abundant opportunities to reduce energy usage.

The American Paper Institute (API; now AF&PA) commissioned Johan to write the Recovery Boiler Reference Manual, Volumes I, II, and III - those blue books that can be found in most powerhouse offices. For this project, he worked with a committee of recovery boiler expert representatives of most companies. This gave him exposure to decision makers who started asking him for advice and to help with technical problems.

In Canada, the Jansen company earned notoriety by conceptualizing and evaluating the feasibility for the conversion of an oil-fired boiler to burn spent pulping liquors in a paper mill in Quebec. This mill was facing closure due to the rising cost of oil and the mill was a major polluter due to the discharge of the waste liquors in the river. The fuel conversion was successful, and saved the mill and small town. Still, the company's lack of design expertise meant that it could not carry out the conversion detail engineering for the project. To expand the company's engineering capabilities, additional engineering staff was hired in the mid/late 1980s and for the third time the company had to move to larger digs.

A young Johan

With these engineering talents, the company could take on large projects such as the low-odor conversion at Prince Rupert, British Columbia and complete lower furnace replacement in Valdosta, Georgia. At that time the company had about 35 employees.

Another milestone was Johan's invention of the High Energy Combustion Air Nozzle™, for which he would receive a US patent in 1989. The nozzle's design would allow for effective combustion air delivery in large furnaces, thereby facilitating more efficient and cleaner boiler operation at significantly higher capacities. Since then, these nozzles have been installed in some 30 recovery boilers and over 130 biomass and waste fuel boilers in North America. The company, now called Jansen Combustion and Boiler Technologies, Inc., provided complete turnkey Engineer, Procure and Construct (EPC) scope for many of these projects.

Johan retired in 1997 after selling the company to a core group of employees that had been hired in the years prior. He stayed active as an independent consultant for some time. He passed away in December 2025, less than two months before the 50th anniversary of the company he founded.

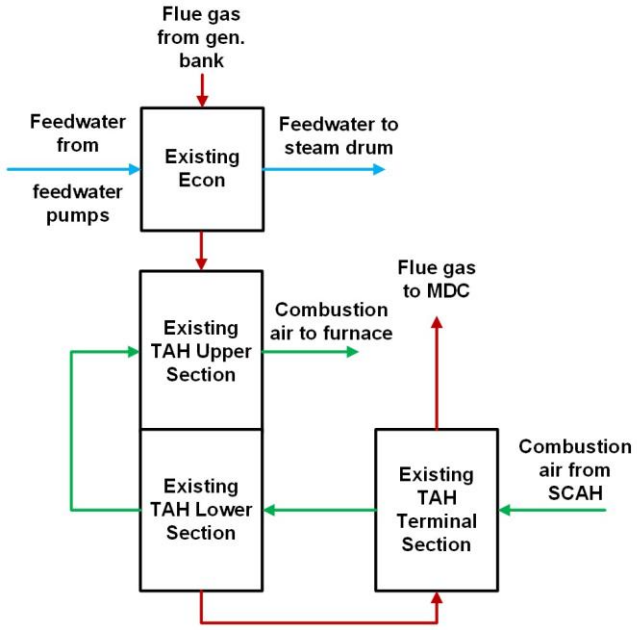
In his 20 years at the helm, Johan steered the company from solely consulting to full-service EPC. In capturing his personality and business acumen, he was a visionary in different ways, a true entrepreneur with confidence daring to take risks and expand his business. He had excellent technical skills and, more importantly, keen people skills that created loyalty with many. And he left a legacy that today's Jansen employees are honored to carry on.

Tubular Air Heater Corrosion: Evaluation and Prevention

When maximizing boiler performance, the main hindrance is often within the boiler backpasses. Over time, the economizer, tubular air heater (TAH), dust collector, and other equipment can erode, corrode, exhibit air in-leakage or develop other issues that negatively impact boiler efficiency. One common issue is corrosion within the TAH.

It is common to use a counterflow TAH to maximize the rate of heat transfer while minimizing surface area. In a counterflow arrangement, the coldest flue gas exchanges heat with the coldest air. Corrosion often occurs in these areas because the average tube temperature can regularly fall below the dew point for sulfur dioxide (SO_2) and sulfur trioxide (SO_3.) Jansen has seen many TAHs plagued with this systemic corrosion issue as the counterflow design arrangement is not able to accommodate for changing fuel quality or lower flue gas exit temperatures. Some mills mitigate the flue gas/air temperature difference by preheating the combustion air with a steam coil air heater (SCAH), but this leads to parasitic steam usage in the SCAH and reduces overall boiler efficiency.

Having a combination of economizer and TAH is standard for most boilers, as these return a large amount of waste heat to the boiler through both the combustion air and the feedwater. Jansen has been exploring alternate configurations for a client whose boiler backpasses, including an economizer and TAH, are at end of life from a combination of erosion and corrosion. The TAH experiences erosion in the inlet tubes due to excessive flue gas velocities and corrosion in the cold end. A typical backend layout depicting an economizer and a counterflow TAH similar to our client's arrangement is depicted in the schematic below.



Typical Backend Equipment Arrangement

The first alternate configuration is shown in the left schematic on the next page. By reversing the direction of combustion air flow in the TAH from counterflow to cocurrent flow and investing in a larger economizer, TAH tube metal temperatures rise by 50°F in the coldest end. This provides improved corrosion protection and the SCAH is no longer required. In addition, overall heat transfer from the flue gas remains identical to that of the original arrangement.

In general, not only are TAHs susceptible to cold end corrosion, they are also prone to pluggage and can erode when encountering high flue gas velocities and flue gas laden with particulate matter. Performance issues often arise as damaged and plugged TAH tubes result in increased gas side pressure drop and the introduction of air in-leakage into the gas stream, which puts more load on the induced draft fan. TAH inspections are time consuming and tube repairs can be difficult, if not impossible.

To provide a more robust design, a second alternate configuration is being considered. The design, shown in the right schematic on the next page, eliminates the TAH completely. In this arrangement, the economizer and TAH are replaced with two new large economizers. The feedwater exiting the economizers is then used to heat the combustion air using water coil air heaters (WCAHs.) This configuration allows the SCAH to be removed and results in heat transfer equivalent to the existing arrangement. The primary benefit of replacing the TAH with economizers is easier inspection and reduced maintenance costs. In addition, economizer tubes generally operate at temperatures well above the acid dew point, unlike TAH tubes. Therefore, economizers are less susceptible to acid dew corrosion.

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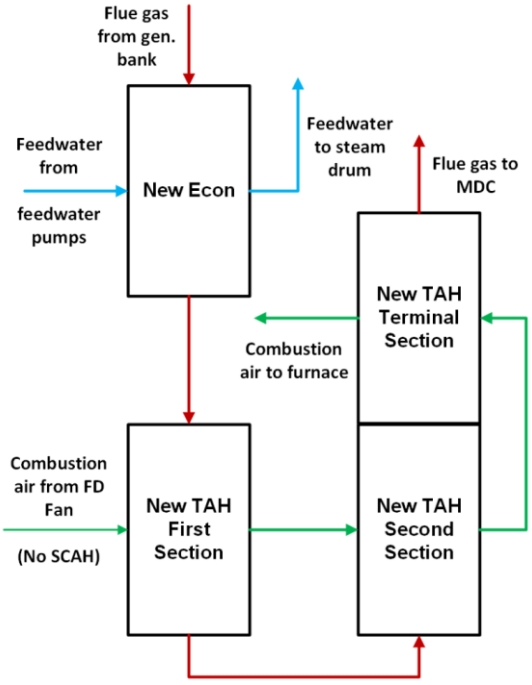
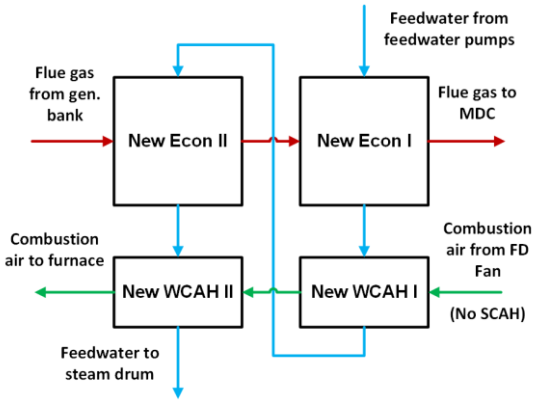
Tubular Air Heater Corrosion: Evaluation and Prevention, continued from page 5



Alternative Arrangement 1



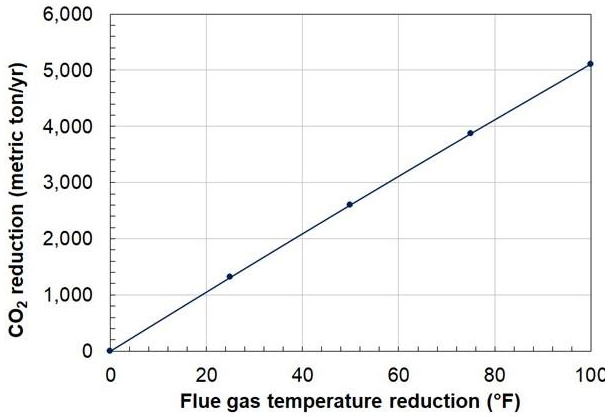
Alternative Arrangement 2

As Jansen considers the longevity of equipment it is designing, it has three priorities: maximizing thermal efficiency, improving equipment lifespan, and reducing yearly equipment overhead. Jansen engineers are looking forward to providing clients with creative solutions to eliminating TAH cold end corrosion without compromising on efficiency.

Contact us to learn more about this and other energy-saving solutions.

Combustion Efficiency and CO_2 Emissions, continued from page 3

Impact of Heat Capture Improvement: Heat capture optimization is usually achieved by increasing the boiler's convective surface area, for instance by adding an economizer, which reduces the stack flue gas temperature. In a boiler generating 250,000 lb/hr of steam on natural gas firing, each 25°F reduction in stack flue gas temperature improves overall boiler efficiency by about 0.7% and reduces CO_2 generation by 1.4 lbs per 1,000 lb of steam produced. As the chart shows, lowering flue gas exit temperatures by 50°F can reduce CO_2 emissions by roughly 2,600 metric tons per year.



Recently, Jansen upgraded a 400,000 lb/hr steam generating biomass fired boiler to improve its emissions, performance, and efficiency. A modern combustion system was designed to improve fuel burnout and lower overall excess air levels, and a new economizer was added to improve heat capture on the boiler backend. Following the upgrade, the client reported a 10% reduction in fuel firing resulting from a combination of improved efficiency of combustion and waste heat capture. This reduction in biomass fuel firing equates to a CO_2 reduction of 43,000 metric tons per year.

These results demonstrate significant reductions in CO_2 emissions which are often achievable without exotic carbon capture technology. Improving boiler efficiency will play a key role in lowering CO_2 generation from boiler systems, as CO_2 reduced is CO_2 sequestered. Contact Jansen if you're looking for ways to increase boiler efficiency, reduce fuel consumption, or cut greenhouse gas emissions.

Check Out the Jansen Blog!

For more in-depth technical discussions on our recent work, visit the Jansen blog at www.jansenboiler.com/blog. There you'll find articles on topics ranging from boiler tuning to NCG incineration to superheater design and more.

Jansen Welcomes…

Jeremiah Yoder

Senior Project Manager

Jeremiah Yoder has more than 30 years of experience in design engineering and management across a wide range of manufacturing sectors. Since 2001, he has been in the power generation and the pulp & paper industries.

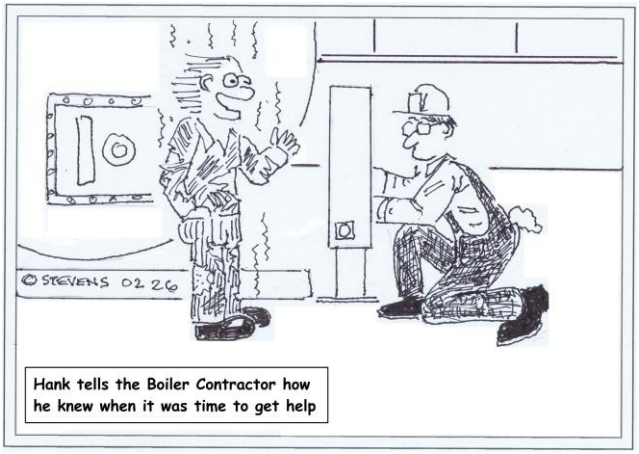
Jeremiah began his industry career with Babcock & Wilcox, where he spent a decade (2001–2011) supporting large-scale boiler and energy related projects. In 2011, he joined Valmet (formerly Metso), taking on roles of increasing responsibility in engineering, proposal development, business management, and project execution. He holds a Bachelor's Degree in Project Management from Malone University (2012).

Originally from Dalton, Ohio (near the hometown of Smucker's Jelly) Jeremiah has lived in the Charlotte, NC metro area since 2011. He is the proud father of three adult children: Reese (28), Jeni (23), and Josh (22). Outside of work, Jeremiah enjoys spending time with loved ones, powerboating, DIY home projects, and woodworking/wood turning.

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

Spring 2026 Biomass Boiler Workshop

May 6 and 7 | Richmond, British Columbia

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 spring 2026 workshop will partner with the Western Canada BLRBAC meeting and will begin immediately following the meeting's conclusion in Richmond, British Columbia.

This unique meeting comprises presentations on the latest technologies and best practices to improve performance, fuel firing capacity, reliability, and operational flexibility of boiler systems. Participants will benefit by:

- Learning about the latest retrofit technologies for biomass and other solid, liquid, and gaseous fuel fired boilers and associated equipment.
- Exploring how other plants solve their boiler area challenges.
- Engaging in discussion on specific plant goals and potential solutions.

The workshop is FREE OF CHARGE, but space fills quickly. For sign-up and to receive a detailed program of the technical presentations, workshop location, and hotel information, please contact **Cathy Thomas: cathy.thomas@lundbergjansen.com, +1 425.952.2835**

The Biomass Boiler Workshop is presented and co-sponsored by:

JANSEN Combustion & Boiler Technologies, Inc. | ProcessBarron | FORNAX SERVICES | Detroit Stoker Company "Our Opportunities Are Always Growing"™ | CleanAir. | ENERO solutions

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