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BUSINESS & INDUSTRY CONNECTION
A BIC ALLIANCE Publication
November/ December 2024
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PIONEERING SUSTAINABLE INDUSTRIAL SOLUTIONS
FOR A GREENER FUTURE



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Pioneering Sustainable Industrial Solutions For A Greener Future





Ammonia injection grid fabrication in Deltak's shop

In an era where environmental responsibility has become a necessity, businesses

are increasingly integrating sustainable practices into their operations to meet customer expectations and ensure long-term success.

Deltak stands out as a forerunner in sustainable industrial solutions. Since its inception, it has been dedicated to developing waste heat recovery equipment that conserves energy and reduces emissions, reflecting its responsibility to environmental stewardship.

The company was founded with a singular mission: to design and build waste heat recovery equipment that conserves energy and reduces the environmental impact of industrial processes. Over the last 50 years, Deltak has developed approximately 12 distinct boiler configurations for different industrial uses. For each project, those basic configurations are then specifically customized to meet the exact process needs of individual clients at their respective plant sites.

While some of the configurations have been phased out as markets have evolved, Deltak continues to innovate its boiler designs. Among its achievements are 17 patents related to heat recovery and supplying the first-ever GE Frame 7H gas turbine heat recovery steam generators (HRSGs). In the 1990s, Deltak designed the first HRSGs that achieved ultra-low NOx emissions of just 2 ppm, along with 2 ppm of ammonia slip; these standards are common today. Ammonia slip occurs when ammonia bypasses a selective catalytic reduction (SCR) reactor without reacting with NOx gases.

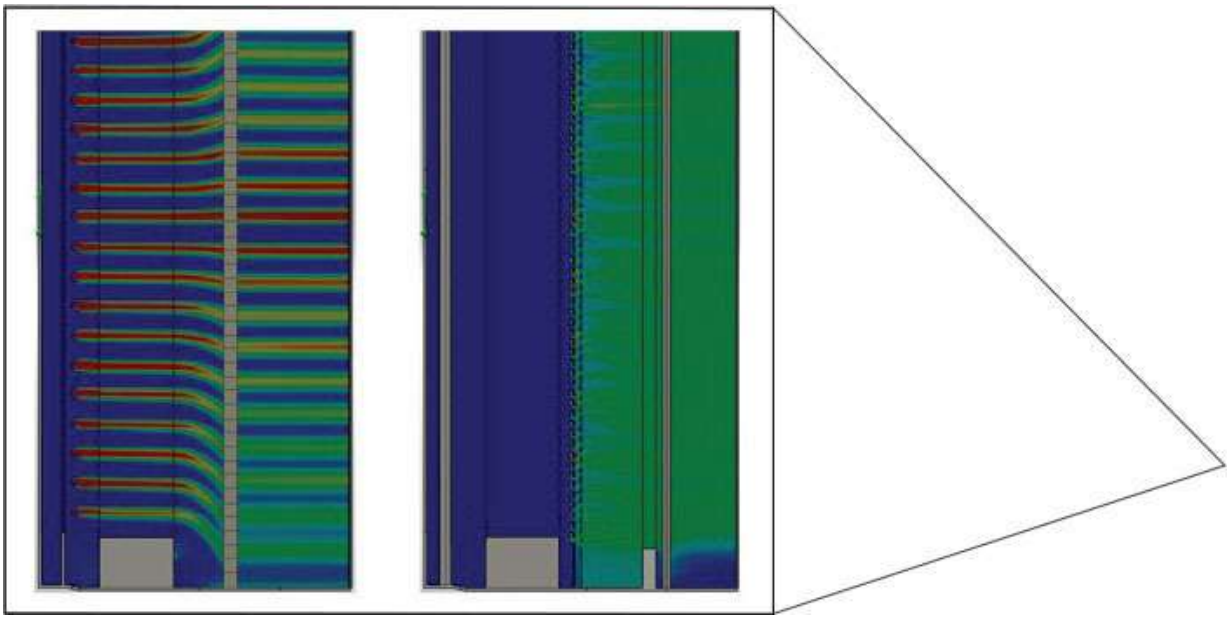




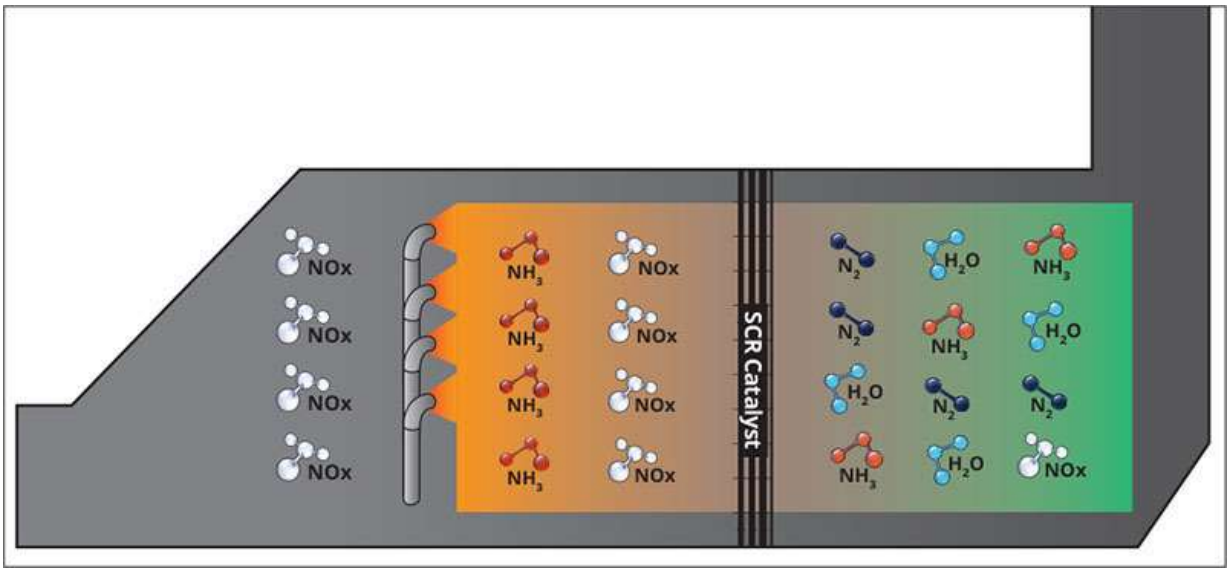
Catalyst frame being installed into an existing HRSG that was not originally designed to house catalyst

Global reach

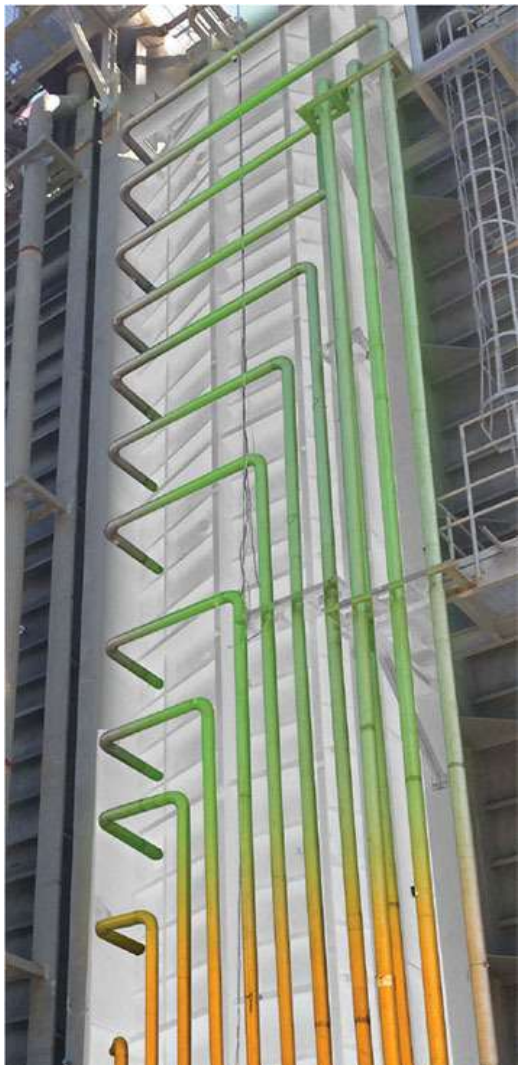
Deltak's global presence speaks volumes about its impact on energy conservation. Its technology supports industries worldwide with over 1,800 units installed in over 50 countries. More than 1,300 Deltak waste heat boilers (WHBs) are found in incineration, biomass, refinery and chemical plant applications, and over 500 Deltak HRSGs are located downstream of gas turbines. Deltak HRSG systems are present in a wide variety of applications, from combined cycle power plants and cogeneration facilities to EOR sites. The versatility of Deltak's HRSGs even extends to cruise ships, where they support gas turbine propulsion at sea.



Original AIG/NH3 mixing design Retrofitted AIG/NH3 mixing design



The Ammonia Injection Grid (AIG) inside HRSG ducting distributes ammonia for reaction within the SCR Catalyst to reduce NOx





Ammonia injection piping, part of a deNOx system, runs up the side and into an HRSG

Emissions control: Catalyst systems

Deltak's direct commitment to reducing harmful emissions includes oxidation catalysts to reduce CO and SCR systems for lowering NOx, both of which contribute to air pollution and climate change. Deltak's HRSGs and simple cycle systems, which do not involve steam generation, can achieve NOx levels as low as 2 ppm with a conversion efficiency exceeding 90%. Its systems also convert over 80% of CO, lowering the levels of this harmful gas to 2 ppm.

CO oxidation catalysts utilize precious metals to convert CO and oxygen into CO_2 and oxygen. The catalyst speeds up the reaction to reduce CO emissions within the correct temperature band. SCR deNOx catalysts, operated within the right temperature range, utilize vaporized ammonia or vaporized urea mixed with combustion turbine exhaust gas to convert NOx into nitrogen and water.

Emissions control: CO boilers and thermal oxidizers

In a general sense, oil refining separates oil into light and heavy fractions. Lighter fractions are sent to an FCCU and heavier fractions to a residual catalytic cracker (RCC). Cracking generates pure carbon in the form of coke on the catalyst, which needs to be removed from the catalyst. In FCCU the coke completely burns off into CO_2. In RCC units, complete coke burn-off would melt the catalyst, so a thermal oxidizer (TO) is utilized to burn the CO into CO_2 at high temperatures and with a short residence time. Deltak has supplied TOs along with WHBs, as well as standalone WHBs behind TOs, to generate steam from hot exhaust gases and lower the gas temperature before it reaches downstream equipment and vents to

the atmosphere.



Fabrication shop fit-up at Deltak: Waste heat boiler as part of hydrogen production facility





New catalyst being installed in a small HRSG

The company's innovative approach to retrofitting HRSGs is particularly noteworthy. While some units were originally designed and built with future emissions modifications in mind, making the addition of emissions systems a relatively simple process, other units present more complex challenges. In some cases, HRSGs have been modified by moving the exhaust stack and rear section of the unit to create space for catalyst ducts. In other cases, Deltak has reconfigured internal piping and adjusted or removed heat-transfer surfaces to accommodate the necessary emissions equipment. Computational fluid dynamics and thermal heat-transfer modeling allow Deltak to provide its clients with information to best understand tradeoffs and chart a path forward.

Heat recovery: A key in SMR hydrogen production

To reduce carbon emissions, hydrogen can be considered as a fuel source on its own or blended with existing fuels. Hydrogen can be produced by steam methane reforming (SMR), where methane, often from natural gas, is combined with high pressure steam.

In a basic description of SMR, methane, steam and heat combine with a catalyst in a reformer to produce CO and hydrogen, known as process gas. Downstream of the reformer, a water-gas shift reaction occurs at certain temperatures where the CO and steam convert to CO_2 and produce even more hydrogen.

Heat and temperature management are critical elements in SMR. Deltak provides heat recovery and steam production solutions that improve the efficiency of the SMR process by capturing and utilizing waste heat generated during the process.

Two major Deltak components of the system are the WHB and the process gas boiler (PGB).

Deltak's WHB: Generating superheated steam

One of the key steps in the SMR process is to generate superheated steam that will mix with methane gas. Deltak's WHB is designed to capture high-temperature exhaust gases from the furnace reactor of the SMR unit. These exhaust gases, which would otherwise be wasted, are used to generate superheated steam. The WHB reduces the need for external energy sources to generate steam and can be designed to optimally locate SCR catalyst systems for direct NOx reduction.

Deltak's PGB: Cooling the process gas and generating additional steam

After the methane and steam undergo the reforming reaction in the furnace reactor, the process gas, which contains about 50% hydrogen, exits the reactor at extremely high temperatures. This gas needs to be cooled to a certain temperature before the shift reaction occurs.

Deltak's PGB plays a key role in this cooling process. Fitted with a flue gas outlet temperature controlling damper, the hot process gas is cooled through the PGB and generates additional steam that can be used in the SMR process or repurposed elsewhere in the facility.

A fully interconnected process

The synergy between Deltak's WHB and PGB in the SMR process is a prime example of how industrial heat recovery systems can drive efficiency. By capturing and repurposing waste heat at multiple stages, Deltak helps minimize energy losses, lowers operational costs and reduces the environmental impact of hydrogen production.

The road ahead: Sustainable energy

Deltak's plan for the future is clear — continue developing heat recovery systems and supporting technologies that exceed ever-tightening environmental regulations. As the world moves towards cleaner and greener energy practices, Deltak's legacy of innovation ensures that its systems will continue to play a pivotal role in reducing the global carbon footprint while enabling industrial growth.



Energy Conservation and Conversion by Innovative Design

We Inspect

We Design

We Fabricate

Aftermarket Solutions | Manufacturing & Fabrication | Engineering & Field

Services Heat Recovery Steam Generators | Heat Recovery Boilers | Watertube Boilers | Firetube Boilers Parts | Design & Engineering Services

To see how Deltak can better your operation, inquire here:

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