Superheater Capacity, Performance, and Reliability Upgrades

Superheater performance and reliability play a critical role in overall plant efficiency. And as the cost of fuels and purchased energy increases, maximizing in-house power generation is a goal with excellent return on investment.

Original equipment and in-kind replacement superheaters were designed to meet the initial operational goals. But a boiler’s operating conditions often change significantly in the years after its commissioning. An increase in steam generation demand, adding a new fuel such as natural gas to the mix, or the need to operate at steam generation rates well below the boiler’s original design are typical drivers of these changes.

These deviations can have a negative effect on the performance of the superheater. The impacts can vary; the final steam temperatures can be lower than the setpoint and lead to reduced power generation, inability to control the steam temperature can result in tube overheating and failures, and structural flaws may be revealed and lead to material damage to the superheater.

To solve superheater limitations, a detailed engineering review is needed. Analysis of its surface area, metallurgy, steam side pressure drop, and attemperation system capacity identifies the now deficient design areas. This allows the development of modifications, or the design of an entirely new superheater that matches the current operational environment.

Based on our analysis and design recommendations, Jansen also engineers, delivers, and successfully starts up improved and robust superheaters. They are installed on boilers used for chemical recovery, biomass, and energy-from-waste using municipal solid waste (MSW) and refuse-derived fuel (RDF), and at facilities co-firing tire-derived fuel (TDF).

We hold an ASME Boiler and Pressure Vessel Code Section I "S" stamp for the design of power and recovery boilers and the NBIC “R” stamp for the design of repairs or alterations of boilers, pressure vessels, and other pressure-retaining items.

Areas of Evaluation and Design

- Process analysis of boiler operating data, flue gas composition and temperature characteristics, superheater geometry and metallurgy, and comprehensive heat transfer study.
- Identification of process parameters to maintain tube metal temperatures at safe levels, i.e., final steam temperature and pressure, attemperator water flow rates, firing capacity, flue gas conditions, deposit characteristics, etc.
- Design and supply of appropriate heating surface area with tube metallurgy to support the target steam temperature.
- Modification of the steam flow pattern to minimize steam side pressure loss across the superheater.
- Engineering analysis for corrosion prediction and preventive action planning.
- Metallurgical upgrades to improve corrosion resistance.
- Review and analysis of the structural elements to support the superheater modifications.