Cross Company

Boiler Control System Upgrade & Efficiency Tuning

Our customer is a large multinational manufacturer of food flavorings and fragrances. In their facility in Florida, they have three boilers which generate steam to provide heat for their production processes. Three boilers provide redundancy and additional capacity for increased need without having to rent or add another boiler. The boilers also act as thermal oxidizers to fully decompose hazardous waste liquids and gases.

Each boiler is controlled by its own PLC. Equipment common to all the boilers is controlled by a BOP (Balance of Plant) PLC with processor redundancy – the plant can tolerate one boiler going down, but if the whole boiler house goes down for more than a few minutes, that would cause much of their production processes to stop for lack of steam. In 2014, the customer contacted Cross about replacing their obsolete Bailey loop controllers to upgrade to newer technology. Shortly after, we upgraded the system to Rockwell's Allen Bradley ControlLogix and CompactLogix. We also integrated the three together to coordinate steam production for optimal efficiency and availability.

In the years since, Cross has come onsite regularly to tune the boiler system for optimum efficiency, as well as regulatory compliance. Without this proper tuning, negative impacts like these could potentially occur:

- **Inconsistent Purity**: Fluctuations in steam pressure or temperature (caused by "hunting" burner controls) lead to surging in the column. This can cause "carryover," where heavier impurities end up in the top product.
- **Off-Spec Production**: If the boiler cannot maintain the precise heat required for the reboiler, the column may fail to reach the boiling point of the target component, leading to wasted batches.
- **Reduced Yield**: Poor control often results in valuable products being lost in the "bottoms" because there wasn't enough consistent energy to vaporize them.
- **High Fuel Consumption**: Improper fuel-to-air ratios lead to inefficient combustion. If there is too much "excess air," you are essentially paying to heat up nitrogen that just flies out the stack.
- **Carbon Tax and Regulatory Fines**: Inefficient combustion increases greenhouse gas emissions. It can also increase production of regulated pollutants such as CO and NOx. In many jurisdictions, this leads to higher carbon taxes or penalties for exceeding emissions permits.
- **Thermal Stress**: Frequent cycling or "slugging" (where the boiler rapidly turns on and off) causes metal fatigue in the boiler tubes and the distillation column's heat exchangers, which shortens their lives.
- **Soot and Scaling:** Incomplete combustion leaves carbon deposits (soot) on the fireside of the tubes. This acts as an insulator, requiring even more fuel to achieve the same heat transfer, creating a "death spiral" of efficiency.

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- **Steam Quality Issues**: An untuned boiler can cause “priming” or “carryover,” where liquid water droplets enter the steam lines. This leads to water hammer, which can rupture pipes and damage the delicate internal trays of a distillation tower.

Running your boiler at peak efficiency is essential for process consistency and to maximize the life of your equipment. Cross Process Solutions has decades of experience tuning boilers in a variety of industries. Contact us today to discuss your particular system and how we can help.