Reducing Emissions and Improving Energy Efficiency for Older Plants

Companies considering plant expansions or reopening older simple cycle power plants and combined cycle power plants should consider that retrofitting older furnaces with the latest burner technology is sometimes necessary for many plants to meet emissions standards and improve energy efficiency. This article outlines some of the difficulties and benefits of retrofitting an older plant for reuse.

Challenges of Retrofitting an Older System

Adding more floor burners to the existing furnaces can alloy the system to reach much higher capacities. However, sometimes complications can arise when retrofitting older systems with the latest burner technology. These complications include flame interaction, which can lead to flame impingement, and flame rollover. Each of these complications can lead to a handful of serious issues which in turn may lead to higher emissions levels, damaged equipment, and unsafe conditions. The smaller distances between burners may increase the risk of flame interaction and flame rollover. Flame interaction can cause damage to the process tubes which will lead to increased emissions and lower outputs.For some situations compact burners are preferred to reduce these risks.

In a combinedcycle system, duct burnerscan be installed to improve the output of a heatrecovery steam generator by providing supplementary firing to increase the thermal energy of the gas turbine's exhaust. When the exhaust from the gas turbine does not have enough thermal energy to superheat the steam for the heatrecovery steam generator, duct burners may be installed to increase the quality or quantity of the steam and increase the amount of electricity being generated by the secondary system. However, burning additional fuel is more expensive and is only cost efficient if electric companies are purchasing the electricity being produced at a higher cost.

Combined Cycle Efficiency and Emissions

Combinedcycle power plants produce as much as 50% more electricity with the same amount of fuel as a simplecycle plant by using both gas and steam turbines. Wasted heat from the gas turbine is used to convert water to steam which is rerouted to a steam turbine to generate extra power. A standard single cycle plant is limited to around 40% efficiency, while a combined cycle gas turbine plant can achieve thermal efficiencies of up to 60%, reducing the amount of fuel needed to generate the same amount of electricity and thereby reducing emissions.

By using waste heat to produce more electricity the amount of fuel necessary to produce the same amount of energy as before is reduced. Burning less fuel inherently generates lower emissions levels. This reduces pollution caused by carbon dioxide and nitrous oxides, while nitrous oxides emissions are reduced further by selective catalytic reductions systems which inject ammonia into the flue gas to combine with the nitrous oxides producing harmless nitrogen and water.

In closing, there are many things to consider for companies that are building, reopening, or expanding simple cycle and combined cycle gas power facilities. This article has outlined some of the thing to keep in mind in order to maximize efficiency and minimize emissions in order to meet emissions standards.