Ultra-Pure Water Injection for NOx Emissions

Market Application Publication

Background

Weather coal or natural gas-fired, today's primary concern for operators of new and existing power plants is the reduction of nitrogen oxides (NOx) emissions. With the Clean Air Act Amendments (CAAA) of 1990 and best available control technology (BACT) for new units, the US EPA increasingly requires reduced NOx emissions. NOx in fuel gas results from nitrogen oxidizing either in the combustion air (thermal NOx) or in the fuel (fuel NOx) with 90 -95% being nitric acid (NO) and the remainder being nitrogen dioxide (NOx). In order to reduce NOx formation it is necessary to reduce the flame temperature.

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Water injection is used to cool the combustion flame temperature to reduce the formation of NOx (nitric oxide). The water is injected straight into the combustors of the turbine. When water is used in a gas turbine, it must be treated just like the water that is used on a typical boiler system to prevent damage to the system. Ready access to water pure enough to use is a challenge and source water must not only be sufficient for the injection flow required but also requires purification.

The Challage

A customer was commissioned to build two temporary fast track power grid systems for a utility. There were regulatory permits issued for the sites mandating stringent regulatory NOx requirements be met. The water was to be sourced from two very brackish wells which also contained a lot of silica in the well water. Consequently in order to make certain all hardness and contaminates were eliminated from the well water to make sure the turbine would be protected, two ultra-pure water systems were commissioned for the site. In addition, the two systems were to be containerized for shipping, meet 160 GPM flow, and had to be delivered complete in less than 10 weeks.

The Parker Solution

Two, 40 ft. containerized dual pass RO units with EDI polishing, complete with chemical feed tanks, prefiltration, booster pumps and EDI distribution pumps were built each on a separate skid. All product was contained within the 40 ft. cargo containers outfitted with fine interior finishing and AC. Each skid is capable of 160 GPM flow each operating independently Each train/unit is controlled by a programmable logic controller (PLC) for automated system operation. The system can start/stop by pushing a single button or from a remote signal such as a digital input signal for low EDI product water tank level. The RO/RO/EDI system is totally contained and permanently bolted inside the vessel. The system can be started and operated under typical steady state conditions. Normal operation is in AUTO with the system controlled through the PLC. Best of all was the systems were built, completely tested and shipped within 10 weeks.

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