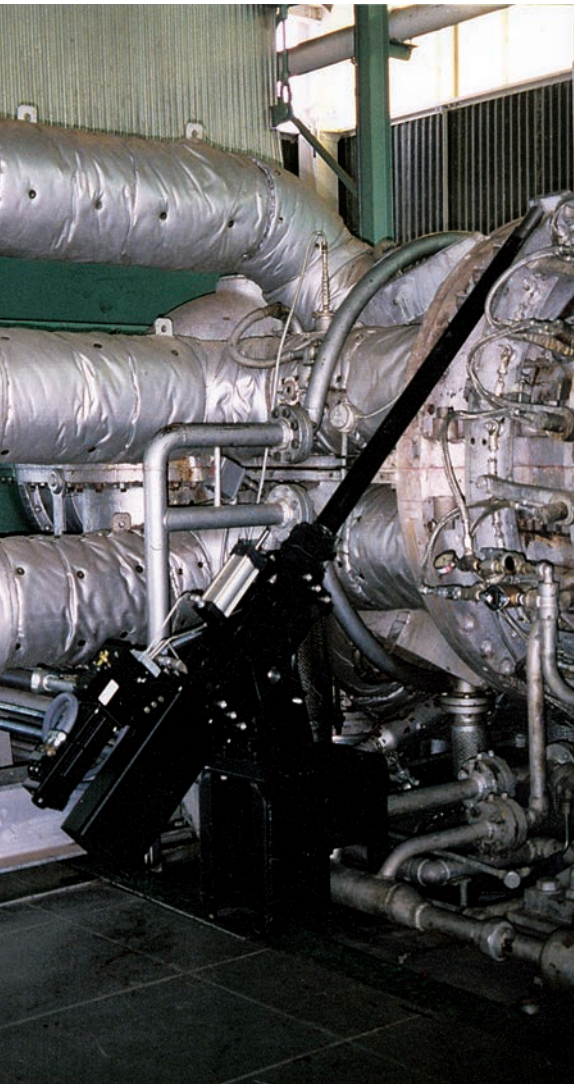




INLET GUIDE VANES AIR FLOW CONTROL



BACKGROUND: Whether a combustion turbine is installed as a simple cycle peaking unit, or in a combined cycle plant with a Heat Recovery Steam Generator (HRSG), it is an integral part of the power generation portfolio for many generation companies. Inlet Guide Vanes (IGVs) are responsible for delivering air to the inlet of the gas turbine's axial compressor, maintaining proper fuel air ratio through various load ranges, and minimizing the potential for unwanted emissions. In a current day combined cycle plant, IGVs are a primary input that ultimately control the exhaust gas temperature, which in turn is a critical input to the HRSG. Stable control of exhaust gas temperature is a key element in delivering the highest level of efficiency to the combined unit.

KEY TO SUCCESS: in keeping flame temperatures low, reducing emissions, and maintaining a stable combustion range, is to accurately and reliably control air to the combustors through the IGVs. Many current day turbines use low NOx combustors that require a lean air-fuel mixture. As hot gas temperatures lower, the formation of NOx reduces. With a higher air mix, it is critical to control the exact amount of air into the combustors, especially during low loads.

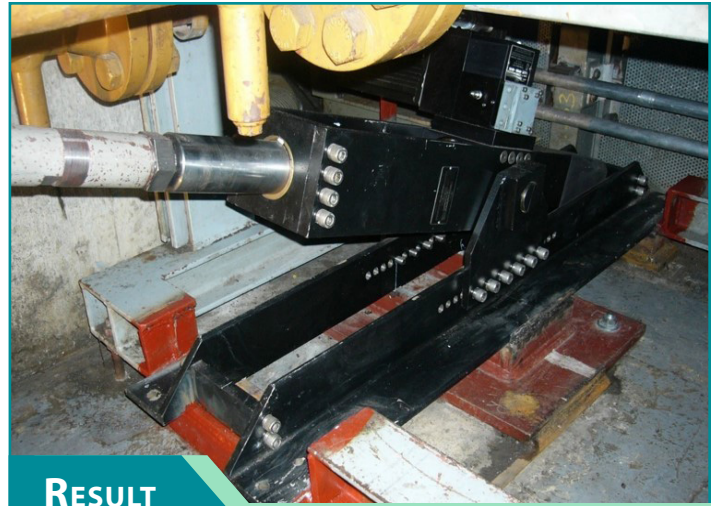
PROBLEM: Maintaining a stable flame and keeping low emissions with dry low NOx combustors is not easy. While the fuel flowing into each individual combustor can be adjusted, the air flow cannot. That is done by controlling the mass flow of air into the turbine's axial compressor. With the air to fuel ratio being so lean, the control of air becomes very critical. Accurately positioning IGVs during ramping and low load conditions can be difficult

ELECTRAULIC™ ACTUATION

when using HPU based hydraulic actuation if any type of contamination is present. With an accuracy of 1% of rated travel for most hydraulic systems, this becomes an ongoing problem that is difficult to shake. Troubleshooting time and replacement parts cost can quickly overwhelm a maintenance department staff.

Flame stability is a challenge during low fuel flow as well, since IGVs must be kept closed so as not to enrich the air-fuel mixture. There is a tendency to increase exhaust temperature during this state, which can put a strain on hot gas path components. So, the vanes are modulated open to prevent the exhaust temperature from surpassing set limits. Precise positioning of the IGVs is certainly a balancing act, and much more challenging than it first appears.

SOLUTION: REXA Electraulic™ Actuation offers a responsive and repeatable control solution for IGV applications on all major manufacturer's combustion turbines. Designed for continuous modulating service, the patented self-contained, closed loop, hydraulic circuit provides stiff, stable control in the harshest conditions (-40°F to +250°F). The closed hydraulic system requires no filters, and does not require any oil based maintenance. A dedicated microprocessor control enclosure operates the drive unit, and is usually located in a convenient area. Set-up and calibration is made simple through a membrane key pad on the enclosure cover. Performance is unmatched in the industry with adjustable dead-band to 0.05% of stroke, resolution of <0.1% and frequency response of 1.5 to 5.0 Hz. Standard product options allow for fail to position or fail in place, as well as rapid full stroke speeds (< 2 seconds) with no hysteresis or overshoot.



RESULT

A gas turbine plant operator will notice improved control of combustion turbine IGVs at low loads almost immediately. This inherently results in consistent exhaust temperatures through the entire load range. When a HRSG is downstream, predictable temperature equals steady steam pressures and temperatures, and improved efficiency. Startup times are reduced, leading to more MW hours on the grid.

When it comes to reliability, since the REXA oil system is self-contained and hermetically sealed, no oil maintenance is required, eliminating unscheduled down time.



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