POWER

FURNACE DRAFT
PRESSURE CONTROL

BACKGROUND: Coal fired power plant operators are facing regulatory pressures to reduce emissions, including NOx and SOx. At the same time generation demand is declining, plants are forced to cycle on and off as well as run at lower minimum loads to remain on line. These two objectives create challenges to a plant's operating practices, many of which were established and refined under constant operation/base load scenarios. Plant operators are forced to adopt new practices and advanced technologies that can improve efficiency and increase reliability even under cycling conditions. Pulverized coal fans and dampers are the final control elements of the combustion process.

Primary Air (PA) fans deliver the required fuel from the pulverizers to the furnace to meet generation demand. Force Draft (FD) and Induced Draft (ID) fans are used to control air and combustion gas flow through the boiler. In the case when both FD and ID fans are utilized, the system is referred to as balanced draft. The most common variant, balanced draft systems operate slightly below atmospheric pressure to ensure safe operation and the removal of flue gas from the furnace.

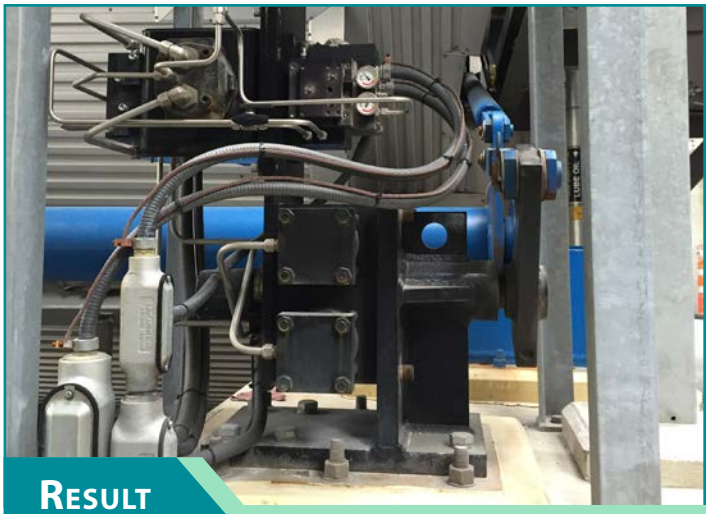
KEY TO SUCCESS of efficient combustion is accurately matching the proper air to fuel ratio entering the furnace. Proper stoichiometric conditions allow plants to maximize fuel usage, and at the same time minimize fugitive emissions at the source of combustion. In systems with large centrifugal fans, flow control is obtained through automation of Inlet Dampers or variable inlet vanes with damper drives. In a balanced draft system, optimized combustion also needs to be obtained with a constant furnace pressure during all load changes. Optimal tuning of both the combustion control and furnace

ELECTRAULIC™ ACTUATION

draft loops requires state of the art and fast acting, high resolution, repeatable damper drives.

Problem: The precise control required to maintain furnace draft can be a difficult proposition, particularly for plants that are cycling. Inadequate FD/ID damper operation negatively affects performance of Low NOx burners which have narrow limits for flammability and need precise fuel/air ratios to work as designed. Poor damper performance, along with inadequate pulverization, are also the main contributors of increased fly ash. The result is slagging and fouling that ultimately leads to increased thermal fatigue of boiler tubes, and subsequent leaks. Load rejection scenarios and turbine upset conditions have the potential to wreak havoc on the stability of furnace draft pressure. Large and rapid step changes can cause pressure swings leading to boiler implosion or explosion scenarios. Pneumatic drives often seen in this application, are less expensive than other options, and capable of very fast stroking speeds. However, they are subject to the compressibility of air, leading to hysteresis and static friction. This makes pneumatics incapable of good repeatability. Electric drives can also be found in damper applications, though they have the slowest speed capability. Those with Induction A/C Motors can have large torque outputs, but are limited in starts/stops per hour. Drives with Asynchronous Motors perform more favorably in continuous modulating systems, but are traditionally limited to lower torque outputs.

Solution: REXA Electraulic™ Actuation offers a rugged, responsive, and repeatable solution for combustion optimization and accurate furnace draft pressure control. Designed for continuous modulating service, the patented self-contained hydraulic circuit provides stiff, stable control in the harshest conditions (-40°F to +250°F). The closed hydraulic system requires no filters or any oil based maintenance. A dedicated microprocessor based 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 very large torque outputs (> 32,000 ft-lbs) and rapid full stroke speeds (< 5 seconds) with no hysteresis or overshoot.



Result

A coal plant operator can realize immediate significant savings due to increased boiler availability. Elimination of all nuisance furnace draft pressure trip events is expected with REXA. Saving one boiler shutdown provides return on investment for the REXA drive 5-15 times depending upon plant size, MW cost, and duration of shutdown. Fuel savings alone due to improved combustion typically pays for the REXA drive in 3-4 months. And something that is not often recognized, a combustion system that's stabilized reduces interaction with other equipment, improving overall plant stability leading to a reduction in required maintenance.

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