Technical Information

Pneumatic Actuators
Reduce Energy Cost while Improving Efficiency

Accurate Positioning of the Final Control Elements in the Boiler Combustion Process is essential for efficiency

Boilers use heat energy to convert water into steam for a variety of applications such as electrical power generation and industrial process heating. Regulations for Boiler Combustion Efficiency to reduce emissions have become stringent in the last years. Accurate positioning of the final control elements is essential to ensure this.

Combustion efficiency in simple terms is the measure of the effective heat rate of a boiler from the combustion process minus the heat loss through the stack. Operating a boiler with an optimum amount of excess air for effective combustion will minimize heat loss up the stack and improve efficiency.

Combustion efficiency is a measure of how effective the energy content of a fuel is transferred into usable heat. Given complete mixing, a precise amount of air is required to completely react with a given quantity of fuel, typically referred to as air to fuel ratio. The end result can be seen as highest delivered heat rate at the lowest fuel cost. In practice, combustion conditions are never ideal, and additional or excess air must be supplied to completely burn the fuel. The correct amount of excess air is determined from analyzing flue gas oxygen. Inadequate excess air results in unburned combustibles, producing soot, smoke, and carbon monoxide. Too much air results in heat lost due to the increased flue gas flow lowering the overall boiler fuel-to-steam efficiency.

Boiler designs vary based on energy type and engineering technology used. In all cases, however, the combustion process requires accurate and repeatable control of the air via diverters, louvers and dampers at the different elevations within the furnace known as hot, cold, primary, secondary, tempering, over fire air dampers, etc.

The UP (Universal Pneumatic) and LP (Linear Pneumatic) actuators are designed to precisely position these final control elements based on the set point from the control system. UP and LP actuators are sized according to the required damper torque/force and travel speed. Options are available for achieving desired safety if the power or control signal fails, such as:

- move the damper to a safe position either fully open or closed or
- hold the last valid damper position.

These options allow the boiler design engineer to select the appropriate safety control philosophy of the combustion loop.

The use of Digital Positioning Technology ensures accurate damper positioning as well as providing advanced diagnostics to provide the user with real time positioning data as well as predictive maintenance information for reliable damper control.

Product Overview:

UP Series Universal Pneumatic Rotary Actuators

Model	Torque (ft-lb)
UP1	90 ft-lb (122 Nm)*
UP2	450 ft-lb (610 Nm)*
UP3	800 ft-lb (1085 Nm)*
UP4	1450 ft-lb (1966 Nm)*
UP5	2800 ft-lb (3796 Nm)*
UP6	4700 ft-lb (6372 Nm)*
UP7	5400 ft-lb (7320 Nm)**

* Supply air 100psi (690Kpa)
** Supply air 80psi (552Kpa)

LP Series Linear Pneumatic Actuators

Model	Cylinder size	Torque**
LP10	2.5x5"(63.5x127mm)	79ft.lb (107Nm)*
LP20	4x4" (101.6x101.6mm)	151ft.lb (205Nm)*
LP30	6x8" (152.4x203.2mm)	724ft.lb (982Nm)*
LP32	6x16" (152.4x406.4mm)	1447ft.lb (1962Nm)*
LP40	8x8" (203.2x203.2mm)	1318ft.lb (1787Nm)*
LP50	8x16" (203.2x406.4mm)	2634ft.lb (3571Nm)*
LP60	10x16" (254x406.4mm)	4107ft.lb (5568 Nm)*

* Supply air 90psi (620Kpa)
** With lever arm providing 90° rotation

Application Overview:

Typical installation of UP type Universal Pneumatic rotary actuator on Boiler Induced Draft Fan Damper control.

Typical installation of LP Type Linear Pneumatic Actuator on Boiler Over fire Air control.

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