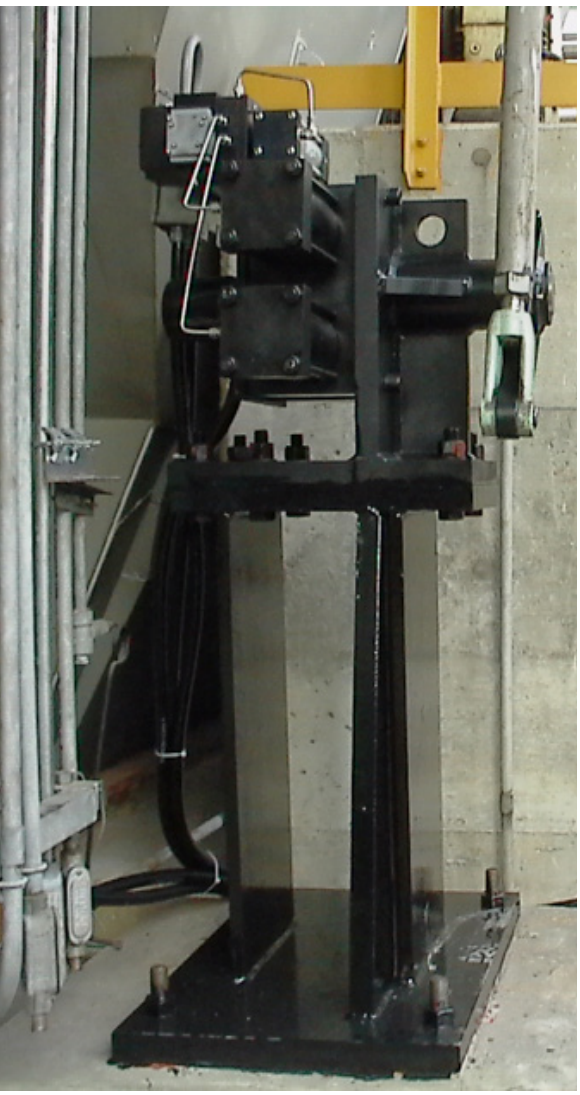
REFINING

FURNACE AND HEATER **STACK DAMPERS**



Background: Furnaces are used in refineries and petrochemical plants to break down hydrocarbon fluids, converting them into fuels or chemicals such as gasoline, diesel, ethylene, and propylene. Furnaces can account for more than 50% of the total plant energy consumption, therefore small improvements in efficiency could have large financial returns. Continuously evolving federal and local environmental laws mandate refineries and petrochemical plants to carefully monitor and reduce cumulative CO & NOx emissions. The effects of controlling fuel consumption, flame shape, excess O2, CO & NOx emission are well understood. Often overlooked are the gains associated with better draft control by utilizing accurate stack damper control.

Key to success: There are many types of processes and instruments available to optimize the draft in a process heater. Safely elevating process fluid temperature to a target level, while maximizing thermal efficiency, throughput, and reducing O2, CO and NOx emissions is the challenge. Fine-tuning of modern damper control systems is possible with fast acting, repeatable and accurate damper positioning. The utilization of accurate and stiff stack damper control can improve efficiency, lower emissions, extend equipment life and improve plant safety. In essence, effective stack damper control can result in higher furnace reliability, maximizing unit run time and increasing the plant's bottom line.

Problem: In refineries and petrochemical plants, despite the high-level automatic control of instruments running complex loops, many dampers are controlled manually, via cable and winch. This type of damper arrangement makes accurate positioning impossible and leads to poor furnace control.

ELECTRAULIC™ ACTUATION

Variations in ambient air temperature, humidity, fuel composition, process flow rates, and unit load create the need to continuously adjust the combustion process to avoid significant swings in furnace temperature and draft pressure. Optimal furnace operation requires the correct air and fuel mixture inside the heater. Most importantly, manual operation of dampers are potential safety hazards to personnel and can be a recipe for disaster during emergency situations.

Pneumatic drives are typically selected as an inexpensive way to automate a damper that was once manually operated. Air's compressibility makes a pneumatic drive an underperformer in this application. Prone to hysteresis, static friction (stiction), overshoot and instability, pneumatic actuators have difficulty making small controlled position changes. This inability to achieve stiff control, limits the efficiency of the combustion process.

Electric drives are capable of high torque outputs but are often slower moving and have motors designed for a limited duty cycle. These drives utilize a gear train which is susceptible to wear over time. This wear results in a loss of positioning resolution, repeatability and an increase hysteresis. Effective combustion control in a furnace requires continuous positioning accuracy which goes beyond the capability of electric actuation.

Since the unavoidable limitations of pneumatic and electric damper drives create unwanted control challenges, operators often choose not to touch the dampers. The dampers may be left open, or in the same position, for days or weeks, thus ignoring the achievable benefits of optimized damper control. By remaining in one position for multiple days or weeks at a time, dampers will often get "stuck" resulting in unsafe conditions for operators who must dislodge the dampers. This type of operation creates significant inefficiencies, lost production and even worse, unit shutdowns that result in profit loss for the plant.

Solution: REXA Electraulic™ damper drives offer high torque, with accurate, repeatable control and quick response time. The positive pressure sealed, self-contained hydraulic system does not require filters, a fluid conditioning system or oil maintenance of any kind. It is designed for 100% duty cycle in the harshest conditions. Torque outputs up to 1,500,000 lb-inches and fast stroking speeds of less than 3 seconds are available. With an adjustable deadband to 0.05% of stroke, a resolution of <0.1%, and a frequency response of 1.5 – 5.0 Hz, REXA delivers accurate control with no hysteresis or overshoot. A dedicated control enclosure operates the system, provides user-friendly setup and calibration and can easily tie into the combustion control system via analog or digital protocols.

Result

Upgrading or automating existing dampers with REXA Electraulic™ drives will provide immediate benefits for any refinery. Accurate and repeatable stack damper positioning allows the operator to control the combustion process, furnace temperature and draft, much more reliably under changing ambient and process conditions. This translates to tighter control, increased furnace efficiency, reduction in emissions and higher production. The return on investment for upgrading to a REXA Electraulic damper drive can be recognized in a matter of weeks.

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