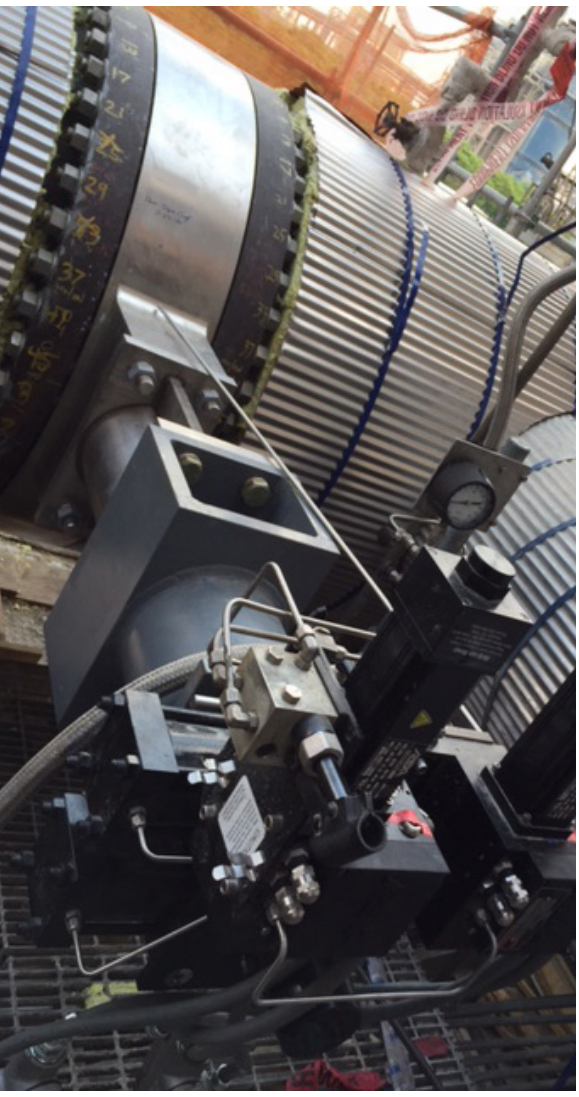
REFINING

FLUID CATALYTIC CRACKING
FLUE GAS SLIDE VALVE



BACKGROUND: Fluid catalytic cracking (FCC) is an essential process in refineries, used to convert heavy feedstock oil into valuable gasoline, jet fuel, and diesel, amongst other products. During the FCC reaction coke builds up on the catalyst, limiting the catalyst's ability to carry out the reaction. The spent catalyst is then transferred to the regenerator to burn off the residual coke. As the spent catalyst is regenerated, flue gas (combustion gas) is created by burning off residual coke. The flue gas must then pass through a flue gas slide valve which diverts the flue gas to a power recovery train or through a series of separators and electro-static precipitators before it is released into the atmosphere.

KEY TO SUCCESS of this application is in engineering a flue gas slide valve and actuator assembly that is capable of modulating with precise control, while providing a fast response to the abnormal pressure disturbances that may occur. The flue gas exiting the regenerator has high pressure, high temperature, high volume and will contain catalyst particulates. These conditions can require the flue gas slide valve to be as large as 80-inches in diameter, with a hydraulic actuator controlled by an Hydraulic Power Unit (HPU). The flue gas slide valve is required to provide accurate pressure control of the regenerator, and in turn, control the differential pressure between the reactor and the regenerator. Tight control is critical in maintaining the FCC pressure balance in the cracking process, allowing smooth flow of the catalyst and feedstock oil between the reactor and the regenerator. Poor valve performance can create pressure unbalances, which can lead to an inefficient hydrocarbon cracking process. If this condition worsens, it creates a potential for unit shutdown and lengthy downtime.

ELECTRAULIC™ ACTUATION

Problem: Common to all HPU's is their inherent "open loop" design flaw. This design characteristic requires HPU's to be maintenance intensive at frequent intervals. Humidity in the air, which is in direct contact with the hydraulic oil in the HPU, creates acid build-up and premature oxidation. Furthermore, contamination in the air leads to dirt and particulate matter entering the hydraulic circuit, impacting the small flow areas associated with servo and proportional valves, and manifolds.

The effect of oil degradation requires HPU's to have several filters in the system that must be replaced frequently, to effectively filter the oil. There are also dozens of O-rings and soft goods in these units that need to be replaced before they become brittle (due to the high temperature of the continuously circulating hydraulic oil) and potential leak paths. HPU's also require the constant operation of pumps, which must maintain a certain operating pressure for the hydraulic actuator to open or close. These pumps require a constant draw of power which can become costly, and they must also be maintained frequently or their failure will result in hydraulic pressure loss and render the valve useless. Finally, these HPU's may have several hundred feet of tubing and hoses creating a potential for leak paths to occur. All of these real concerns require the HPU's to be placed on a rigorous Preventative Maintenance Program, which are time consuming and expensive, in order to prevent the possibility of unit shutdown and unscheduled down time.

Solution: Eliminate the possibility of hydraulic oil breakdown, contamination, and maintenance by upgrading to a REXA closed-loop hydraulic actuator. REXA's self-contained Actuators combine the simplicity of electric operation, the power of hydraulics, the reliability of solid state electronics, and the flexibility of user-configured control. The principle behind REXA's Electraulic™ Technology is a unique hydraulic circuitry called the Flow Match Valve (FMV) system. The actuator incorporates a bi-directional gear pump coupled to either a stepper or a servo motor that provides a highly efficient method of pumping hydraulic fluid from one side of the double acting cylinder to the other. The discrete operation of the motor and pump move only when a position change is required. Once the required position is reached, the motor shuts off and the FMV system hydraulically locks the actuator in place. Motor operation is not required to maintain actuator position; the motor and pump sit idle until a new command signal is received.

Result

With REXA Electraulic™ Actuation, the end-user gets all the advantages of a hydraulic actuator, such as fast response to signal command and precise modulation of the Flue Gas Slide valve, which are essential for tight control, an efficient process and safe operation. The replacement of REXA Actuators provides the client with a closed-loop design, thus eliminating the maintenance intensive headache of a conventional HPU. This means no more oil maintenance, no more changing filters and o-rings, no more maintaining expensive pumps and no more tightening tubing and hydraulic hoses to prevent leaks. Installing a REXA Actuator on your Flue Gas Slide Valve means taking one more thing off your Preventative Maintenance List. With REXA's low deadband (optional 0.05%) and 100% modulating duty cycle, clients retain the precise pressure control reliability and safety required to achieve stable regenerator pressure and steady differential pressure between the reactor and the regenerator in the FCC.

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