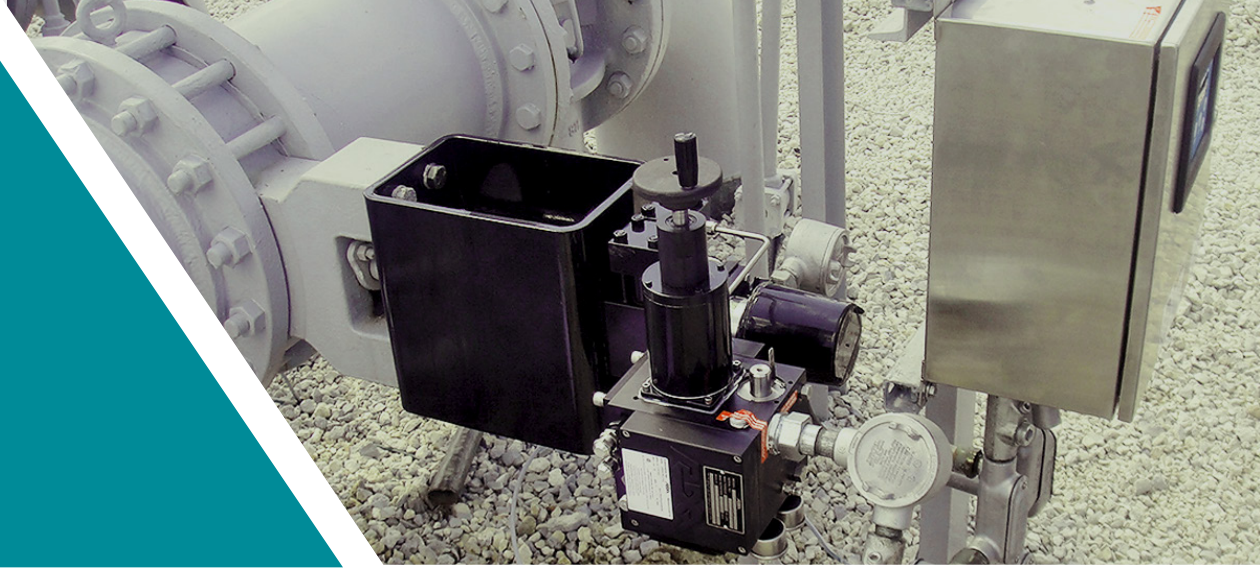
PIPELINE



PUMP STATION
PRESSURE CONTROL

Background: A major midstream pipeline company is undertaking several projects to expand its capacity to meet the energy transportation needs of North America. One of the projects – a pipeline hundreds of miles long – will result in an increase in flow to more than 1,000,000 barrels of crude oil per day from the original design capacity of 400,000 barrels per day. The project will involve modification and upgrading of the existing pump stations, as well as the addition of a number of new pump stations.

Key to success of safe and reliable operations for the company was the inclusion of state-of-the-art pressure control systems as part of the expansion project. Pressure control of incoming and discharge flows at the pump stations directly correlates to overall pipeline safety and security.

Problem: Safe and reliable operations are a primary concern for the company, so state of the art control systems are being implemented as part of the expansion project. A critical part of the control systems is pressure control in the pipeline. Pressure control serves two essential purposes. The first is to control the discharge pressure of the pump station to achieve the proper flow rate and to attenuate pressure fluctuations in the transmission to downstream pump stations. The pressure control systems, which include valves and actuators, must ensure the pipeline is operating below the system design pressure.

The second purpose of the pressure control system is to ensure that the incoming pressure to the pump station is kept above the NPSH

(Net Positive Suction Head) required by the pumps in order to prevent cavitation within the pumps and the possibility of damage that could result from the cavitation.

Pressure control is interactive from one pump station to another, which means that pressure fluctuations at one station will affect all of the other pump stations along the pipeline. The control system must be able to provide fast response to pressure disturbances during starts, stops, and flow rate changes. It must also provide fast response to set point adjustments at one station in order to achieve the desired flow rate and pressure at another.

Solution: Clearly, fast response to commands and precise modulating control of the valves will be essential to ensure the required discharge pressure and to prevent pressure fluctuations in the line, while overcoming the frictional losses during transport of the crude oil. To meet this need, the pipeline company, which owns and operates the line, has selected REXA's X2 Actuators with dual P40 booster pumps. Based on the company's proprietary, Electraulic™ Technology, the 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.

Electraulic™ Technology is comprised of two primary subassemblies: a mechanical subassembly and an electrical subassembly. The principle behind its technology is a unique hydraulic circuitry called the flow match valve system. The actuator incorporates a bi-directional gear pump coupled to either a DC stepper or an AC servo motor that provides a highly efficient method of pumping hydraulic fluid from one side of a double-acting cylinder to the other.

The discrete operation of the motor and pump creates action only when a position change is required. Once the required position is reached, the motor shuts off and the flow match valve system hydraulically locks the actuator in place. Power is not required to maintain actuator position. The motor and pump sit idle until a new command signal is received.

Result

Having secured permits, the pipeline company has begun the expansion project, confident that upgrading the pumping stations and terminals will not only provide the pumping horsepower required along the line, but also the consistent control required in terms of pump discharge pressure and the fluctuations of flow and pressure in the line between the stations. Rigorous customer and third party testing of the valves and actuator packages provides assurance that the pipeline can be operated close to hydraulic capacity for the increased throughput compared to what would otherwise be possible in lines subject to pressure disturbances.

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