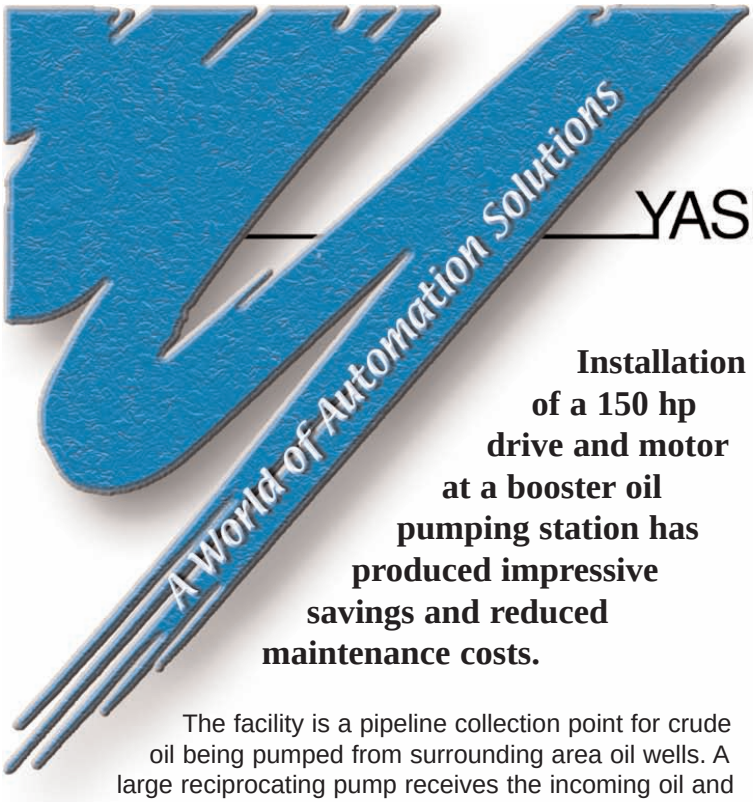

YASKAWA

Installation of a 150 hp drive and motor at a booster oil pumping station has produced impressive savings and reduced maintenance costs.

The facility is a pipeline collection point for crude oil being pumped from surrounding area oil wells. A large reciprocating pump receives the incoming oil and discharges it at pressures high enough to reach a refinery several miles away.

As originally installed, the booster pumping station operated across-the-line, using a PLC to maintain minimum/maximum pressure limits by simple on/off switching. The frequent starts and stops by the constant-torque reciprocating pump resulted in severe electrical demand spikes and significant demand charges assessed by the local electrical utility.

The existing system was subject to broad pressure swings, making process control difficult. Additionally, pressure spikes caused by abrupt starts and stops stressed pump and pipeline system valves and components, resulting in high maintenance and repair costs.

After evaluating the installation and considering alternatives, Gary Dundee, owner of Advanced Industrial Devices, Tulsa, Oklahoma, and Jim Wilson, Regional Drives Specialist for Yaskawa, worked with oil company engineers to solve both the energy and mechanical problems. Their solution was the installation of a Yaskawa ac drive and a 150hp motor.

As installed by Advanced Industrial Devices, the drive is set up to operate in PID mode. It utilizes the drive's built-in set point control to maintain an optimum operating pressure based upon a signal input from the customer's pressure transducer. Because of the application requirements, the drive is set to operate inversely - the greater the signal input, the higher the output frequency.

Pump start and stop cycles have been significantly reduced and utility demand penalties have been virtually eliminated due to the drive's built-in soft start acceleration ramp. Also, the drive's ability to produce a 98 % power factor has nullified "power factor" penalties.

Inrush current for the system is now limited to less than 150 %, a truly remarkable reduction from the 600-800 % usually experienced when the system operated across-the-line.

Additionally, because of the PID set point control, the motor no longer has to run at full speed in order to hold the desired line pressure. Actual running current has dropped from over 160 amps to an average of 116 amps - a reduction of nearly 30 percent.

The drive's built-in set point control has lowered maintenance costs and increased system reliability. One project engineer states that "in the past, we've always had to have a separate, expensive set point controller for process control installations. Now we simply establish a target pressure and enter it into the drive. The PLC provides an error signal which the drive automatically compares to the set point, then speeds up or slows down the motor to match that setting".

Because of high potential pressures in the pipeline, the customer is forced to use a pressure transducer rated at 10 times the operating pressure of the system. As a result, the operating range available for PID control of the drive is limited to less than 1.5 volts out of a possible range of 1-10 VDC. Despite this obstacle, the drive has been tuned so that pressure oscillation has been almost eliminated.

Before installing the drive, system pressure fluctuated between 40 and 400 psi, according to the viscosity of the fluid being pumped. Since the reciprocating pump was being controlled by an "on/off" type pressure switch, the highly unstable pressures caused severe mechanical stresses on the pipeline, valves and related components. Once the drive was installed, pressure surges were eliminated and the system's operating pressure dropped to one half previous levels.