

SURGE CONTROL OPTION

Under *emergency conditions*, some applications require immediate, very high speed motion in one direction. This surge operation may tend to open as in the case of a discharge valve for a centrifugal compressor or to close as in the case of a steam governor for a turbine. The extreme ends (either closed or open) is usually not the ideal control point, but instead a position that is 10% to 30% from the end is optimum. Normal conditions will typically call for precise positioning, modest speeds, consistent operation and stable control.

These two vastly contrary control conditions have led to expensive and complex equipment configurations. The single valve approach requires a sophisticated electrohydraulic actuator with an oversized pump and accumulator system. A two valve approach separates each control condition for improved normal operation, but adds complexity and reduces reliability. In either case, higher cost (both capital and ownership), system overhead and increased maintenance is the result of a surge condition with a 0.1% probability of occurrence.

REXA's approach to surge control is not to design for the exceptional event, but first to provide an actuator that fulfills the normal control needs. Selection consideration is given to the required torque or thrust, stroke, resolution and normal operating speed. The standard actuator is now modified with the surge control package which consist of three main components:

1. **MECHANICAL SPRING**—provides the force to move the actuator in the surge direction.
2. **SOLENOID**—bypasses the normal actuator hydraulic circuit. Requires a high pressure solenoid with zero leakage and fast response.
3. **SOLID STATE RELAY**—interfaces the Rexa electronic controls with the solenoid.

The only customer connections are the power supply and control signal (4-20 mA). An additional calibration parameter (Surge Breakpoint) is included in the setup menu to indicate at what change of signal should the surge control feature be engaged. This parameter is in percent of signal change. If the change in control signal is less then the Surge Breakpoint, then the actuator operates normally through its Electraulic power module. If the change in control signal is greater than the Surge Breakpoint (and in the surge motion direction), then the solenoid opens and the valve is moved at high speed to the new position as indicated by the control signal. Once at the surge position, the solenoid closes and the actuator is precisely positioned by normal operation. An adjustable needle valve is included in the solenoid bypass to allow tuning of surge speed.

Recent understanding of different machines and piping systems have led to various control strategies to predict, limit and stop a surge. High speed instrumentation and control devices are available to sense and provide a corrective signal. The REXA Xpac with surge control option allows the final control element to meet the performance of normal control and still respond to a surge when needed.