**Proactive Valve and Actuator Maintenance Programs**

**for New EPA Regulatory Compliance**

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*Deepwater Horizon* is currently in movie theaters, bringing prime-time coverage to the ongoing risks that must be managed within our energy infrastructure. Lacking the flair of this Hollywood production, government agencies have been busy updating compliance requirements for energy producers. As an example, the U.S. Environmental Protection Agency (EPA) has continued to step up the scrutiny and scope of its Greenhouse Gas Reporting (GHG) rules in an effort to further restrict methane and other volatile organic compound emissions (VOC). Subpart W of the Code of Federal Regulations (CFR) 40, Part 98 addresses reporting of onshore natural gas assets, including pipelines. Since it was enacted in 2011, the subpart dealt with most pipeline segments from the wellhead, through gas processing stages, transmission with compression stations, to above and underground storage facilities and ultimately to local distribution service points. As of January 1, 2016, Subpart W has been expanded to include gathering lines and booster stations as well.

In addition to Subpart W coverage of gathering lines and booster stations, CFR 40, Part 60, Subpart 0000, (commonly referred to as Quad O) has been implemented on all onshore gas facilities constructed or modified since 2011. This regulation subpart affects the operation of equipment in hydraulically fractured gas well completions, pneumatic controllers, reciprocating and centrifugal compressors, storage vessels and leak detection equipment.

With these new regulatory additions, it has become incumbent on operators to consider aggressive predictive maintenance and repair protocols. Valves, valve actuators and linebreak detection systems on natural gas pipelines are three areas that are impacted. These are the final control elements used for emergency shutdowns, and they must be maintained and tested in a manner appropriate to each application to assure required performance while avoiding spurious trips. Spurious trips result in unplanned site repairs and lost revenue, and performance failures can result in escalating repair expenses, regulatory penalties and damage to public relations. A complicating factor to this maintenance program for gas producers and pipeline operators is the fact that these automated valves and linebreak systems are often widely distributed across remote areas.

How can predictive or planned maintenance for these three equipment types be beneficial to natural gas producers and pipeline operators? Each has specific purposes in the spectrum. Valves, Actuators and Detection Systems have identifiable parts that are susceptible to premature failure and that require particular attention for continued, trouble-free operation.

***Valves*** *-* Depending on function, operators employ a variety of valve types for controlling or regulating flow. Rising stem valves are used for shutdown, flow control and pressure control and can include gate valves using wedge, slab and knife configurations, globe valves, and rising stem ball and plug valves.

Part-turn valves for onshore production and pipeline are principally ball and butterfly designs. They are most often used in fail open or fail closed configurations.

Valve leakage can often be attributable to pending failure of its seats or seals. In some instances these components can be replaced in the field, but if they have been subject to corrosive environments, they will need more comprehensive repair of their stems or internal surfaces in a shop environment. Valve stem packing can be restored in the field. Valve replacement inventory at the end users or distributors often allows the valves to be returned to a designated shop where qualified technicians can rebuild the valve with machining, seat grinding, repacking and other services, and warranty its continued use after return to the field.

***Actuators*** *–* the superstructure of a valve normally includes an actuator designed to provide automatic power for operating the valve. Depending on the valve’s function, the actuator can operate as part-turn, linear or multi-turn. Operating parameters can vary in complexity depending on power availability at the site as well as the necessary thrust or torque output necessary to close the valve. Pipeline pressure can range from lows of 50 psi to high pressures of 3,000 psi or more, generally highest in upstream applications nearest the wellhead. Typically, valve actuators are powered pneumatically, hydraulically, or electrically. Pneumatic and hydraulic systems can utilize direct pipeline gas as a supply, and electric systems including electro-hydraulics may utilize solar or cogenerated power with battery backups. Recent updates to electro-hydraulic (EH) actuator technology allow for elimination of the use of line gas for actuator operation while retaining the fast-acting performance of accumulator-powered hydraulic actuators, and EH actuators are trending as an environmentally compliant solution.

Repair and servicing of valve actuators can often be accomplished in the field. The most prevalent operations problems are leakage at the stem seal or stem packing. Environmental conditions can cause seal degradation and corrosion to sealing surfaces of actuators seeing only infrequent operation. Temperature fluctuations, humidity variations and precipitation can also have an influence on standard longevity and mean time between failures. Valve actuators seeing active use can experience seal and seat wear due to side loading from misalignment or harsh conditions. High pipeline pressures can also contribute to the frequency of component replacement needs. Seal kits for all major brands are normally available from brand manufacturers, distributors and qualified repair facilities. Pressure leakage can be visibly detected and seals or packing replaced by isolating the valve without taking it out of service.

***Linebreak Detection Systems*** *-* Pipeline pressure, preset within a specified range, is an indicator that the line is operating as desired for optimum production. Linebreak devices are designed to monitor natural gas pipeline pressures and automatically signal a change outside of pre-determined local conditions. The indication of a pressure anomaly triggers a shutdown of the line until the problem can be identified and rectified. The most common detection device on pipelines today is a mechanical pneumatic unit utilizing a differential pressure pilot to accurately show the rate of drop (ROD) in line pressure. Mechanical units can be placed in remote service without electric power and without risk of an electrical disruption to the detection system. Electronic devices are also available and with perhaps a wider range of configurability.

Linebreak detection systems should include procedures for field calibration of the ROD setting without shutting the main line, and specific test kits are available for this purpose. Experienced technicians and kit providers have the understanding of calibration requirements and should be consulted to perform the service or to act in a supervisory capacity.

The EPA has continued the institution of new methods and regulations designed to reduce the emissions of methane and VOCs. In addition to environmental preservation, part of their rationale is that properly operating equipment can often pay for itself through increased production. Well-functioning valves, control devices, valves actuators and leak detection equipment are key to the clean air initiatives and recapturing of some of its costs. Producers and pipeline operators, with guidance from manufacturers and service providers, all play a role in the success of GHG programs. Establishing a defined program for periodic maintenance and restoration of equipment is necessary to meet compliance requirements and to achieve trouble-free operation.

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