5 simple steps to total valve integrity

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Careful handling and storage of valves prior to installation, as well as following correct procedures during construction and commissioning, ensures a more efficient and safe pipeline, with less chance of lost production and failed isolations. This article outlines five steps to follow for a healthy valve.

1. Selecting the right valves

There are many valve manufacturers and valves for any type of production, temperature, pressure and service condition can be found. Of these makes and styles there is a wide range of feature options to choose from, such as full or reduced port, floating or trunion-mounted ball, rising or non-rising stem gate.

When selecting a crucial component like a mainline block valve, it is best to consider the service conditions. What is the likelihood of the valve seat seals being worn enough to cause significant leakage due to continued dry cycling or the presence of an abrasive like construction debris, black powder or sand? For instance, a metal-seated plug valve would suit a mainline block cross-over assembly application better than a soft-seal ball valve. Due to line purging and throttling, damage can easily occur on the soft-seat seals of a ball valve, whereas metal-seated plug valves are designed to resist seat wear in these conditions.

Many manufacturers claim to produce valves that do not require lubrication and, hence, do not include a seat sealant system to inject lubricant or emergency sealant. Every valve will eventually leak if not properly maintained and the operator's ability to maintain production or to isolate a pipe section could depend greatly on sealing one leaking valve.

2. Storage and handling

Valve care is often neglected before initial installation. Often large diameter block valves are stored on a dusty construction site with no end covers or alternative protection from airborne contaminants. Rarely is the internal sealing integrity of the valve taken into consideration by construction crews whose number one concern is its timely installation.

Likewise, the improper transportation of the valve itself should be of paramount concern to project managers. Any rough handling of the valve could cause the ball or gate to 'creep' out of its seat, exposing the seat ring and body cavity to debris contamination. Any opportunity to prevent contamination of the valve assembly will increase the likelihood of achieving a positive seat seal test once installed.

3. Upgrading

Once the valve design that best suits the operating conditions of the pipeline has been chosen, one of the most important steps is to outfit the valve with the proper internal check valves, sealant injection fittings, body vent/drain fittings, packing injectors, and riser lines (if required). The only chance at maintaining the sealing integrity of the valve depends on the ability to inject synthetic lubricants and sealants into the seat and stem areas of the valve. It only takes one cycle of a contaminated valve to completely destroy the highly sensitive soft seals inside the seating area.

Typically, these upgrades are overlooked during the design phase as future wear and tear is rarely taken into account. Specifying 3/8 inch riser lines, opposed to the more popular and slightly cheaper ¼ inch riser lines, enables service technicians a much greater chance of injecting a heavy sealant faster if leakage is occurring in the seat area and a seal must be achieved. Likewise for injection fittings, a threaded cage design is more likely to withstand the injection pressures of heavy emergency sealants than a crimped cage design, which can fail under as little as 3,000 psi (20,700 kPa). Studies have shown that threaded cage style fittings can withstand injection pressures of well over 50,000 psi (344,700 kPa).

Valve maintenance technicians rely on the ability to blow-down the valve body cavity to create pressure differentials across leak paths in order to 'draw' sealants into the required areas. Technicians are often faced with servicing valves of up to

60 inch inner diameter that are outfitted with ¼inch body vent ports. This is hardly an ideal situation as the drain port will not be able to vent enough pressure to create the kind of differential that is required to deliver the sealant to the areas that need it the most. Many pipeline operators are beginning to specify full-port ball valves in place of body vent fittings on large diameter valves for this reason.

4. Inspecting and commissioning

Of any step taken toward ensuring that a pipeline runs efficiently and safely, valve commissioning is the most crucial. A case in point involves the resurrection of three brand new 36 inch buried mainline block valves due to the complete washout of seat seals during nitrogen purging. The cause: no lubricant in the seat sealant system or seat ring groove.

As a result of valve installation, construction debris becomes trapped inside the pipe where the butt ends are welded. Once installed, the purging process pushes the construction debris against the ball and into the gap between the seat ring and the sealing face. At this point during the aforementioned construction project, had any lubricant been injected into the valve, it would have pushed enough of the debris out and away from the sealing area and minimal damage would have occurred. Instead, the valve was dry cycled and so severely damaged to the point that it required replacement before the pipeline section could be brought online.

The engineers and managers of this pipeline project would go on to implement a strict valve commissioning and pipe inspection procedure. As a result; welding slag, dirt, rocks, and any other kind of debris was meticulously removed from pipe sections before valve installation. Every valve was purged of factory grease and replaced with a high quality synthetic lubricant and air tested to ensure that the seat seals maintained their integrity. Eight years later, every commissioned valve on this project retains perfect sealing integrity.

5. Routine maintenance

If the preceding four steps have been followed, the valve should be online with no problems concerning sealing capability. In order to maintain the valve properly, the operator will need to implement a scheduled routine of sealant system top-ups with synthetic lubricant. Typically, a new valve will require top-up more often than a valve that has been in operation for one year or more. It is this first critical year of operation that the valve seals sit tightest against the ball plug or gate slab and lubricant is required to reduce the breakout torque during operation.

It is advised to top up the lubricant every time a valve is operated for the first year in addition to a semi-annual full service schedule. It may seem excessive, but a small investment in time and preventative maintenance on the front end could potentially save hundreds of thousands, if not millions of dollars on the back end taking into account pipe section isolation during emergency shutdowns. Compared to the cost of an emergency valve body sealing job, a preventative maintenance routine will quickly pay for itself.

Conclusion

Much of this information is not new to pipeline operators, yet thousands of valves in every sector of the petroleum industry are scheduled for replacement every year causing lost production. By taking a few simple steps like these ones above, one could almost completely eliminate having to replace valves before their service life expectancy. In combination with specialised sealants and pumping equipment, it is conceivable that any given valve could stay in service indefinitely and retain sealing integrity.

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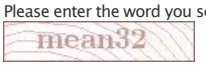

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