MSV Steam Bypass Upgrade
Extends Valve Life

Improved design addresses excess erosion patterns

REGENCO manufactures multi-hole bypass valve retrofits for GE and Toshiba MSV (main stop valve) bypass valves. This MSV bypass valve upgrade applies to steam turbine main stop valves of all unit ratings and includes all stop valve sizes from 8 through 13 inches.

The company recently delivered six MSV multi-hole steam bypass valves to three customers who operate several 350-plus MW GE steam turbines.

Under the original design, bypass valves and stop valve stems exhibit severe erosion in the area adjacent to the bypass valve. OEM attempts to eliminate this problem have included stem inlays and skirted bypass valves, as well as steam chest modifications. Erosion, and the subsequent need to replace valve stems, has significantly reduced time between outages.

Erosion can be an extremely negative issue in steam bypass valves, to the extent that pieces of the bypass valve or stem can break loose and cause damage upon flowing through the turbine. These pieces might also become stuck under the seat of the bypass valve or main valve head, preventing full closure of the main valve.

Two other reasons to avoid possible erosion in the bypass valve area include the cost of overall repairs and replacement parts, as well as the downtime associated with stem failure while in service.

A fully assembled MSV Multi-hole bypass valve.

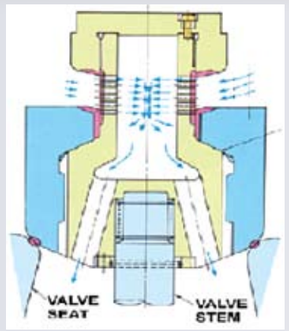
The multi-hole bypass valve is an improved design that redirects steam through the bypass valve without excessive erosion to valve components, as is typically experienced with the original design. The redesigned bypass valve is a hollow steel cylinder with numerous holes that enable bypass steam to flow with no mechanical redirection necessary. The steam turbine's main stop valve performance remains unaffected by this upgrade.

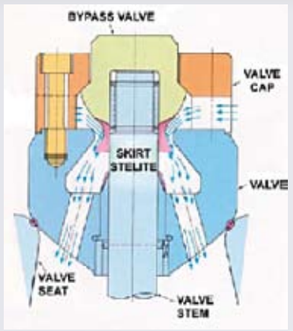
"We are seeing similarities in customer operating profiles for which these multi-hole bypass valves offer an excellent solution," noted Dion Bauer, vice president of engineering for REGENCO. "The typical application undergoes frequent annual starts, and they also spend significant time in bypass mode to heat soak the unit during startup.

"Another challenge for some operators is poor steam quality and the presence of solid particle erosion (SPE) within the steam turbine, which impacts the service life of the bypass valve," Bauer said. "Our multi-hole configuration is a totally different design that has no bypass head in the steam path, so no component is prone to failure from SPE.

"The valve's improved design enables even wear across the valve and increased life expectancy. The valve can be rotated in 90 degree increments, which can result in four times the wear compared to conventional designs," he added.

REGENCO's multi-hole steam bypass valve (left) eliminates the in-stream bypass valve from the original design (right), thus greatly reducing erosion within the assembly.





Better parts, better solution

REGENCO's solution replaces the entire steam-side valve assembly with a multi-hole bypass assembly. This upgraded assembly includes parts made from the latest materials in an effort to minimize the need for future service.

All parts are made under REGENCO's quality program, which includes processes such as CNC machining and automated stellite hard-face welding. The multi-hole design utilizes the following upgraded materials:

- ❑ Stellite coatings in high wear areas
- ❑ Valve stems upgraded to Incoloy material
- ❑ Stellite coated bushings

Implementation of the multi-hole bypass valve design requires an adaptation inspection to measure the existing valve body and parts for retrofit with the upgraded parts.

The multi-hole bypass valve upgrade features all of the parts required for a direct replacement of the original valve assembly, including the bypass valve, valve cap, main valve disc, pressure seal head and valve stem.

A close-up of the multi-hole configuration of the bypass valve head assembly.

Operation after installation

Once the valve upgrade has been installed, REGENCO recommends that the valve be disassembled at regular intervals and inspected for scale build-up. The normal recommendation for inspection frequency is every four to six years to de-scale. This time may vary since scale deposits are a function of steam quality.

Depending on the available steam quality, it is further recommended that the valve be disassembled for full inspection within two years of installation. This determines the amount of scale build-up based on specific steam conditions and facilitates scale removal. Providing that there is no excessive scale build-up observed, the valves should then be inspected at regular four-to-six year intervals.

"Anyone who considers bypass valve failure to be a significant risk for their plant or system should consider our multi-hole configuration," Bauer said.

Increasing time between outages

Upgrading to the multi-hole bypass valve also adds value by reducing typical operating and maintenance costs, such as:

- ❑ Eliminating typical planned outages to replace parts or make repairs due to erosion
- ❑ Extending inspection outages
- ❑ Minimizing blue blush and scale build-up, thus extending intervals between seal head bushing replacement
- ❑ Reducing the risk of bypass valve pieces flowing through the turbine or lodging within the valve
- ❑ Reducing the risk of stem failure

These multi-hole bypass valves have been installed on many steam turbines throughout the world, with units averaging several hundred start/stop cycles. Over time, the current installed base of multi-hole bypass valves has accumulated over five million operating hours.

REGENCO will be happy to schedule a site visit to examine the condition of your bypass valves and offer an assessment on replacement options. To learn more about our MSV multi-hole bypass valves, call REGENCO at 414-475-2800 or visit our website at: **www.regencoservices.com** for your region's sales contact.