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Small Valves

Eliminate leakage by drain, vent, block valves

Many plant managers will tell you that much of the work required to make a new combined cycle a competitive generation asset doesn't begin until after the facility is commissioned and the construction/startup crew drives out the gate and off into the sunset. It's a tough pill for experienced plant personnel to swallow, but they are well aware that many independent power producers focus on initial cost and schedule to meet their pro formas. Lessons learned and best practices often are ignored when developing a spec to build a plant that puts power on the grid as quickly and as inexpensively as possible.

Small valves, in particular, may fly "under the radar." Hundreds of blowdown, drain, and vent valves on heat-recovery steam generators (HRSGs) and turbine steam supply and extraction systems often are sourced offshore from suppliers with questionable quality-control practices. These valves typically are of the gate type, which are marginal for the intended duty in most cases. The bottom line: The valves don't last long and must be replaced.

Budgets, of course, always challenge good judgment. Instead of replacing all HRSG drain valves, for example, plant personnel typically are asked to monitor them and replace leakers at the next outage, as necessary. It can take years to overcome poor decisions.

Bob Morse of New Hampshire-based Bremco Inc, industrial contractors specializing in powerplant equipment installation, upgrades, and replacement, told the editors he often is called to generating stations to replace valves. Some plants, he says, do acoustic surveys of drains on a regular basis to identify ineffective valves. Selection of replacements generally is a matter of personal preference and not based on an engineering evaluation of the specific situation.

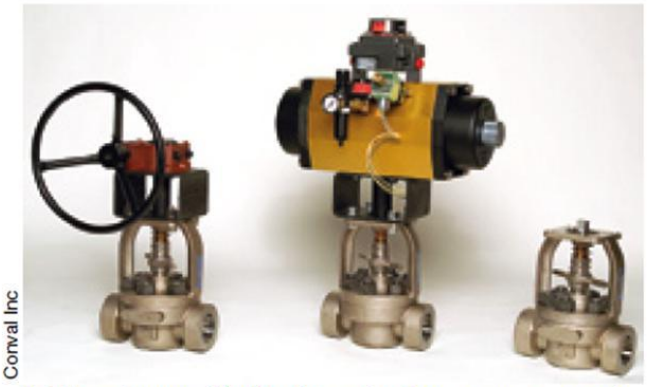
Conval Inc

1. Manual ball valve has removable top for maintenance and inspection. The copper-coated ring is the body-to-bonnet seal

Many valves don't have a chance, he continued, because their seats are compromised during heat treatment. With all the things an owner must check/verify during construction, how carefully can drain-valve installation be monitored? Morse said he often has a difficult time getting heat-treatment specs from valve manufacturers and most suppliers do not provide welding guidelines in writing.

A way to protect valve seats against excessive heat during installation might be to have them supplied with shop-welded "safe ends" (nipples). This is particularly important for 91 material because of its post-weld heat-treat requirements.

Morse said it's not uncommon to find drain systems with mixed materials. For example, P91 piping and F91 valves would be close to the HRSG where temperatures and pressures are highest, 22 material further downstream, and carbon steel near the end of the circuit where temperatures and pressures are lowest. Where this is the case, plant personnel need to be sure replacement valves and piping are matched up correctly; also, that the contractor hired has a QC program in place that lets its personnel weld the material being worked on.



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2. Three types of ball-valve actuators: gear, pneumatic, manual (l to r). Gear operator comes standard on 3- and 4-in. valves from at least one manufacturer because the torque required to operate these valves is so high the handle length would be impractical. Unit shown with large-diameter handwheel has a 4:1 gear reduction, facilitating its operation

The maintenance supervisor for a 2 × 1 7FA-powered combined cycle said valve issues were identified in the steam-turbine drain system at his facility only months after commercial operation. Valves ranged in size from 1 to 2.5 in.

Even earlier, problems arose with the HP bypass desuperheater, which takes spray water off the intermediate-pressure (IP) boiler-feed pump. The stop and control valves for that device were globe-type.

Their Teflon and PEEK seats (wrong materials) stuck within the first hour of operation. The stop valve was replaced with a ball valve, which is less expensive than a premium globe. Ball valves also were installed in the problematic steam-turbine drain system. In both cases, the solution met expectations.

The durability of the plant's original valves for main, cold-reheat, hot-reheat steam drains, and attemperator stop and control service, came under question by management. A list of critical drain valves was developed and annual monitoring of leak-by was conducted to be sure the plant was not losing efficiency.

Conval Inc

3. Ball valve, 1 in. and pneumatically operated, is installed in drain line to handle 2300 psig/950F steam conditions

Ports of about 1 in. in diameter were cut into the insulation to accommodate the acoustic sensor on the "listening device."

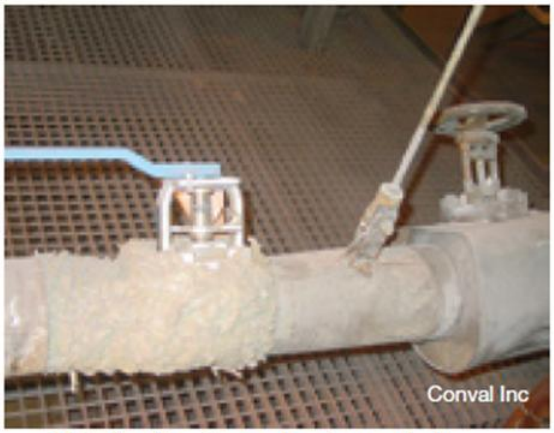
Manual and motor-operated block valves for attemperators were switched to air-operated actuators for simplicity.

The maintenance supervisor told the editors that many of the valves were F91 and had P91 pipe on the upstream side and P22 on the discharge side. The plant continues to survey drain valves for tight shutoff and to replace leakers during maintenance outages. Replacement valves are selected based on compatibility with operating conditions. Ball valves are preferred.

Valves. The editors next spoke with VP Mike Hendrick of Conval Inc, Somers, Ct, which makes a wide range of globe, gate, and ball valves for high-temperature/high-pressure service, to get his recommendations concerning the problematic drain and attemperator block valves supplied with many new combined cycles.

Hendrick prefers ball valves to meet the on/off (never throttling) demanding service needs of isolation, vent, and drain valves. For the temperatures and pressures

experienced in F-class combined cycles, Conval offers ball valves up to 4 in. This size range satisfies most HRSG applications, including attemperator block valves.



4. Ball valve for main-steam drain isolation service replaced an ineffective gate. Body is of F91 material

Quality (eight-turn) globe valves don't leak in demanding drain service, but they are more expensive than ball valves. An advantage globe valves have over ball valves is that you can (but shouldn't) torque down on the stem and slow or stop the leakage; can't do that with ball valves. Stems of ball-type attemperator block valves sometimes snap off because of rapid actuation and abrupt stop.

If "zero-leakage" ball valves leak, it probably is because of distortion in the seat area attributed to the weld process—such as post-weld heat treatment. Welding into a pipeline must be precise, cautioned Hendrick. And when post-weld heat treatment is required, consider valves with safe ends as suggested by Morse of Bremco. Also, be sure lines are clean before operating valves to assure seats will not be scored.

Select your valves carefully. Be sure metal seats are available when service temperatures are 400F and above, stems are blowout-proof, seat leakage meets the tightest specs after installation, coatings assure long life, and can be accessed internally, inline, for inspection and maintenance . ccj