Monitoring Deaerator Performance

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Boiler Systems

Performance Monitoring
Deaerator performance can be benchmarked by routinely looking at several parameters.

Pressure
Deaerator operating pressure should be well regulated and not vary greatly. Otherwise, dissolved oxygen (DO) removal is inconsistent and DO levels may be higher than expected.

Temperatures
One way to monitor deaerator performance is to routinely check the deaerating section temperature and pressure. The temperature should be within 4°F of saturation steam temperature at the deaerator operating pressure. See Deaerator Design and Operation (TB1-010). For a quick estimate: deaerator temperature should be at least two times the inlet steam pressure plus 212. If the temperature is lower than what it should be for the operating pressure, there may be an internal malfunction, insufficient venting, inadequate steam flow, excessive feedwater flow, or makeup and/or condensate temperatures may be too low. Also, periodically check the deaerator storage tank temperature. It should be within 5°F of the deaerator section temperature. Lower storage temperatures indicate poor distribution of feedwater, broken spray nozzles, or cracked, plugged, broken, or shifted trays.

Venting
Check deaerator venting. Proper venting will result in an invisible area between the vent discharge and the plume. You should not see steam right at the end of the pipe, nor should you see water spitting out.

DO Testing
To ensure optimum oxygen removal, spot monitoring of DO in deaerator effluent should be performed. Spot DO testing can be done by the CHEMets chemical test method. For a more detailed analysis or continuous monitoring use an online oxygen analyzer. Before conducting a DO test, feed of the oxygen scavenger needs to be stopped for sufficient time that it is depleted from the deaerator storage section. Depletion time can be estimated using steam load and deaerator volume. Perform DO testing to confirm not only maximum effluent DO level, but also variations in DO levels with swings in steam demand and/or makeup use. If wide swings occur, the demand for an oxygen scavenger may be greater than anticipated or feedwater scavenger residuals will vary widely with the potential for pitting problems in the preboiler section and boiler.

Inspections
Deaerators should be inspected routinely, as advised by the inspection agency. The inspecting agency may require periodic deaerator inspections to ensure weld integrity since weld failures have resulted in several fatal deaerator explosions. Internal inspections can also uncover problems with spray nozzles, trays, deposition, and corrosion so corrective action can be taken. When you inspect a deaerator, some of the items to check include
1. Confirm deaerator type
2. Check trays for positioning and deposition
   • Should be level and secure
   • Should be clean and free of corrosion products
3. Check spray nozzles
   • Spring action and gaskets
   • Spray pattern for evenness - look for dark spots on deaerator walls, indicating uneven spray pattern
4. Check vent for obstruction and any vent condenser present for leakage
5. Check water line position and evenness in the storage section - may indicate level control problems.

Weld integrity is normally the responsibility of the inspecting agency, but if you see obvious evidence of a problem, you may bring it to the attention of the plant personnel. See Troubleshooting Guide: Deaerators (TB1-011).