Shippensburg Pump Company, Inc.

BOILER FEED • CONDENSATE • DEAERATOR • VACUUM

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Re: Why inject steam below the water line of the storage section in our deaerator designs.

Injecting steam into the storage section (also referred as water reserve) of deaerators provides several advantages over other designs. Primarily, it helps prevent the re-absorption of oxygen into the deaerated water since steam injected below the water line keeps the water in the storage section in constant agitation. It provides a heat source for load swings that enables the storage section to operate as a steam accumulator if a rapid load swing should occur. Finally, it keeps the water in the storage section moving which prevents chlorides from becoming stagnant.

In a system *without a surge tank but large quantities of uncontrolled returns*, the addition of make-up water, when required, will create a load swing that will be the difference in temperatures between the hotter system returns and the colder make-up water. An advantage of Shipco's design is that the deaerator has some stored energy in reserve in the storage section creating the capability to continuously scrub water in the storage section to prevent re-absorption of oxygen. When a sudden change in pressure occurs, steam will to be released from the storage water helping maintain the level of deaeration desired.

For deaerator designs where steam is only injected above the water line in the storage section, any oxygen that is re-absorbed into the effluent cannot be released without agitation and the water temperature in the storage section reaching the saturation point (i.e., boiling point). The saturation temperature throughout the depth of the storage section varies. For example, the saturation temperature is higher at the bottom of the receiver than at the water surface. At the bottom of the receiver, the saturation temperature depends on both the internal tank pressure plus the pressure generated by the weight of the water from the surface to the bottom of the tank.

While various designs exist within the industry, most deaerator manufacturers use the same or similar type of steam control valves since steam control valves are very responsive to detecting pressure changes inside the storage tank.

Our goal in manufacturing deaerators is to provide a reliable unit that will meet or exceed customer requirements. Supporting this goal, we are fortunate to have an independent, third-party test of our .005 “dome-style”, pressurized deaerator that confirms our design of injecting steam below the water line produces results that exceed rated performance. The test shows that the highest reading for dissolved oxygen was only 5 parts per billion (ppb) — below the industry-standard rating of 7 ppb for a .005-rated deaerator.

(Note: We recommend using a surge tank to lessen the effects of load swing in a system when condensate returns are 20 percent or more of system load. With a surge tank, make-up water is mixed with system returns for a blended effluent that is pumped to the deaerator by transfer pumps).

Sincerely,

Shipco® Marketing and Sales Department