
Engineering Guidelines

by INDUSTRIAL STEAM

Section 2 - Pressure Decay, 2.2

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Engineering Guidelines

are offered by INDUSTRIAL STEAM to assist in the application, sizing and selection of deaeration and feed water conditioning systems.

If you have questions on any of the topics discussed or on the information provided, please contact one of our people in our sales or engineering groups for assistance.

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Pressure Decay

I. What is pressure decay?

Pressure decay is the uncontrolled drop of pressure within the deaerator which occurs when the steam supply to the deaerator is inadequate to heat the incoming water to saturation temperature.

II. What causes pressure decay in a deaerator?

The reason pressure decay occurs is usually due to the uncontrolled flow of pumped condensate to the deaerator. The flows exceed the heating capacity of the steam service which causes a sudden pressure drop. A failure of the steam supply during operation can also be a factor but this is rare.

III. What are the problems caused by pressure decay?

When pressure decay occurs, the heated, deaerated water boils because the water temperature is higher than the saturation temperature. The feedwater entering the pump suction will boil, causing flashing. The flashing water entering the pump inlet will damage the pump (cavitation) and disrupts feedwater flow to the boiler. If allowed to continue for an extended period, a vacuum will result which can crush the deaerator if it is not designed for a 15# external pressure or not equipped with vacuum relief.

IV. The solutions

A deaeration system which consists of two compartments or vessels will dampen out the effects of large condensate surges which will allow the steam valve to control the vessel pressure and eliminate pressure decay.

Steam Flow: This deaerator utilizes an anti-flash manifold which directs surges of pumped condensate below the water level in the mixing section. Since this body of water is large in respect to the pumped returns the pressure control system never sees a sudden temperature change which can adversely affect the control pressure. Temperature transition is smooth and slow.

Deaerator with a Surge Tank: Make up water and pumped condensate is collected in the surge tank. The blended water is fed to the deaerator through a spring loaded spray nozzle in the internal vent condenser. The feed water flow is always controlled, which results in gradual changes in feedwater temperature. The steam valve is always able to respond to the gradual changes in temperature which allows it to control the pressure.