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# Engineering Guidelines

by INDUSTRIAL STEAM

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Section 2 - Boiler Carryover, 2.5

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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.*

### Engineering Guidelines

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## Boiler Carryover

Frequently a customer calls saying, "The boiler feed pump won't keep up with the boiler." If the pressure and capacity was properly selected, the likelihood of this happening is remote. However, when the boiler feed pump is running and the water level is slowly descending to low level cut-off, it is difficult to convince someone that the fault does not lie with the boiler feed pump.

In nearly every instance, we have found excessive boiler carryover to be the culprit. In other words, boiler water is leaving with the steam which results in water requirements exceeding pump capacity. Low pressure boilers are primary offenders although high pressure units are sometimes responsible.

Carryover can be either mechanical or chemical. Some of the causes of carryover are:

### Mechanical

- 1) Boiler construction-improper internals.
- 2) High water level or improper location of water column.
- 3) Surge firing, on-off firing, or on-off feedwater addition.
- 4) Surge loads where steam demand exceeds boiler capacity.

### Chemical

- 1) Improper cleaning of new boiler.
- 2) High suspended solids.
- 3) High alkalinities.
- 4) Oil in the boiler.
- 5) Improper water treatment and control.

The simplest method of determining boiler carryover is the chloride test. Chlorides are not chemically affected and offer a direct percentage relationship.

For instance, if the raw water has 40 ppm (parts per million) of chlorides and the system has 80% returns, the chlorides in the deaerator should be around 8 ppm. Boiler chlorides are generally 5 to 10 times raw water or in this case, between 200 and 400 ppm. Suppose under the above conditions your deaerator tests at 200 ppm of Cl with the boiler at 350 ppm. You can see that the carryover exceeds 100% of the steam demand. This is not unusual for a high carryover situation, and I have been at jobs where the deaerator water and the boiler water had exactly the same chemical composition. This includes high pressure jobs as well as low pressure. There is no way a properly selected boiler feed pump can keep up with boiler water requirements under these circumstances.

On installations where there are no returns, it might be necessary to run tests on steam samples from the main feed line. Sometimes tests can be run from trap discharges or condensate receivers located in the plant. Any competent water treatment analyst is capable of ascertaining the existence of carryover and computing the exact percentage.

If the water level in the boiler is dropping, or the pump seems to cavitate for no reason, check for carryover. It may explain what is happening.