Controlling Heat Exchanger Leaks

BACKGROUND

Energy costs continue to impact the bottom line at many industrial plants. Wherever possible, heat exchangers are used to capture waste heat for reuse in other areas. The capital cost of a heat exchanger is compensated by reduced fuel costs over the lifetime of the heat exchanger.

Corrosion and eventual leakage in heat exchangers can have several undesirable effects. A concentrated process stream may leak into cooling water that is discharged into a lake or river, causing pollution. Process water, used to condense steam to feed a large boiler, may leak into the condensate and severely damage the boiler. In non-critical applications, corrosion is a problem because a corroded heat exchanger is less efficient and energy is wasted.

Engineers use a heat balance to calculate the efficiency of a heat exchanger, but a small leak actually "appears" to improve heat transfer (although the process is then much **less** efficient).

pH OR CONDUCTIVITY MEASUREMENT?

Leaks can be detected easily with both pH and conductivity measurement (see Figures 1 and 2). Flow will occur from the high pressure side to the low pressure side, so monitoring the low pressure side is recommended. Conductivity is an excellent indicator of contamination for boiler feedwater because the condensate has very low conductivity (under 10 µS/cm) and even a small leak of process water will sharply increase the reading. More conductive liquids can be monitored by pH measurement if the other side of the heat exchanger contains an acid or base of a different strength. In cases where process conditions can change, measurements before and after the heat exchanger can be used to isolate possible leaks.

INSTRUMENTATION

The Model 1056 Analyzer is an ideal instrument for controlling leaks. When the reading (conductivity or pH) reaches the alarm setpoint, a relay in the instrument will close a set of normally open contacts. These contacts can be used to activate an audible alarm, a control room annunciator, and/or a three-way valve that diverts the flow of contaminated liquid to a holding area.

The conductivity sensor used will depend on the range and sensitivity required for leak detection. The 400 Series conductivity sensors are recommended for small leaks in boiler water. The 3900 pH sensor is ideal for monitoring leaks of acids or bases in process water.

• *NOTE: Neither pH or conductivity will detect small leaks of organic liquids into water unless the organic contains a good quantity of acid or base.*

INSTRUMENTATION

Model 1056 Analyzer

- MULTI-PARAMETER INSTRUMENT – single or dual input. Any combination of pH/ORP/ISE, Resistivity/Conductivity, Chlorine, Oxygen, Ozone, Turbidity, Flow.
- LARGE DISPLAY – easy-to-read process measurements.
- SEVEN LANGUAGES: English, French, German, Italian, Spanish, Portuguese, and Chinese.
- HART® AND PROFIBUS® DP Digital Communications.

Model 3900 General Purpose pH/ORP Sensor

- Extended sensor life provided by double junction reference.
- Rugged polyphenylene sulfide body, completely sealed to eliminate sensor leakage.
- Multiple mounting options, including ¾" and 1" insertion and 1" submersion.

Model 400 Conductivity Sensor

- Fast and easy start up with predetermined factory cal constant .
- Rugged titanium electrodes.
- Versatile mounting configurations for screw-in, retractable, or flow-through.

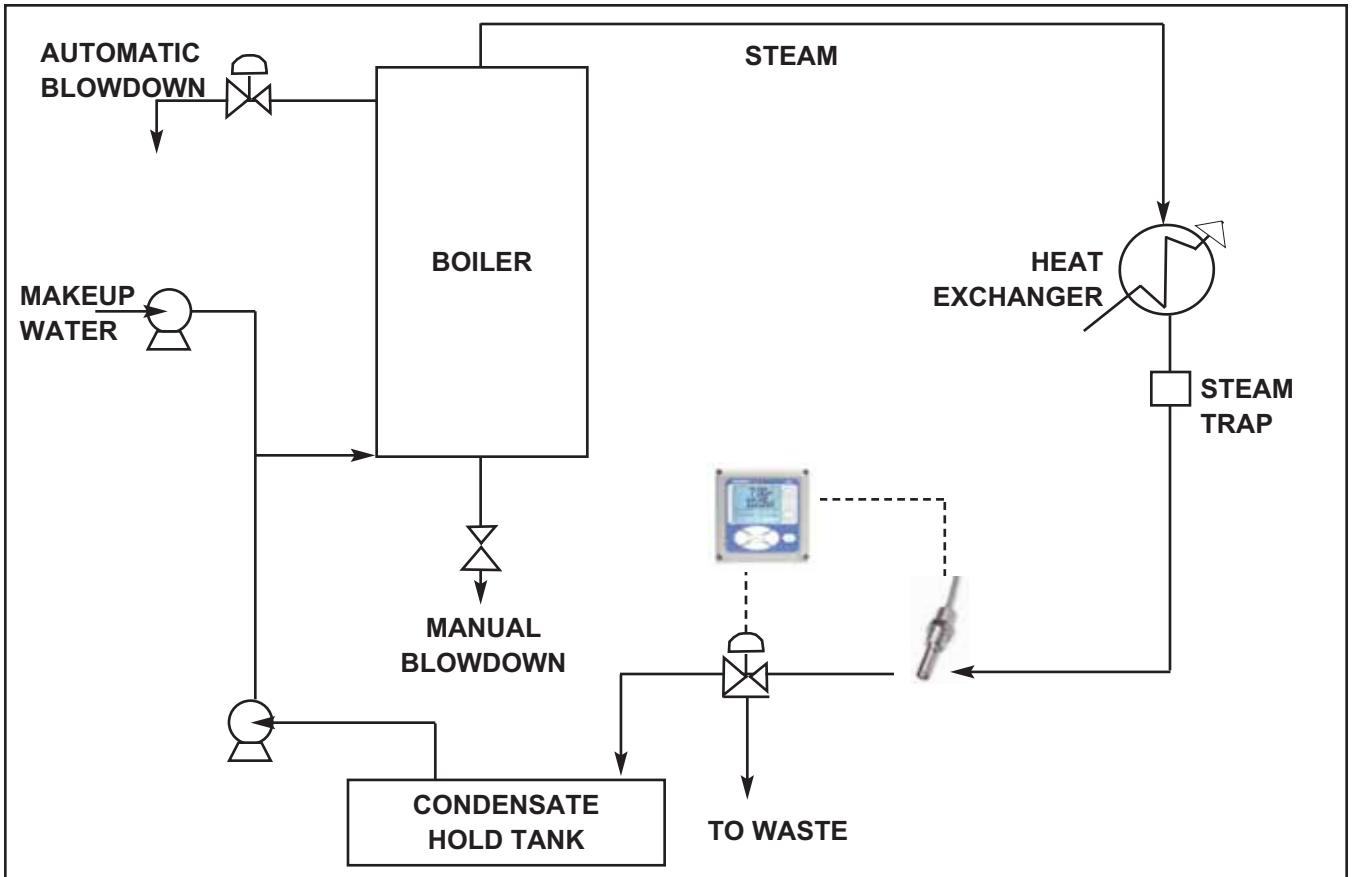

FIGURE 1. Conductivity Measurement Prevents Boiler Damage.

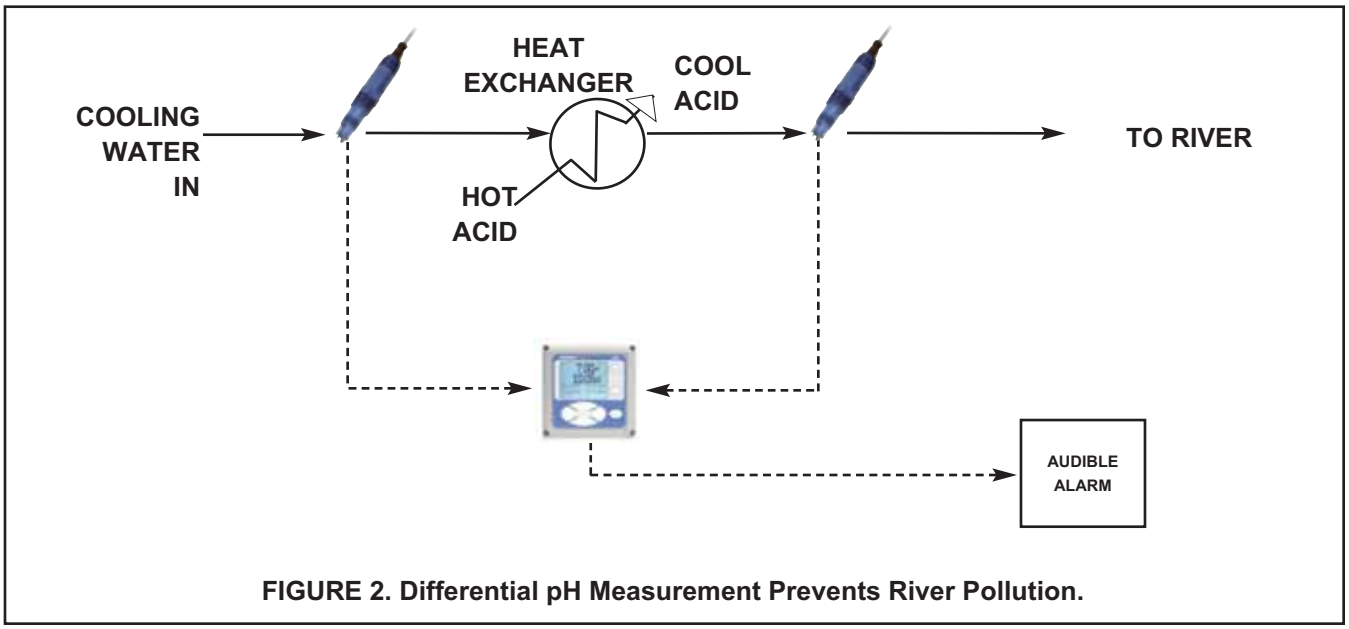

FIGURE 2. Differential pH Measurement Prevents River Pollution.

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