

METTLER TOLEDO APPLICATION NOTE

Controlling Heat Exchanger Leaks

BACKGROUND

Energy costs continue to affect 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).

THE PROCESS

Leaks can be detected easily with both pH and conductivity measurement. 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 feed water

because the condensate has very low conductivity (under 10 microsiemens/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 Models 2100 pH and 7100 Conductivity Analyzers are ideal instruments for controlling leaks. When the reading (conductivity or pH) reaches the alarm set point, 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 InPro[®] 7000 sensor is recommended for leak detection in boiler feed water while the InPro[®] 7200 Toroidal sensors and the Condl 7100 Toroidal Conductivity Analyzer are recommended for leaks of highly conductive solutions when the possibility of fouling exists. The InPro[®] 4500VP pH sensor is ideal for monitoring leaks of acids or bases in process water.

PRODUCTS

Model Condi 7100 Toroidal Conductivity Analyzer

- Measures conductivity, resistivity and % concentration
- Detachable front panel and plug-in terminals for ease of installation
- All functions accessible through the keypad for increased ease of use
- Continuous sensor and transmitter diagnostics to monitor performance
- FM certification for Class I, Div 1 & 2 Environments
- 3 year warranty

InPro® 7200 Toroidal Conductivity Sensors

- Recommended for high accuracy measurement in high conductivity processes
- Choice of materials of construction for increased chemical compatibility
- High temperature range option suitable for CIP and Boiler Blowdown applications
- FM approved for electrical safety

Model 7100 Conductivity Analyzer

- Meets USP23 for Pharmaceutical Grade Water Monitoring
- Detachable front panel and plug-in terminals for ease of installation
- All functions accessible through the keypad for increased ease of use
- Continuous sensor and transmitter diagnostics to monitor performance
- FM certification for Class I, Div 1 & 2 Environments and CSA General Purpose Approval
- 3 year warranty

InPro® 7000 Conductivity Sensor

- Recommended for high accuracy measurement in low conductivity process media
- Variety of materials of construction and process fittings to meet most process requirements
- Stainless Steel sensors are steam sterilizable for hygienic applications
- NIST-calibrated to ensure maximum accuracy

2100 pH Analyzer

- Detachable front panel and plug-in terminals for ease of installation
- All functions accessible through the keypad for increased ease of use
- Continuous sensor and transmitter diagnostics to monitor performance
- FM certification for Class I, Div 1 & 2 Environments and CSA General Purpose Approval
- 3 year warranty

InPro® 4500VP Solid Polymer pH Electrode

- Patented Xerolyt® solid polymer reference system maintains a stable potential for accurate and repeatable pH measurement and low maintenance
- Open junction eliminates reference clogging and extends sensor life
- High pressure resistance eliminates requirement for pressurizable housing
- Xerolyt solid polymer is particularly suitable for use in emulsions, suspensions, heavily contaminated or sulfide-containing media, and solutions with a high concentration of suspended solids