Application Note AN_CorrosionRate

Verifying Corrosion Rate Measurement

1. Overview

Linear Polarization Resistance, **LPR** corrosion rate measurement, displays the instantaneous corrosion rate updating every 2 minutes.

This application note details methods to ensure that the **LPR** sensor is operating & responding to changes in stream corrosivity.

2. Weight Loss Coupon Comparison

If you have weight loss coupons in the same stream as the **LPR** sensor, you should expect the **LPR** rate to be within a factor of 2 of the weight loss rate. This correlation between monitoring methods is applicable for all vendors of **LPR**.

For example, if weight loss indicates 2 mils/year, you would expect the **LPR** measurement to be from 1 to 4 mpy.

Notes:

1. **LPR** is effective in detecting immediate changes in corrosion rate. **LPR** does not replace weight loss coupons.
2. **LPR** and weight loss coupons are not used where the corrosion mechanism is pitting or galvanic corrosion. If with the weight loss coupon or the **LPR** sensor is pitted, the mpy data is invalid for both methods.

3. Verifying Sensor Reponse

Reporting Tools:

1. View or plot the corrosion rate versus oxidant and or acid pump ON time. Corrosion rates typically increase as free oxidant levels rise after satisfying the biological demand. Corrosion rates may increase as pH decreases during the latter part of an acid feed cycle.
2. View or plot the corrosion rate versus temperature and or flowswitch ON time. Corrosion rates may trend higher during mid-afternoon when tower water temperature increases and fall when the system shuts down and flow through the sample header stops.
3. Copper corrosion rates are typically lower than carbon steel unless there are stream components that preferentially corrode copper or deposit on copper surfaces.

Chemical treatment programs vary as widely as the streams that are corrosion rate monitored.

Since corrosion rate monitoring is usually installed to detect a specific fault like loss of inhibitor feed or a change in make-up corrosivity; test the corrosion rate sensors by simulating the fault that you wish to detect.

3. Verifying Sensor Response, continued

On-Site Inspection & Test

1. Remove the sensor and inspect for fouling and pitting. If organically fouled, degrease. Note that the displayed corrosion rate drops after 2-4 minutes when the sensor is not immersed and dried. Streams that foul contact type conductivity sensors, typically coat and foul corrosion rate sensors.
2. Place the sensor is a bleach solution and note that within 5 minutes the corrosion rate has increased.
3. Perform the off-line sensor testing, one sensor at a time to allow you to identify sensors that are incorrectly labeled or have the incorrect alloy type number.

4. Resources

The **LPR** corrosion rate driver card user manual, **Driver_CR.pdf** details:

1. The use of the browser diagnostic display to verify correct sensor operation (Section 2.2)
2. Alloy numbers for different metals (Section 2.1)
3. A simple hardware verification test that requires a 10K resistor (end of Section 2.2)

During testing, increase the resolution of the corrosion rate sensor from 2 to 3 digits after the decimal so that you can view small changes in corrosion rate.