

RETURN GOODS INSPECTION REPORT DETAIL ANALYSIS

Customer: Furrow Pump
Contact: Tim/Phil
Reference No. RGA#110504SE-3
Date: 11-09-2004
Products returned: 1 each S660CD-ORP
Complaint: Electrode Output Shifted

Test Results:

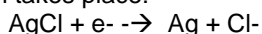
PH4 + quinhydrone: 218mV (acceptance range = 245-290mV)
Ref/Ref: 48mV (acceptance range = <10mV)

Ref/Ref Explained: When an electrode's offset (how much its output varies from the value of the standard solution) exceeds 0.2pH or 10mV, a test is made to determine which part of the sensor (reference of pH or ORP) caused the offset to change. The value of the electrode's reference (connected to the outer shell of BNC) is compared to a known good reference. The known good reference is connected to a pH/ORP meter at the reference input (- input) and the questionable reference is connected to the pH/ORP input (+ input). Two good electrodes will give <10mV or <0.2 pH. Values exceeding these numbers indicate that the reference output has shifted. Once an out of range Ref/Ref is obtained the electrode is cut open to view the reference gel and reference wire.

Inspection Details: After testing in solutions above and confirming offset was at the reference, the electrode was cut open and inspected for signs of ground loop failure. A ground loop was confirmed by the appearance of the reference wire as shown in the photographs below.

A simple explanation of the ground loop is as follows:

Reference is Ag wire dipped in AgCl in 3.5M KCl. If attacked by stray current the following reaction takes place:



Liberation of Cl ion changes Cl concentration in reference and shifts electrode output.

Practical Ground loop information is as follows:

A ground loop commonly occurs due to the following conditions:

Cause

1. Use of plastic pipe and tanks
2. Dirty electrical motors, pumps, mixers, valves, etc.
3. Conductivity probes or other sensors which induce electrical voltage into the solution.
4. Dirty earth grounds in facility.

Effect

1. pH and ORP electrodes are not isolated, which allows voltage to flow through electrode.
2. Voltage seeks to escape from the system through path of least resistance.
3. Reference of electrode acts as this path, and is connected to circuit common or earth ground.

Solution

1. Stop voltage flow through electrode and provide a path of lesser resistance for voltage flow by grounding tank to earth ground.
2. Use Sensorex Ground Loop Interrupt pH electrodes. See attached product bulletin.

We cannot guarantee that Sensorex Ground Loop Interrupt pH or ORP electrodes will solve your ground loop problem, but they should at least reduce the voltage traveling through the reference junction and extend your probe life. Ground loops are not covered under warranty and your returned electrode has been disposed of properly.

