Oxygen Reduction Potential (ORP)

Oxidation-Reduction Potential (ORP) monitoring is normally accomplished by using a platinum measuring electrode. The process exposed to the platinum electrode produces a chemical reaction with the platinum and oxidizes or reduces the platinum band. This process generates a millivolt (mV) signal which is normally of the magnitude of ±2000mV.

ORP is a gross measurement and is not specific for any one parameter unless that parameter is the only variable. Platinum electrodes have been utilized to monitor chlorine residuals in cooling tower systems and swimming pools. Normally the only variable changing is the chlorine level and, therefore, the ORP reading may be equated to chlorine residual. It should be noted the ORP electrode is also reactive to changes in pH. When utilizing an ORP electrode, the pH must be constant for repeatable readings.

Displays may be in the American convention which produces a negative voltage reading during a reduction of the platinum and a positive reading during the oxidation of the platinum. The European convention reverses the polarities.

Calibration of an ORP system is normally accomplished by equating mV levels to concentration. This may be accomplished by noting the reading of the ORP indicator and relating the reading to a laboratory analysis. Calibration standards may be generated by dissolving to saturation quinhydrone in a 4pH buffer at 25°C which should produce a reading of approximately 263mV. By utilizing a 7pH buffer solution with quinhydrone the generation should be approximately 86 mV. The readings are with the use of an Ag/AgCl reference electrode. For calomel reference use, reduce each value by 45mV. It has been noted in past experiences utilizing platinum band electrodes an initial slow response is experienced which may take 30 to 45 minutes for the system to initially stabilize.

The decision of the measurement technique to be used should be a decision made by the customer. Phoenix Electrode Sales is not able to properly evaluate if ORP will generate the required data.

ORP electrodes are subjected to coating and abrasion by ORP measurement. The following is a procedure for testing electrode(s) in solutions of standard potential which will determine response or maintenance requirements.

Set millivolt (mV) range of instrument for the particular application. Add sufficient crystals of quinhydrone to saturate a solution of 7pH buffer. This may be evidenced by undissolved crystals suspended in solution. While stirring, immerse electrode(s) into liquid.

Measure potential. Potential should be within ±10mV of the following values:

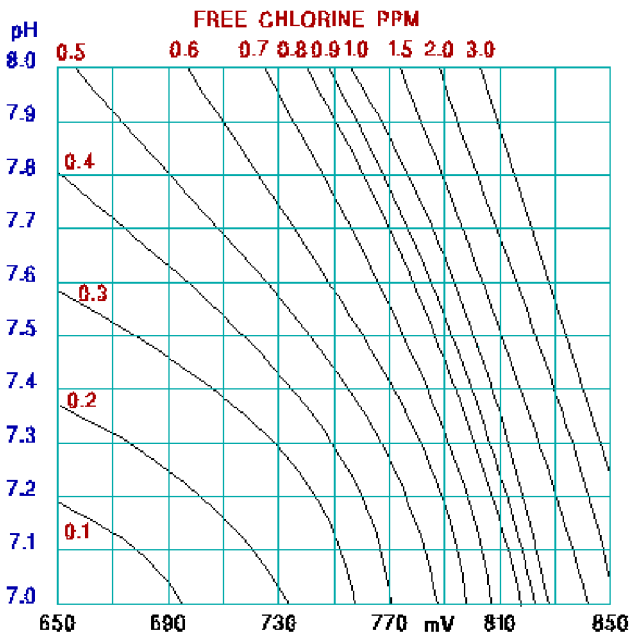
Temperature (°C):	20	25	30
Potential (mV):	+92	+86	+79

Remove electrode(s) and rinse thoroughly with water. Formulate a saturated quinhydrone solution in 4pH buffer. Immerse electrode(s). There should be a rapid response to the following potential.

Temperature (°C):	20	25	30
Potential (mV):	+268	+263	+258

The mV difference between the two solutions is theoretically 177mV. The absolute values may shift a few mV due to slight variations from theoretical potential by the reference electrode.

If the potentials are correct, flush electrode(s) with de-ionized water and measure the liquid in question. If incorrect by more than 10mV, electrode(s) should be cleaned with aqua regia, three volumes concentrated hydrochloric acid and one volume concentrated nitric acid. Note: Solution very corrosive, so handle with extreme care. Repeat above tests. When satisfactory readings are obtained, install electrode(s) in liquid in question. Because quinhydrone solutions are not stable, discard immediately after use.



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