



Comparison of Dissolved Oxygen (DO) Test Methods

Introduction

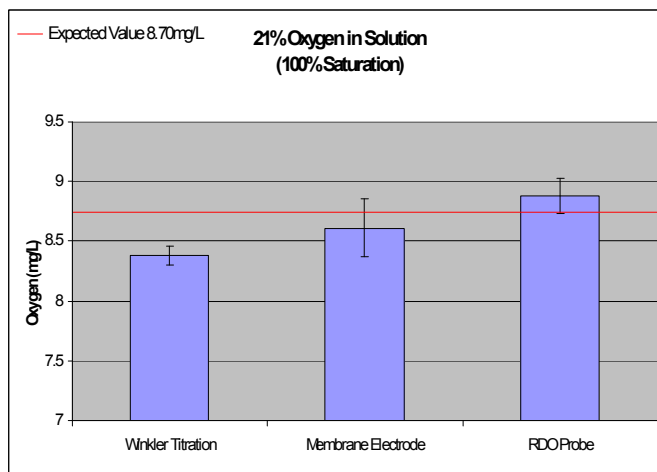
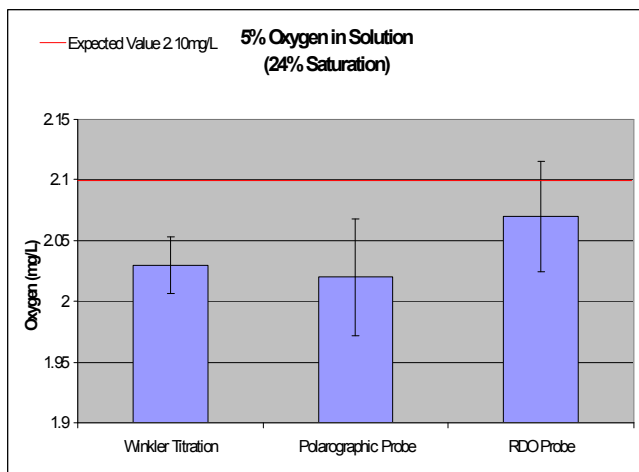
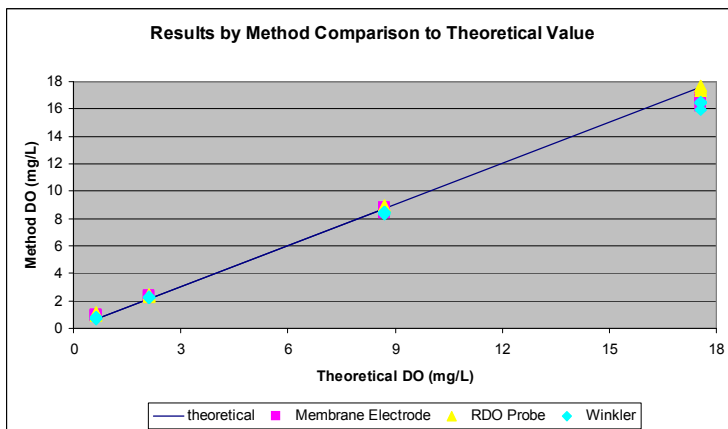
The Orion Rugged Dissolved Oxygen (RDO) probe utilizes the latest lumiphore technology for measuring DO. This probe requires little maintenance making measurements simpler and easier. The speed, accuracy and precision of the RDO probe is equivalent or superior to current DO measurement techniques. To see application notes for measurement of DO in specific samples such as wastewater, seawater, groundwater and wine, go to www.thermo.com/waterapps.

How the Sensor Works

The Orion RDO probe utilizes a luminescence technology to detect oxygen in a sample. The sensor cap contains a lumiphore which, when excited with a blue LED light, emits back a red light in the absence of oxygen. When oxygen is present, it quenches some of the blue light so a reduced red signal is emitted. This process is well characterized and thus can be used to determine the oxygen in a sample. Because the signal response is inversely related to the oxygen content the less oxygen, the stronger the signal. Therefore this probe has improved accuracy in low level samples.

Accuracy

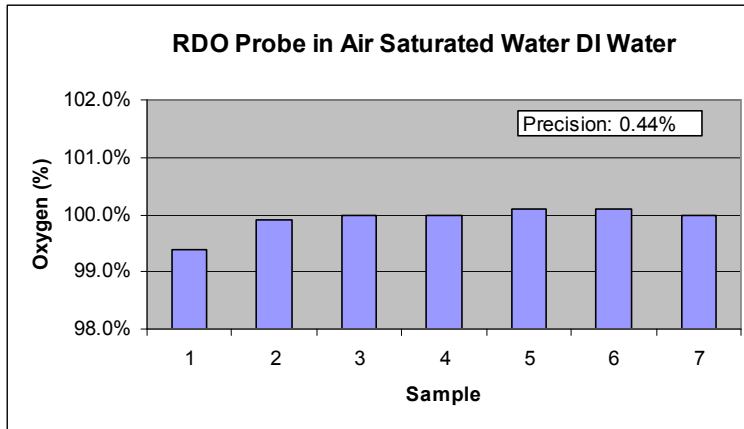
The Winkler Titration and Membrane Electrode are the current accepted methods for reporting DO results in wastewater. The Orion RDO probe is well correlated with these methods and has improved accuracy as can be seen in the graphs below. Samples are all deionized water bubbled with gases containing known amounts of oxygen to saturation.





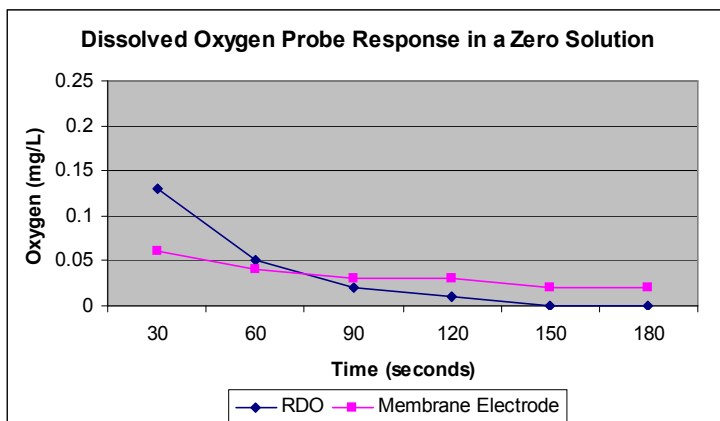
Precision

The Orion RDO probe also displays great precision as is shown in the graph of multiple air saturated water sample measurements.



Low Level Response

The Orion RDO probe shows excellent response in low level oxygen samples. The response time is comparable to the membrane electrode but the Orion RDO probe has improved accuracy as it reads the expected zero in the oxygen-free solution. These readings followed a water saturated air calibration, indicating that calibration at a zero point is not necessary for accurate low level measurements with the Orion RDO probe.



Method Approval

The luminescence technology is accepted by ASTM for wastewater testing in Method D 888-05 Part C Luminescence Based-Sensor Procedure. The federal EPA has recommended that regional EPA offices grant interim approval for this method for wastewater dissolved oxygen and BOD monitoring. The regions are evaluating this procedure and some have already accepted it as a method for wastewater monitoring.

The Orion RDO probe was tested as part of the Standard Methods Oxygen Joint Task Group which was formed to evaluate the luminescence probe against current methods for inclusion in SM 4500-O for water and wastewater testing.

Probe Advantages

In addition to improved performance, the Orion RDO probe has other features which make it advantageous over the membrane electrode. The sensor cap is good for one year and does not degrade over time. This replaces the membranes and electrolyte used in membrane electrodes which must be changed frequently. There is no fouling of the RDO probe sensor so the regular internal polishing of the membrane electrode is not required. The lumiphore is specific for oxygen and therefore other gases, such as H₂S do not interfere with Orion RDO probe measurements. The luminescence technology does not involve oxygen consumption by the probe (as in the membrane method) and therefore requires no stirring or sample stream during measurement. The RDO probe can also be used immediately – there is no wait time required since polarization is unnecessary.