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## **Independent Testing of Dissolved Oxygen Monitors for Water Distribution Monitoring Insite IG 3100 pipe mounted optical DO meter**

### Introduction

WRc is currently running a project titled: Using dissolved oxygen for real time monitoring of water quality. The primary objective of this work is to fully evaluate the potential for DO to provide real time information on significant changes in the microbiological, chemical or physical quality of water during distribution. As part of the work DO measurement instruments have been selected and evaluated under laboratory conditions to determine measurement stability in response to changes in other distribution variables.

### Dissolved oxygen instruments

Envitech Ltd as the UK distributor for Insite IG loaned WRc an 3100 DO monitor for inclusion in the laboratory testing. The instrument was operated using the control interface with the response logged via the 4-20mA output. As recommended the factory calibration was not changed for the period of the tests.

### Experimental

The test instruments were positioned on a 3-inch PVC section of pipe feed from the rising main at WRc, Swindon. The Insite IG 3100 was positioned on the pipe length using the supplied T fitting onto which the sensor located.

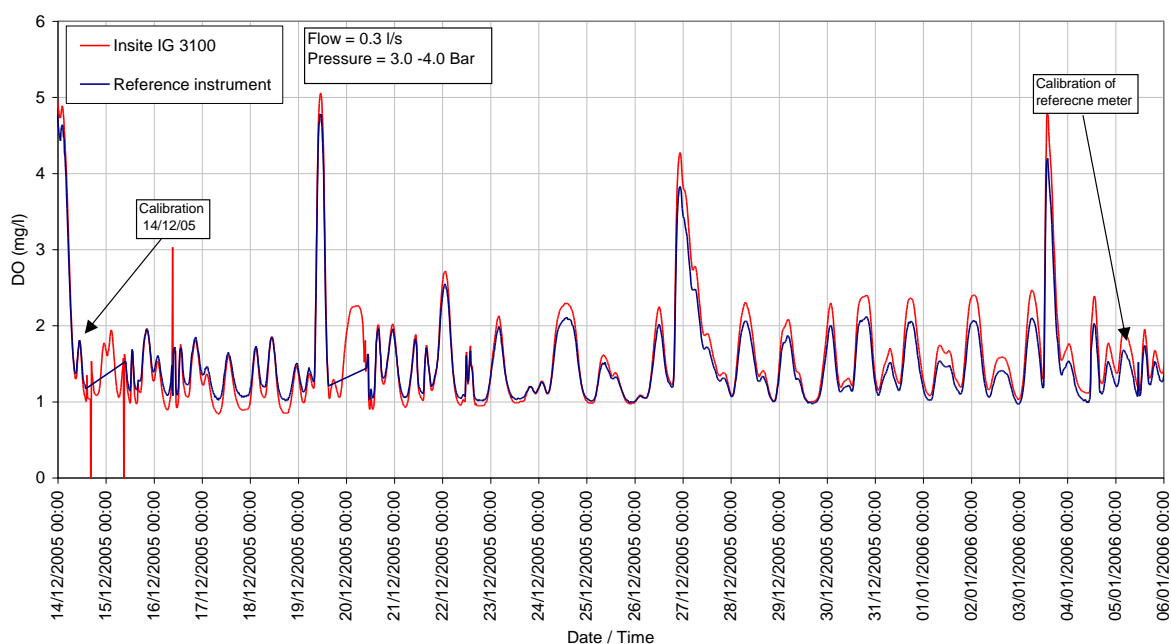
The experimental testing conducted by WRc included continuous operation as well as the assessment of variables likely to occur under operation in a water main.

### Results

#### a) Instrument response and comparison to reference instrument

The Insite IG 3100 was tested for a continuous period of 39 days between 09/12/05 to 17/01/06. The instrument was found to successfully track the dissolved oxygen level between 1-5 mg/l over the period of the trial. The only unexpected event was an instrument error, occurring on several occasions, which is thought this is likely to relate to the instrument earthing within the experimental rig.

The results in Figure 1 show the DO response over a period of 23 days. There is very good agreement between the Insite IG 3100 and reference instruments in the period following the calibration on the 14/12/05. The instrument drift was not rigorously evaluated, however the drift over this period is estimated at less than 0.18 mg/l, when compared to a recalibrated reference meter. Drift of the reference Galvanic type meter can be clearly seen in Figure 1.



**Figure 1 Comparison of Insite IG 3100 and reference meter over a period of 23 days**

b) Assessment of potential factors affecting performance

Factor investigated	Results
Pressure change	No observed change to dissolved oxygen response over a pressure range of 0-4.5 Bar
Flow velocity	No observed change to dissolved oxygen response over a velocity range of 0.15-5.5 cm/s. At zero flow the instrument continues to respond.
Temperature	The instrument responded correctly over the range of 7–19°C.  When subjected to a rapid change in temperature (9°C change over 5 minute period) the DO reading showed a small deviation from the correct level until the temperature stabilised, at which point the DO returned to the correct level. It is thought that this is a result of a temperature compensation delay. It should be noted this response was observed in all the tested instruments and is not considered an issue for potable water monitoring.
Chlorine	No observed change to dissolved oxygen response over a free chlorine concentration of 0.1–5 mg/l
High DO level (Performed as mains water at low level)	A clear response up to saturation levels which closely agreed with reference instrument.

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