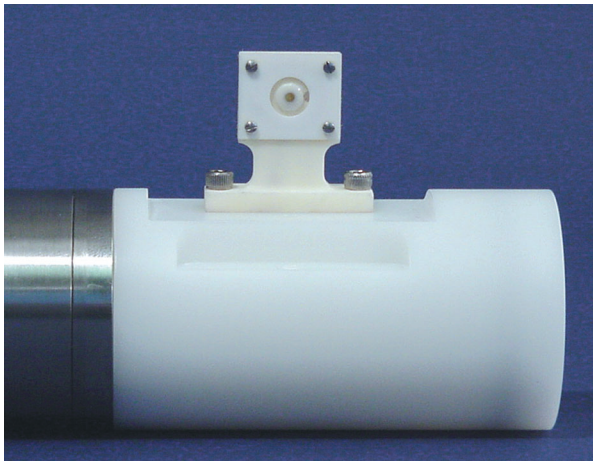


# Extend Your Dissolved Oxygen Measurements in High Fouling Environments

Sea-Bird identified the causes of known Clark cell problems and developed solutions for each one in the SBE 43

Electrochemical drift non-detectable,  $\ll 1 \mu\text{mol/kg/yr}$



*SBE 43 Dissolved Oxygen Sensor with plenum removed*

- Polarization time eliminated
  - Stabilization time at beginning of profile reduced to seconds
- Thermistor at sensor electrode reduces phase error between T and DO
  - Signal resolution increased by onboard temperature compensation
- Flushing at time of sample guarantees an accurate reading of ambient DO

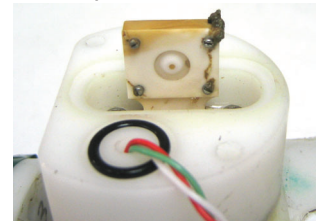
With negligible electrochemical drift, biofouling becomes the main challenge in coastal estuarine environments

Plumbing isolates SBE 43 from continuous exposure to external fouling environment

*Outside of plenum*



*With plenum removed*



*SBE 43 after 4 months in Shilshole Bay (see data on next page, far right)*

Other benefits of plumbed environment:

- Water is trapped and goes anoxic, minimizing electrolyte effects
- Anti-foulant concentration is held in place between samples
- Black tubing and plenum block light, reducing *in situ* algal growth
- No moving parts that will foul



*SBE 16plus with SBE 43 before and after 5 months in Cockburn Sound -- note, intake and exhaust protected from biofouling by copper extensions*

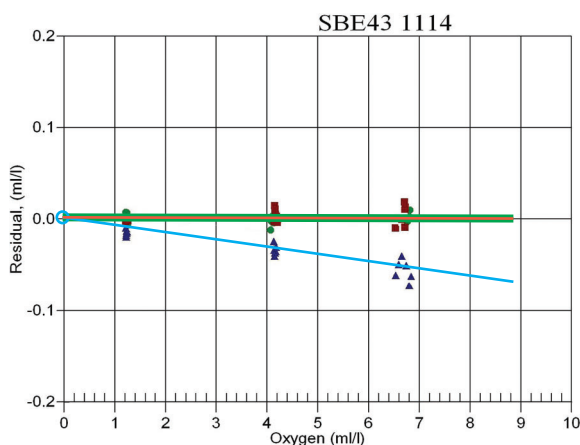
## The SBE 43 calibration changes in slope, not offset

SBE 43 calibration changes in slope due to fouling, but the sensor voltage at zero remains stable.

$$\text{Oxygen (ml/L)} = \text{SOC} * V * [\text{Tcor}(T) * \text{Pcor}(P,T) * \text{Oxsol}(T,S)]$$

where

- **SOC = Linear slope scaling coefficient; changes with fouling**
- V = Sensor voltage
- Tcor and Pcor = Model of Temperature and Pressure response of sensor
- Oxsol = Oxygen solubility

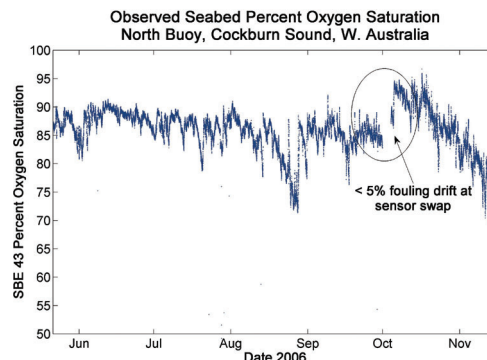


Original SBE 43 calibration (green), post calibration (blue), after cleaning calibration (red). Zero oxygen residual does not change.

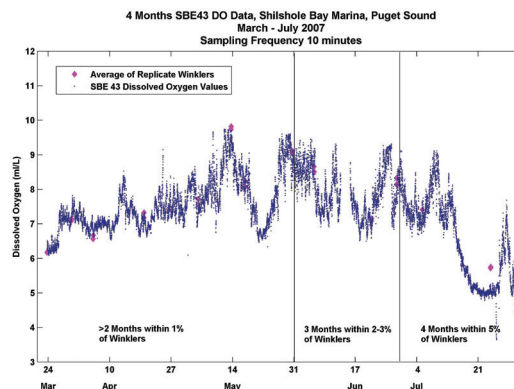
Reference Winkler DO (ml/L)	SBE 43 DO before cleaning (ml/L)	Residual (SBE-Wink) (ml/L)	Correction factor to multiply SOC in calibration equation
6.80	6.75	-0.05	6.80/6.75=1.007
4.20	4.17	-0.03	4.20/4.17=1.007
1.20	1.19	-0.01	1.20/1.19=1.008

Fouling affects the slope only. Therefore, a single reference value can be used to correct the slope term (SOC) in the calibration.

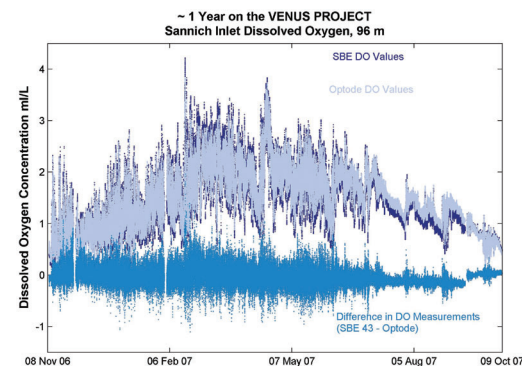
## The SBE 43 is proving an excellent performer on long-term moored applications



5 months in restricted coastal lagoon, < 5% fouling drift observed at sensor swap (Cockburn Sound, W. Australia)



4 months in coastal urban marina (Shilshole Bay, Washington)



<http://www.venus.uvic.ca/data/mainpage.html>

1 year on Venus Project, sample rate 1 minute.  
SBE 43 measures true environmental variability in DO due to faster response time.  
**No Electrochemical Drift, No Fouling Drift, No H<sub>2</sub>S Poisoning!**