

Version No: 1 Issue Date: 31/08/2011 Portfolio: Water Quality	Horizons Regional Council	Section No: 10.21 Page: 1 of 2
	Hydrology Operations Manual	

Saturation Calculation (Barometric pressure correction)

Overview:

The WTW in-situ dissolved oxygen sensors do not measure barometric pressure and therefore do not correct for changes in barometric pressure. All dissolved oxygen readings recorded in the field by the in-situ sensors will require barometric pressure correction.

Barometric pressure measurement is not available at all dissolved oxygen sites and in those instances barometric pressure from a “close by” site is used with an altitude correction. “Close by” for the purposes of dissolved oxygen is within 50 km of the dissolved oxygen sensor.

The in-situ sensors actually measure oxygen pressure so it is essential to correct the saturation readings using the barometric pressure at the time of sampling.

Altitude correction:

The barometric pressure used in the saturation calculation is true barometric pressure, not corrected to sea level. The altitude corrections and barometer used at each dissolved oxygen site is shown in method 10.2 of this manual.

For simplicity this conversion corrects the barometric pressure of the reference barometric pressure sensor to sea level, then applies the altitude correction for the dissolved oxygen site. This reports the calculated true barometric pressure at the dissolved oxygen site.

- Correct reference barometer to sea level:

$$P_{\text{sea level}} = P_{\text{reference}} + (H_{\text{reference}} \times 0.1222)$$

- Correct to true barometric pressure at the site:

$$P_{\text{Site}} = P_{\text{sea level}} - (H_{\text{site}} \times 0.1222)$$

Where:

$P_{\text{reference}}$ = True barometric pressure in mbars of the reference barometer

P_{Site} = True calculated barometric pressure in mbars of the dissolved oxygen site

$P_{\text{sea level}}$ = Sea level corrected barometric pressure in mbars of the reference barometer

$H_{\text{reference}}$ = Height above sea level in meters of the reference barometer

H_{site} = Height above sea level in meters of the dissolved oxygen site

Barometric pressure corrected saturation calculation:

$$\text{DO\%}_{\text{Corrected}} = \text{DO\%}_{\text{Uncorrected}} \times 1013.25 \div P_{\text{Site}}$$

Where:

P_{Site} = True calculated barometric pressure in mbars of the dissolved oxygen site

$\text{DO\%}_{\text{Uncorrected}}$ = Raw dissolved oxygen saturation from the sensor

$\text{DO\%}_{\text{Corrected}}$ = Corrected dissolved oxygen saturation

Version No: 1 Issue Date: 31/08/2011 Portfolio: Water Quality	Horizons Regional Council	Section No: 10.21 Page: 2 of 2
	Hydrology Operations Manual	

Saturation Calculation (Barometric pressure correction)

Virtual Model calculation for Hilltop:

The following VM will calculate the dissolved oxygen saturation value correcting to a nearby barometric pressure sensor.

'Atmospheric pressure correction for dissolved oxygen saturation
'Written 01-08-2011, By David Brown.

Get "Dissolved Oxygen Sensor" as Temperature

Get "DO saturation" as Uncorrected_Saturation

Get "{Manawatu at Hopelands} Atmospheric Pressure" as Barometer 'Select reference barometer

' Correct nearby reference barometer for altitude:

Barometer_Height = 109

'Height above sea level in meters for the referenced nearby barometer.

Site_Height = _Altitude

'Height of this site above sea level

'Pressure change per 100 meters taken as 12.22 mbar (at 15 degrees)

sealevel = Barometer + (Barometer_Height * 0.1222)

Barometer = sealevel - (Site_Height * 0.1222)

'Calculate local corrected DO saturation:

Corrected_Saturation = Uncorrected_Saturation * 1013.25 / Barometer

Put Corrected_Saturation

The highlighted items will need to be changed when using a different reference barometer.