BOD Dissolved Oxygen Study for Capped vs. Uncapped Bottles

Application Bulletin # 5

Last Updated June 2017

Introduction:

The purpose of this study was to analyze the effects on the Dissolved Oxygen (D.O.) of a sample if it was left open to the atmosphere, and compare this to a sample that was immediately capped after dilution water was added (commonly referred to as Initials) then to repeat this study for the same samples after 5 days of incubation (commonly referred to as Finals).

A series of samples were studied:

- Blank (dilution water only)
- 15ml Seed (Polyseed) + dilution water
- 6ml Glucose/ Glutamic Acid (GGA) + dilution water
- 12ml Glucose/ Glutamic Acid + dilution water

Conforms to: Standard Method 5210B 20th & 21st Edition, EN 1899-1

Sample: Treated and Untreated water samples

Equipment:

- YSI 5100 D.O. Meter
- YSI 5905 D.O. Probe

Procedure:

The D.O. meter was calibrated using the air saturated method and the D.O. meter's Auto-calibration feature.

D.O. measurement with bottles uncapped:

1. Fill bottle with required solutions to reflect sample being studied (see above) to the neck of the BOD bottle
2. Measure the D.O. until reading is stable (determined by the meter), and record.
3. Remove the probe and store in a BOD storage bottle (containing 1" of water in the bottom)
4. Leave the bottle uncapped for 5 minutes and repeat.

This was repeated for a total of 60 minutes for each sample type analyzed.

D.O. measurement with bottles capped:

1. Fill bottle with required solutions to reflect sample being studied (see above) to the neck of the BOD bottle
2. Measure the D.O. until reading is stable (determined by the meter), and record.
3. Remove the probe and store in a BOD storage bottle (containing 1" of water in the bottom)
4. Cap the bottle and leave for 5 minutes and repeat.

This was repeated for a total of 60 minutes for each sample type analyzed

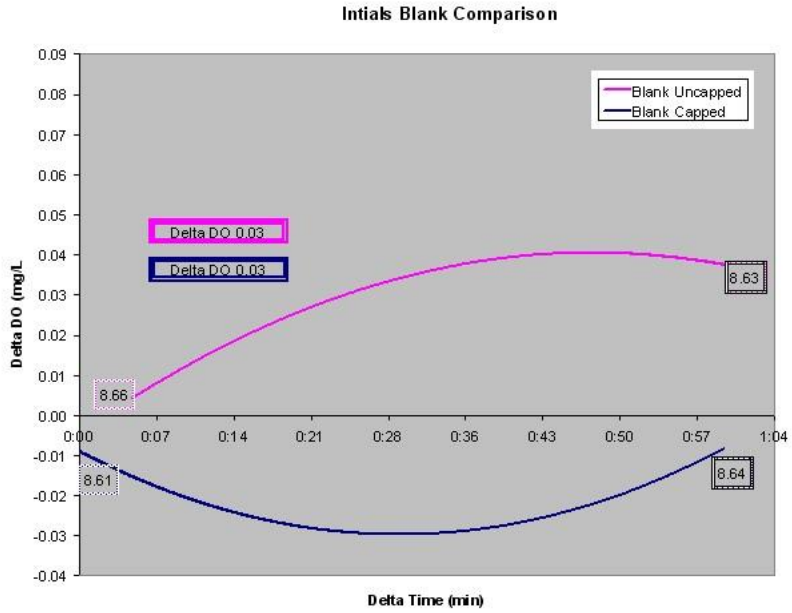

Figure 1: Blank Initials

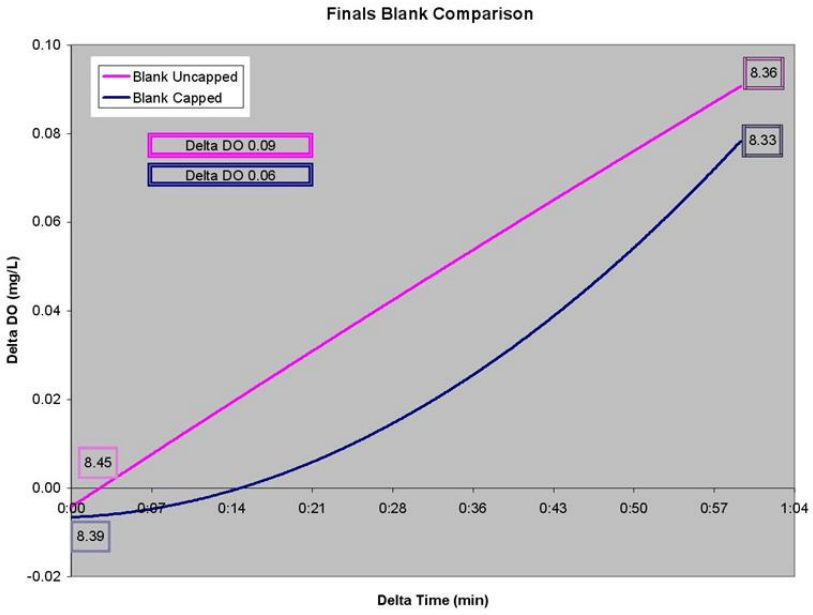

Figure 2: Blank Finals

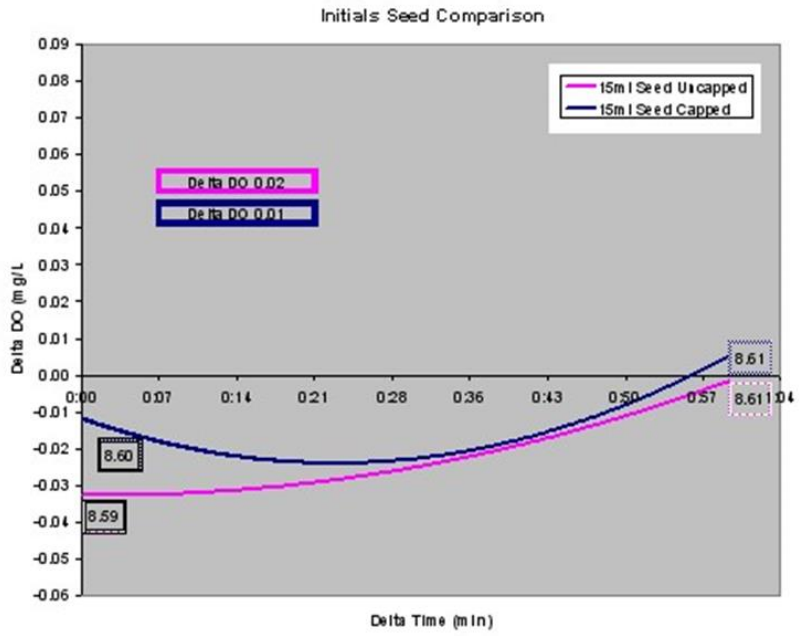

Figure 3: Seed Initials

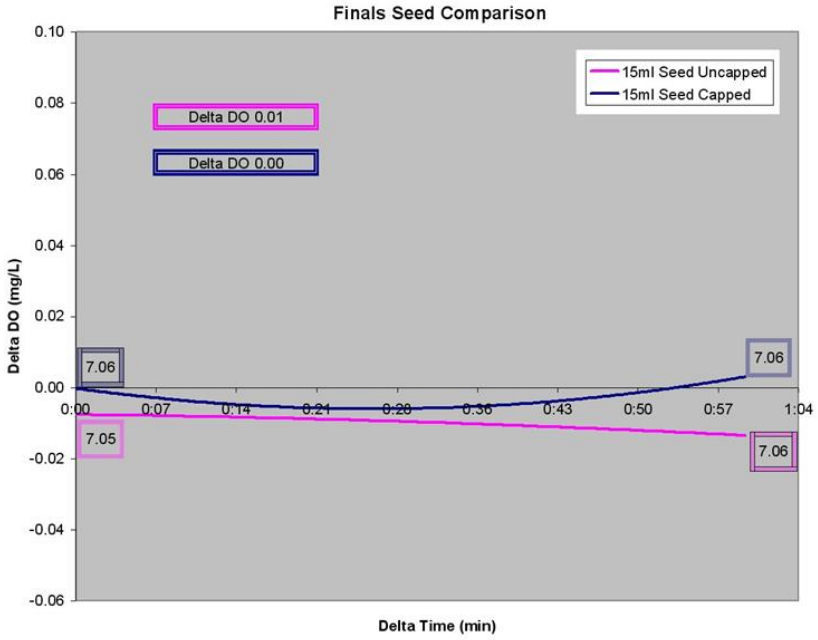

Figure 4: Seed Finals

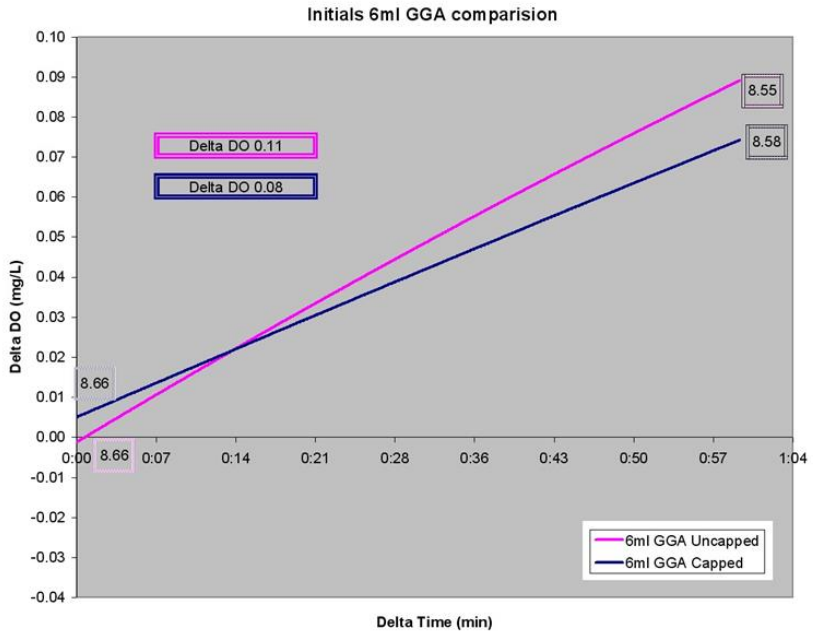

Figure 5: 6ml GGA Initials

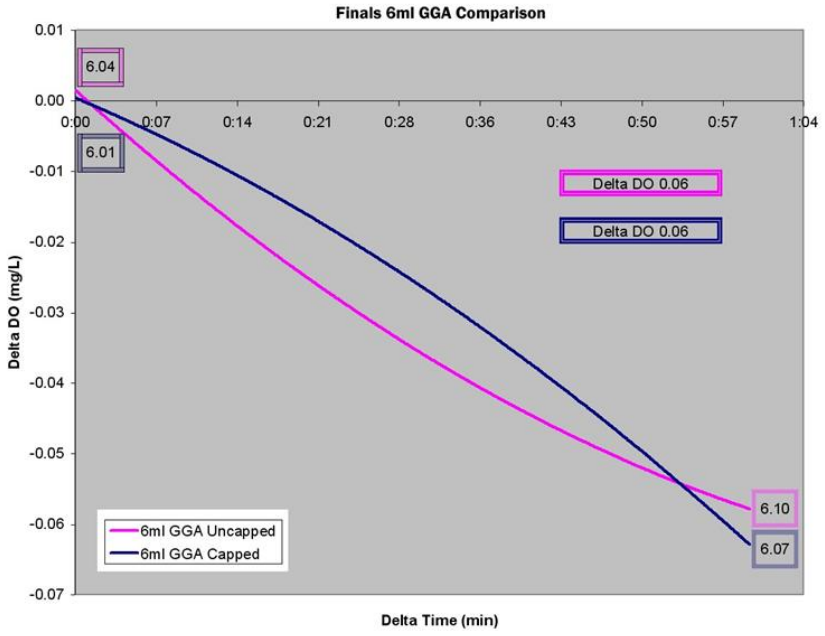

Figure 6: 6ml GGA Finals

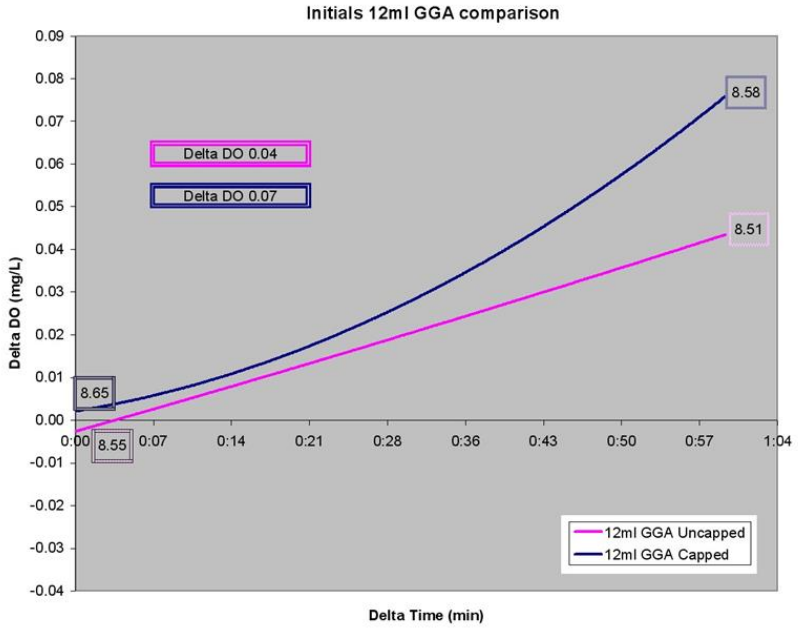

Figure 7: 12ml GGA Initials

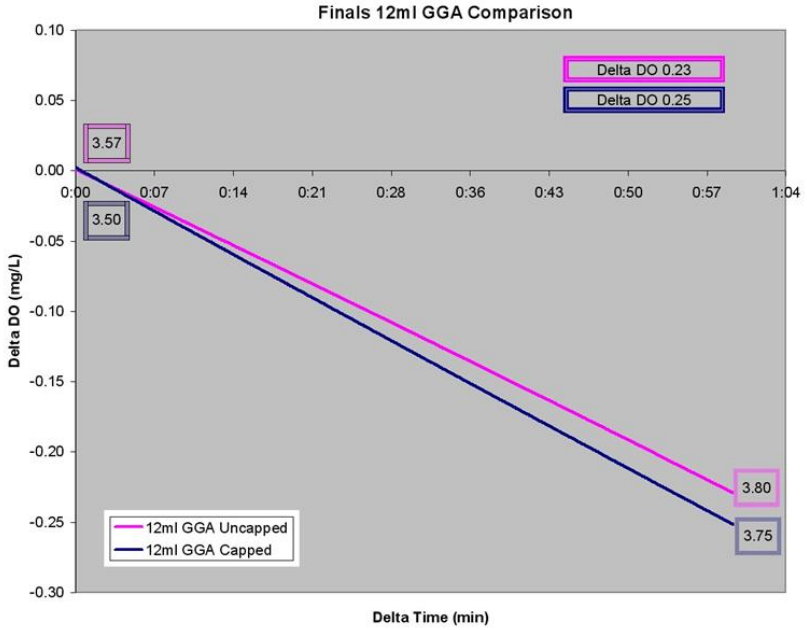

Figure 8: 12ml GGA Finals

Table1: Summary of DO data with Delta DO

Sample		DO (mg/L)		Delta DO (mg/L)
		t = 0 minutes	t = 60 minutes	
Blank Initial				
	Uncapped	8.66	8.63	0.03
	Capped	8.61	8.64	0.03
Blank Final				
	Uncapped	8.45	8.36	0.09
	Capped	8.39	8.33	0.06
15ml Seed Initial				
	Uncapped	8.60	8.61	0.01
	Capped	8.59	8.61	0.02
15ml Seed Final				
	Uncapped	7.06	7.06	0.00
	Capped	7.05	7.06	0.01
6ml GGA Initial				
	Uncapped	8.66	8.55	0.11
	Capped	8.66	8.58	0.08
6ml GGA Final				
	Uncapped	6.04	6.10	0.06
	Capped	6.01	6.07	0.06
12ml GGA Initial				
	Uncapped	8.55	8.51	0.04
	Capped	8.65	8.58	0.07
12ml GGA Final				
	Uncapped	3.57	3.80	0.23
	Capped	3.50	3.75	0.25

Conclusion:

From this study, it is evident that leaving a bottle open to the atmosphere will have insignificant effects on the DO of the sample. The DO measurements for uncapped versus capped bottles is virtually the same (identical in one case) and the delta DO after an hour is insignificant, close to zero or exactly zero.

When running an automated system, a rack of 24 bottles will typically take 35 minutes for initial reads (based on the system automating addition of seed, inhibitor for CBOD and dilution water), and 20 minutes for final reads. This is significantly less than the hour time period in which this study was performed, therefore, any observed differences in the measurements will be even less than that listed in Table 1.

The rugged, reliable Man-Tech PC-BOD offers the most rapid BOD preparation and measurement system in the market generating accurate and precise results that stand the test of time.