

A STUDY OF THE 5-DAY  
BIOCHEMICAL OXYGEN DEMAND  
OF SUPERALL #38

PREPARED FOR:

SUPERALL PRODUCTS, INC.  
P.O. Box 2954  
Spring, Texas 77383

PERFORMED BY:

SOUTH CENTRAL LABORATORIES, INC.  
P.O. Box 390  
Morgan City, LA 70381  
(504) 385-1855

## INTRODUCTION

In an effort to understand the environmental oxygen demand of its product, the manufactures of SuperAll # 38 (SuperAll Products, Inc. of Spring, TX) contracted South Central Laboratories to conduct 5-Day Biochemical Oxygen Demand (BOD) study on the product. Method 5210B, 5-Day BOD Test, found in Standard Methods of the Examination of Water and Wastewater. 19<sup>th</sup> Edition, 1995, APHA was followed and there were no deviations from the stated method. Oxygen depletion in five days was the endpoint of interest.

### Test Procedure

Test dilution water was prepared by filling a 4-liter Cubitainers® with 3 liters of ASTM Type I reagent water. The containers were placed in an environmental chamber maintained at 20°C for five days to allow the water to become saturated with oxygen. One hour prior to test initiation a package of BOD Nutrients (HACH Co., Loveland, CO; Lot J6194) was added to each cubitainer®. A BOD seed solution was prepared by adding one capsule of BOD seed ( Polybac Corp., Bethlehem, PA; Lot A137) to 250 milliliters of test dilution water. The seed mixture was mixed for one hour using a magnetic stirrer.

Glass BOD bottles of 300 milliliter capacity were used as incubation chambers for the test. These bottles have a ground glass stopper and a polypropylene over cap which allow the bottle to have a water seal which ensures that oxygen cannot be drawn from or escape to the atmosphere during the course of the test. Three milliliters of the seed mixture were added to each test bottle. SuperAll #38 concentrate was added in varying amounts ( See Appendix A) to the test bottles. Following the addition of SuperAll #38 , each test bottle was filled to 300 milliliters with dilution water. The test bottles were placed individually on a magnetic stirrer and mixed. Dissolved oxygen was measured in each test bottle and recorded. Dissolved oxygen was measured using an Orion Model 820 DO meter and the meter was calibrated in “air” prior to use.

Each bottle was then capped and placed in the dark in the environmental chamber. Temperature in the environmental chamber is maintained at 20° ± 1° C and is documented on a Taylor Instruments Weather Hawk® recording thermometer. Temperature records for the three exposed periods used to evaluate SuperAll #38 are found on SCL Chart No. 9720, 9721, 9722 and 9723 respectively.

In addition to the various concentration of SuperAll #38 concentrate evaluated, a dilution water blank, a seed control and a Glucose-Glutamic acid spike were evaluated in each of the three exposure periods. Dilution water blanks consist of 300 milliliters of dilution water alone exposed to the same environmental conditions as the test solutions during the 5-Day exposure period. For a test system to be considered valid, oxygen depletion in the blank must be less than 0.2 milligrams per liter during the five days.

A seed control is employed to evaluate the oxygen depletion caused by seeding material. Fifteen, twenty and twenty five milliliters of seed solution were added to three BOD bottles respectively. Each bottle was top up to 300 milliliters with dilution water. Mixing, DO

measurement and incubation of the seed control is identical to that of the test solutions. Oxygen depletion caused by the seed is the average of the three seed control dilutions. It is calculated using the following equation:

$$\text{Seed } O_2 \text{ Depletion (F)} = \frac{\text{mls of seed sample}}{\text{mls of seed control}}$$

Oxygen depletion by the seed control must range between 0.6 and 1.0 milligrams per liter for the test system to be considered valid.

To assess the quality of the seeding material and the dilution water, a Glucose- Glutamic Acid (GGA) spike was performed. Reagent grade glucose and glutamic acid were oven dried at 103°C for one hour. The compounds were allowed to cool in an automatic dessicator. One hundred fifty milligrams of both the glucose and glutamic acid were volumetrically dissolved in 100 milliliters of ASTM Type I reagent water. Six milliliters of the GGA solution were added to a BOD bottle along with 3 milliliters of the seed solution. The bottle was then filled to 300 milliliters using dilution water. Mixing, DO measurements and incubation were performed identically to the treatments and seed controls. For a test system to be considered Valid, the 5-Day BOD of GGA spike must be between 163 and 237 milligrams per liter.

After five days of incubation, all treatments, seed controls and glucose-glutamic acid spikes were removed from the environmental chamber. Dissolved oxygen in each bottle is measured, recorded and the test is terminated. The 5-Day Biochemical Oxygen Demand is calculated using the following equation:

$$BOD_5 = \text{Average of } \frac{(DO_i - DO_f) - F}{P}$$

Where:  $BOD_5$  = 5 Day Biochemical Oxygen Demand

$DO_i$  = Initial Dissolved Oxygen

$DO_f$  = Final Dissolved Oxygen

$F$  = Oxygen Depletion caused by the seed

$P$  = volume of sample

## Results

Three separate exposure periods were used to determine the 5-Day Biochemical Oxygen Demand of SuperAll #38 concentrate: May 21 thru May 26, 1997; May 29 thru June 3, 1997; June 5 thru June 10, 1997. Acceptance criteria for seed controls and glucose-glutamic acid spikes were met in the three exposures. Results of all treatments and quality assurance appear in Appendix A.


SuperAll #38 concentrate was tested from a low concentration of 33.3 ppm up to a high concentration of 500,000 ppm. In none of the 12 concentrations tested did the oxygen depletion in five days exceed 2 milligrams per liter. It can be therefore concluded that when evaluated using Method 5210B, SuperAll #38 concentrate has a biochemical oxygen demand of less than 2.0 mg/L.

## CERTIFICATION

Data presented in this report was derived by methods and with materials identified in “Test Procedure” section of this report.

A project notebook was maintained during the test, SCL Laboratory Notebook BS 002, Pages 1-3. All data transcribed from the notebook to the report were checked for accuracy.

SOUTH CENTRAL LABORATORIES, INC.

  
Laboratory Director

## Appendix A – SuperAll #38 Biochemical Oxygen Demand

### Exposure #1 (5-21-97 thru 5-26-97)

	Volume (mls)	O <sub>2</sub> Depletion (mg/L)
Dilution Water Blank		
Seed Control	15	4.3
	20	5.6
	25	7.0
Glucose – Glutamic Check	6	4.3
SuperAll #38	0.100	0.0
	0.050	0.7
	0.030	1.4
	0.020	0.8
	0.010	1.2

### Exposure #1 (5-29-97 thru 6-3-97)

	Volume (mls)	O <sub>2</sub> Depletion (mg/L)
Dilution Water Blank	300	0.2
Seed Control	15	3.4
	20	4.4
	25	5.4
Glucose – Glutamic Check	6	40
SuperAll #38	25	0.0
	10	0.0
	5	0.0
	1	0.0