

**REPORT FOR ACUTE TOXICITY TESTING OF
APPLIED POLYMER SYSTEMS, INC.
SILT STOP 704B PRODUCT**

WOODSTOCK, GEORGIA

TEST PERIOD: AUGUST 14-18, 2002

Prepared for:

APPLIED POLYMER SYSTEMS, INC.
Woodstock, Georgia

August 2002

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Prepared for:

**Applied Polymer Systems, Inc.
Woodstock, Georgia**

Prepared by:

**BioTox Laboratory
Law Engineering and Environmental Services, Inc.
Kennesaw, Georgia**

August 2002

August 30, 2002

Mr. Steven R. Iwinski
Applied Polymer Systems, Inc.
519 Industrial Way
Woodstock, GA 30189

Subject: **Applied Polymer Systems, Inc. Acute Toxicity Testing on 704B Product,
August 14-18, 2002
Law Project No. 12000-0-2046.01**

Dear Mr. Iwinski:

Law Engineering and Environmental Services, Inc. (LAW), BioTox Laboratory has completed 96-hour acute toxicity testing on samples of Silt Stop 704B submitted by you on July 31, 2002. Toxicity testing was initiated by LAW on August 14, 2002 to determine the LC₅₀ (the concentration of the sample at which 50% of the rainbow trout, *Oncorhynchus mykiss*, die) and the NOAEC (the No Observed Acute Effect Concentration, or the highest concentration tested that did not exhibit acute toxicity). Test samples were prepared by adding 6,720 milligrams (mg) of polymer to 1.0 liter (L) of laboratory formulated water and allowed to mix on a stir plate until fully dissolved (approximately 24 hours). This stock test sample was then diluted with laboratory formulated water to the following test concentrations: 420 parts per million (ppm), 840 ppm, 1,680 ppm, 3,360 ppm, and 6,720 ppm. Test results indicated acute mortality to *Oncorhynchus mykiss* in the 840 ppm, 1,680 ppm, 3,360 ppm, and 6,720 ppm 704B polymer samples. The statistically determined LC₅₀ was 1,004 ppm and the NOAEC was 420 ppm.

Results are summarized in the accompanying report. Detailed testing documentation, including chemical and physical measurements (Appendix A), rainbow trout documentation (Appendix B), and polymer sample test data/reference toxicant data (Appendix C).

LAW appreciates the opportunity to provide these testing services to you and Applied Polymer Systems, and we look forward to serving your future needs. If there are any questions, please do not hesitate to contact Mr. Andrew S. Peiken at (770) 421-7027.

Sincerely,

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Andrew S. Peiken, C.E.
BioTox Laboratory Manager

Margaret E. Tanner
Environmental Engineer

Attachment: Data Report

TEST SUMMARY

I. Client

Client: Applied Polymer Systems, Inc.
519 Industrial Way
Woodstock, GA 30189

Product Tested: Silt Stop 704B

II. Laboratory Accreditation

Laboratory: BioTox Laboratory
Law Engineering and Environmental Services, Inc.
3200 Town Point Drive N.W., Suite 100
Kennesaw, Georgia 30144

Accreditor: State of Florida, Dept. of Health and Rehabilitative Services
Office of Laboratory Services, Environmental Water

Accreditation ID: Lab ID. E87477, Certificate No. 477-128

Category: Bioassay

Effective: July 1, 2002 through June 30, 2003

III. Tests Conducted

Test: Rainbow Trout, *Oncorhynchus mykiss*
96-hr. Acute Static Toxicity Test
EPA/600/4-90/027F, Fourth Edition, Sept. 1991

Test Dates: August 14-18, 2002

Source, Age of Organisms: ARO, ID No. CS85208130202 / 16 days

Test Concentrations: Control, 420, 840, 1,680, 3,360, and 6,720 ppm

Dilution/Control Water: Moderately hard synthetic freshwater (reagent grade chemicals and Milli-Q)

Deviation From Test Protocol: None

IV. Results

Survival Data for *Oncorhynchus mykiss* Exposed for 96-hr to Applied Polymer Systems, Inc. Silt Stop 704B Product, August 14-18, 2002.

Concentration (ppm)	Survival at 48-hours (%)	LC ₅₀ (ppm)	NOAEC (ppm)
Laboratory Control ^a	100	1,004	420
420	100		
840	65		
1,680	10		
3,360	0		
6,720	0		

Calculated by: ASP 8/30/02

Checked by: RFP 8/30/02

^a Laboratory Control – Moderately hard synthetic freshwater.

V. Summary

Law Engineering and Environmental Services, Inc. (LAW), BioTox Laboratory has completed 96-hour acute toxicity testing on samples of Silt Stop 704B submitted by you on July 31, 2002. Toxicity testing was initiated by LAW on August 14, 2002 to determine the LC₅₀ (the concentration of the sample at which 50% of the rainbow trout, *Oncorhynchus mykiss*, die) and the NOAEC (the No Observed Acute Effect Concentration, or the highest concentration tested that did not exhibit acute toxicity). Test samples were prepared by adding 6,720 milligrams (mg) of polymer to 1.0 liter (L) of laboratory formulated water and allowed to mix on a stir plate until fully dissolved (approximately 24 hours). This stock test sample was then diluted with laboratory formulated water to the following test concentrations: 420 parts per million (ppm), 840 ppm, 1,680 ppm, 3,360 ppm, and 6,720 ppm. Test results indicated acute mortality to *Oncorhynchus mykiss* in the 840 ppm, 1,680 ppm, 3,360 ppm, and 6,720 ppm 704B polymer samples. The statistically determined LC₅₀ for Silt Stop 704B is 1,004 ppm and the NOAEC is 420 ppm. During the testing period, it was noted that the dissolved oxygen in the 3,360 ppm and 6,720 ppm test replicates fell below 6.00 mg/L. Desirable dissolved oxygen levels range between 6.0 and 9.0 mg/L. The drop in dissolved oxygen noted at the higher test concentrations would be expected to result in acute toxicity, however we cannot conclude that the low dissolved oxygen level alone resulted in the observed toxicity.

VI. Quality Assurance

Oncorhynchus mykiss, KCl Reference Toxicant, 005, 8/14/02

Survival: 48-hr LC₅₀ = 4,000 mg/L KCl (PASS)

48-hr LC₅₀ Range of Acceptability = 1,680 to 4,200 mg/L KCl

GLOSSARY AND ABBREVIATIONS

Acute	Involving a stimulus severe enough to rapidly induce a response; in toxicity tests, a response observed in 96 hours or less typically is considered acute.
Chronic	Involving a stimulus that lingers or continues for a relatively long period of time, often one-tenth of the life span or more. A chronic effect can be lethality, growth, reduced reproduction, etc.
Chronic Value	A numeric value representing the geometric mean of the numeric values of concentrations analyzed as the NOEC (No Observed Effect Concentration) and the LOEC (Lowest Observed Effect Concentration) by chronic toxicity testing. The chronic value is an estimate of the toxicant concentration that will be the actual no effect concentration based on the chronic effect tested.
Critical Value	Minimum numeric value for a toxicity test endpoint (i.e., survival, growth, or reproduction) below which a given test result will be statistically significantly different from the control value.
DMW	Diluted Mineral Water
EC	Effective concentration, a point estimate of the toxicant concentration that would cause an adverse response such as death, immobilization, or serious incapacitation.
Ft-c	Foot candles - a measure of <u>light</u> intensity
Graphical Method	Log concentration versus percent mortality method. Toxicity test data are plotted on 2-cycle semi-log graph paper. The logarithmic axis (y axis) is used for percent effluent concentration, and the linear axis (x axis) is used for percent mortality. The graph provides a reasonably accurate estimate of the LC ₅₀ , but does not provide a confidence interval.
IC	Inhibition Concentration, a point estimate of the toxicant concentration that would cause a given percent reduction in a biological measurement such as fecundity or growth.
LC	Lethal Concentration, identical to EC when the observed response is death.
LC ₅₀	The toxicant concentration that is lethal to 50 percent of exposed organisms at a specific time of observation.
LCL	Lower 95% Confidence Limit
LOEC	Lowest-Observed-Effect-Concentration, the lowest concentration of toxicant to which organisms are exposed that causes adverse effects.
LWC	Lab Water Control, moderately hard synthetic freshwater prepared from MILLIPORE MILLI-Q ^R water and reagent grade chemicals.

NOEC	No-Observed-Effect-Concentration, the highest concentration of toxicant to which organisms are exposed that causes no observable adverse effects.
Probit Analysis	Probit Analysis consists of a group of statistical methods used to analyze data from concentration-response experiments, and provides an estimate of the LC ₅₀ and the precision of this estimate. In Probit Analysis, the percentages of affected organisms are converted to Probits (probability units), and the effluent concentrations are converted to logarithms. The relationship between the Probits and the logarithmic values of the concentrations is approximately linear. A Probit regression line drawn through the data points is used to estimate the LC ₅₀ and its precision estimate. To use Probit Analysis, at least two partial mortalities must be obtained in the toxicity test.
RWC	Receiving Water Control
UCL	Upper 95% Confidence Limit
μE/m ² /s	Micro-ergs per square meter per second - a measure of <u>light</u> intensity

REFERENCES

- Gulley, D.D., and WEST, Inc. 1996. TOXSTAT version 3.5. Fish Physiology and Toxicology Laboratory. Department of Zoology and Physiology. University of Wyoming. Laramie, Wyoming.
- Peltier, W., and C.I. Weber. eds. 1991. Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms. Fourth Edition. Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency, Cincinnati, OH. EPA 600/4-90/027F.
- U.S. Environmental Protection Agency. 1979. Methods for Chemical Analysis of Water And Wastes. Environmental Monitoring Laboratory, U.S. Environmental Protection Agency, Cincinnati, OH. EPA 600/4-79-020.
- U.S. Environmental Protection Agency. 1999. Errata for Effluent and Receiving Water Toxicity Testing Manuals: Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms; Short-Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms; and Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms. U.S. Environmental Protection Agency, Office of Research and Development, Duluth, MN. EPA/600/R-98/182.

Summary of Effluent Toxicity Test Conditions for the Rainbow Trout (*Oncorhynchus mykiss*) Acute Survival Test (EPA 600/4-90/027F)

1. Test type:	96-hr Static Renewal Acute
2. Temperature (°C):	12.0-17.0°C
3. Light quality:	Cool White Fluorescent
4. Light intensity:	10-20 uE/m ² /s (50-100 ft-c)
5. Photoperiod:	16-hr light, 8-hr dark
6. Test chamber size:	5 L
7. Test solution volume:	4 L/replicate
8. Age of rainbow trout:	16 days
9. No. fish per test chamber:	10
10. No. replicate chambers per concentration:	2
11. No. fish per concentration:	20
12. Feeding regime:	Fed Trout Chow prior to test start and at 48 hrs
13. Aeration:	None
14. Dilution water:	Moderately hard synthetic freshwater (reagent grade chemicals and Milli-Q)
15. Effluent concentrations (ppm):	Control, 420, 840, 1,680, 3,360, and 6,720
16. Dilution factor:	0.5
17. Test duration	96-hr
18. Effect measured:	Mortality - no movement on gentle prodding
19. Test acceptability:	90% or greater survival in controls
20. Sample handling:	Whole polymer samples held at room temperature.
21. Sample volume required:	10 L
22. Chemical parameters:	pH, DO, total residual chlorine, total alkalinity, total hardness, conductivity, temperature

Initial Chemical Characterization of Applied Polymer Systems, Inc. Silt Stop 704B Product and Control Water Used in Acute Toxicity Tests, August 14-18, 2002.

	704B (6,720 ppm)	Control^a
Dissolved Oxygen (mg/L)	7.63	7.60
pH	7.38	7.30
Total Alkalinity as CaCO ₃ (mg/L)	257.5	75.0
Total Hardness as CaCO ₃ (mg/L)	706.0	86.0
Conductivity @ 25°C (μmhos/cm)	1,030	267
Total Residual Chlorine ^b (mg/L)	0.02	<0.01
Total Ammonia-nitrogen ^b (mg/L)	0.77 ^c	<0.01

Determined according to EPA 600/4-79-020, 1979.

Entered by: ASP 8/30/02
Checked by: RFP 8/30/02

^a Control = Moderately hard synthetic freshwater (reagent grade chemicals and Milli-Q)

^b Determined by Hach Colorimetric Test Kit in conjunction with spectrophotometer

^c A flocculant (interference) was noted upon addition of Nessler Reagent to the sample. Results should be interpreted with caution.

APPENDICES

APPENDIX A

Chemical and Physical Data

APPENDIX B

Rainbow trout Documents

LAW Engineering and Environmental Services, Inc.
BioTox Laboratory

Oncorhynchus mykiss Culture Source Document

Larvae ID No.	Hatch Date	Source	Age of Larvae at Test Start	Water Type/Temp. (°C)	Food Type
CS852081302	7/31/02	ARO, Inc.	16 dys.	LWC (12.0)	Trout Chow

APPENDIX C

Test Data Sheets

**Rainbow Trout
Polymer Test**

**Rainbow Trout
Reference Toxicant Data Sheets**