

**REPORT FOR ACUTE TOXICITY TESTING OF
APPLIED POLYMER SYSTEMS, INC.
SILT STOP PRODUCTS**

NORCROSS, GEORGIA

TEST PERIOD: FEBRUARY 1-18, 2000

Prepared for:

APPLIED POLYMER SYSTEMS, INC.

Norcross, Georgia

March 2000

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Prepared for:

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

Prepared by:

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

March 2000

August 22, 2000

Mr. Steven R. Iwinski
Applied Polymer Systems, Inc.
4015 Holcomb Bridge Rd.
Suite 350-931
Norcross, GA 30092

Subject: **Applied Polymer Systems, Inc. Acute Toxicity Testing, February 1-18, 2000**

Dear Mr. Iwinski:

Law Engineering and Environmental Services, Inc. (LAW), BioTox Laboratory has completed 48-hr. acute static toxicity testing on four powdered polymer samples of Silt Stop Products submitted by you on January 28, 2000. Toxicity testing was initiated by LAW on February 1, 3, and 16, 2000 to determine the LC₅₀ (the concentration of the sample at which 50% of the test organisms die). The 702, 730 CB, 730 CY, and 730 F polymers were serially diluted to 26.25, 52.5, 105, 210, and 420 ppm. Testing was performed on the water flea, *Daphnia magna*.

Test results indicated no acute mortality to the water flea in the 702, 730 CB, 730 CY, and 730 F polymer samples. Because there were no mortality rates greater than 50% in these samples, the LC₅₀'s were not measureable and reported as greater than the highest concentration tested (>420 ppm).

Results are summarized in the accompanying report. Detailed testing documentation, including chemical and physical measurements (Appendix A), test organism documentation (Appendix B), and polymer sample test data and associated 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 or Ronald G. King (770) 499-6737.

Sincerely,

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Andrew S. Peiken
BioTox Laboratory Manager

Ronald G. King, M.S., C.F.P.
Senior Environmental Scientist

Attachment: Data Report

TEST SUMMARY

I. Client

Client : Applied Polymer Systems, Inc.
4015 Holcomb Bridge Rd.
Suite 350-931
Norcross, GA 30092

Product Tested: Silt Stop Products: 630CY, 630F, 702, 730CB, 730CY, 730F

Laboratory: BioTox Laboratory
Law Engineering and Environmental Services, Inc.
112 TownPark Drive
Kennesaw, Georgia 30144

II. Tests Conducted

Test: Water Flea, *Daphnia magna*
48-hr. Acute Static Screen Toxicity Test
EPA/600/4-90/027F, Fourth Edition, Sept. 1991

Test Dates/Times: February 1 (1200) – 18 (1510), 2000

Source, Age of Organisms: In-house cultures, ID No. MAGM002012100,
MAGM005020700, <24-hr old

Test Concentrations: Lab control, 6.57 ppm, 13.13 ppm, 26.25 ppm, 52.5 ppm, 105
ppm, 210 ppm, 420 ppm

Dilution/Control Water: Moderately hard synthetic freshwater (20% Perrier/80% Milli-Q)

Deviation From Test Protocol: None

III. Results

Survival Data for *Daphnia magna* Exposed for 48-hr to Applied Polymer Systems, Inc. Silt Stop Products, February 1–18, 2000.

Sample (ppm)	<i>Daphnia magna</i> (Mean Percent Survival)	LC ₅₀ (ppm)
630 CV		
Laboratory Control ^a	100	1.38
6.57	30	
13.13	20	
26.25	20	
52.5	10	
105	20	
210	5	
420	0	
630 F		
Laboratory Control ^a	100	0.002
6.57	10	
13.13	5	
26.25	5	
52.5	5	
105	15	
210	0	
420	5	
702		
Laboratory Control ^a	100	>420
26.25	100	
52.5	95	
105	80	
210	90	
420	70	

Calculated by: ASP 3/1/00
 Checked by: RFP 3/1/00

^a Laboratory Control – Moderately hard synthetic freshwater -- 20% Perrier

Survival Data for *Daphnia magna* Exposed for 48-hr to Applied Polymer Systems, Inc. Silt Stop Products, February 1–18, 2000.

Sample (ppm)	<i>Daphnia magna</i> (Mean Percent Survival)	LC ₅₀ (ppm)
730 CB		
Laboratory Control ^a	100	>420
26.25	100	
52.5	90	
105	100	
210	100	
420	95	
730 CV		
Laboratory Control ^a	100	>420
26.25	100	
52.5	100	
105	95	
210	95	
420	95	
730 F		
Laboratory Control ^a	100	>420
26.25	100	
52.5	100	
105	95	
210	95	
420	95	

Calculated by: ASP 3/1/00

Checked by: RFP 3/1/00

^a Laboratory Control – Moderately hard synthetic freshwater -- 20% Perrier**IV. Summary**

Test results indicated acute mortality to the water flea in the 630 CY and 630 F polymer samples. The LC₅₀'s were measured as 1.38 and 0.002 ppm, respectively. Test results indicated no acute mortality to the water flea in the 702, 730 CB, 730 CY, and 730 F polymer samples. Because there were no mortality rates greater than 50% in these samples, the LC₅₀'s were not measurable and reported as greater than the highest concentration tested (>420 ppm).

V. Quality Assurance

Daphnia magna, NaCl Reference Toxicant, 005, 1/26/00

Survival: 48-hr LC₅₀ = 3335 mg/L NaCl

48-hr LC₅₀ Range of Acceptability = 2130 to 8010 mg/L NaCl (**PASS**)

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 light 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 Water Flea (*Daphnia magna*) Acute Survival Test (EPA 600/4-90/027F)

1. Test type:	48-hr Static Acute
2. Temperature (°C):	19.0-21.0°C
3. Light quality:	Ambient laboratory illumination
4. Light intensity:	10-20 uE/m ² /s (50-100 ft-c) (ambient laboratory levels)
5. Photoperiod:	16-hr light, 8-hr dark
6. Test chamber size:	30 mL
7. Test solution volume:	25 mL/replicate
8. Age of test organisms:	<24-hr
9. No. neonates per test chamber:	5
10. No. replicate chambers per concentration:	4
11. No. neonates per concentration:	20
12. Feeding regime:	Fed 0.1 each of <i>Selenastrum</i> /YCT prior to test start and at 48-hr
13. Aeration:	None
14. Dilution water:	Moderately hard synthetic water prepared using MILLIPORE MILLI-Q [®] water and 20% Perrier
15. Effluent concentrations:	Control, 6.57 ppm, 13.13 ppm, 26.25 ppm, 52.5 ppm, 105 ppm, 210 ppm, 420 ppm
16. Dilution factor:	0.5
17. Test duration	48-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:	1 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 Products and Control Water Used in Acute Toxicity Tests, February 1-18, 2000.

Parameter	420 ug/L Polymer Sample						
	630 CY	630 F	702	730 CB	730 CY	730 F	DMW ^a
Date Sampled	2/1/00	2/1/00	2/1/00	2/1/00	2/1/00	2/1/00	2/1/00
Time Sampled (hr.)	1200	1220	1230	1530	1440	1500	1200
Temperature on Arrival (°C)	25	25	25	25	25	25	20.0
Dissolved Oxygen (mg/L)	7.8	8.0	7.4	7.7	7.6	7.4	7.60
pH	7.82	7.97	7.85	7.86	7.88	7.69	8.12
Total Alkalinity as CaCO ₃ (mg/L)	66	68.5	68.5	83.5	98.5	98.5	56
Total Hardness as CaCO ₃ (mg/L)	67.5	67.5	75.5	67.5	67.5	67.5	67.5
Conductivity @ 25°C (µmhos/cm)	168	156	186	179	173	176	223
Total Residual Chlorine ^b (mg/L)	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Total Ammonia ^b (mg/L)	8.45	<0.005	3.324	<0.005	0.33	<0.005	<0.005

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

Entered by: ASP 3/1/00
Checked by: RFP 3/1/00

^a DMW - control used in the water flea test

^b Determined by Hach Test Kit (DPD Method in conjunction with spectrophotometer)

APPENDICES

APPENDIX A

Chemical and Physical Data

APPENDIX B

Test Organism Documents

LAW Engineering and Environmental Services, Inc.
BioTox Laboratory

Daphnia magna In-house Culture Source Document

Brood Board ID No.	Brood Board Date	Date/Time Cups Marked	Age of Neonates at Test Start	Water Type/Temp. (°C)	Food Type
MAGM002012100	1/21/00	2/1/00 (0900)	<24 hrs.	DMW / 20.0	YCT & <i>Selenastrum</i>
MAGM005020700	2/07/00	2/16/00 (0900)	<24.0 hrs.	DMW / 20.0	YCT & <i>Selenastrum</i>

APPENDIX C

Test Data Sheets

**Water Flea
Polymer Test**

**Water Flea
Reference Toxicant Data Sheets**