

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

NORCROSS, GEORGIA

TEST PERIOD: APRIL 19 – MAY 12, 2000

Prepared for:

APPLIED POLYMER SYSTEMS, INC.

Norcross, Georgia

May 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**

May 2000

May 17, 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, April 19 – May 12, 2000**

Dear Mr. Iwinski:

Law Engineering and Environmental Services, Inc. (LAW), BioTox Laboratory has completed 48-hr. acute static toxicity testing on three polymer samples of Silt Stop Products submitted by you on March 17, 2000. Toxicity testing was initiated by LAW on April 19, 2000 to determine the LC₅₀ (the concentration of the sample at which 50% of the test organism, *Daphnia magna*, die). The initial set of test concentrations recommended by you (26.25, 52.5, 105, 210, and 420 ppm) resulted in 100% mortality in all test concentrations of the three polymer samples. Therefore, an LC₅₀ was not calculable. Upon your approval, the test concentrations were reformulated to include 1.64, 3.28, 6.56, 13.13, and 26.25 ppm and tests were repeated on May 10, 2000. Test results indicated acute mortality to *Daphnia magna* in the 602 M, 630 M and 640 M polymer samples. The LC₅₀'s were measured as 2.5, 21.1, and 4.4 ppm, respectively.

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: 602 M, 630 M, 640 M

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

II. Tests Conducted

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

Test Dates: April 19-21, 2000 and May 10-12, 2000

Source, Age of Organisms: In-house cultures, ID No. MAGM016041400,
MAGM017041400, MAGM019042800 / <48-hr old

Test Concentrations: 1.64, 3.28, 6.56, 13.13, 26.25, 52.5, 105, 210, and 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, April 19, 2000 through May 12, 2000.

| Sample (ppm) | Survival at 48-hours (%) | LC ₅₀ (ppm) | |
|---------------------------------|--------------------------|------------------------|------|
| 602 M | | | |
| Laboratory Control ^a | 100 | 25 | |
| 1.64 | 65 | | |
| 3.28 | 40 | | |
| 6.57 | 15 | | |
| 13.13 | 0 | | |
| 26.25 | 0 | | |
| 52.5 | 0 | | |
| 105 | 0 | | |
| 210 | 0 | | |
| 420 | 0 | | |
| 630 M | | | |
| Laboratory Control ^a | 100 | | 21.1 |
| 1.64 | 75 | | |
| 3.28 | 70 | | |
| 6.57 | 55 | | |
| 13.13 | 70 | | |
| 26.25 | 40 | | |
| 52.5 | 0 | | |
| 105 | 0 | | |
| 210 | 0 | | |
| 420 | 0 | | |
| 640 M | | | |
| Laboratory Control ^a | 100 | 4.4 | |
| 1.64 | 75 | | |
| 3.28 | 65 | | |
| 6.56 | 40 | | |
| 13.13 | 5 | | |
| 26.25 | 20 | | |
| 52.5 | 0 | | |
| 105 | 0 | | |
| 210 | 0 | | |
| 420 | 0 | | |

Calculated by: ASP 5/15/00
 Checked by: RFP 5/15/00

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

IV. Summary

Toxicity testing was initiated by LAW on April 19, 2000 to determine the LC₅₀ (the concentration of the sample at which 50% of the test organism, *Daphnia magna*, die). The initial set of test concentrations recommended by you (26.25, 52.5, 105, 210, and 420 ppm) resulted in 100% mortality in all test concentrations of the three polymer samples. Therefore, an LC₅₀ was not calculable. Upon your approval, the test concentrations were reformulated to include 1.64, 3.28, 6.56, 13.13, and 26.25 ppm and tests were repeated on May 10, 2000. Test results indicated acute mortality to *Daphnia magna* in the 602 M, 630 M and 640 M polymer samples. The LC₅₀'s were measured as 2.5, 21.1, and 4.4 ppm, respectively.

V. Quality Assurance

Daphnia magna, NaCl Reference Toxicant, 006, 4/25/00

Survival: 48-hr LC₅₀ = 4757 mg/L NaCl

48-hr LC₅₀ Range of Acceptability = 2360 to 7680 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 (ppm): | 1.64, 3.28, 6.56, 13.13, 26.25, 52.5, 105, 210, and 420 |
| 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, April 19-21, 2000 and May 10-12, 2000.

| Parameter | 420 ug/L Polymer Sample | | | |
|--|-------------------------|-------------------|-------------------|------------------|
| | 602 M | 630 M | 640 M | DMW ^a |
| Date Sampled | 4/19/00 | 4/19/00 | 4/19/00 | 4/19/00 |
| Time Sampled (hr.) | 1600 | 1530 | 1630 | 1200 |
| Temperature on Arrival (°C) | 20 | 20 | 20 | 20 |
| Dissolved Oxygen (mg/L) | 7.3 | 7.15 | 7.20 | 7.40 |
| pH | 7.94 | 8.06 | 8.06 | 7.44 |
| Total Alkalinity as CaCO ₃ (mg/L) | 76.0 | 76.0 | 81.0 | 68.5 |
| Total Hardness as CaCO ₃ (mg/L) | 79.5 | 75.5 | 77.5 | 79.5 |
| Conductivity @ 25°C (µmhos/cm) | 156 | 159 | 152 | 160 |
| Total Residual Chlorine ^b (mg/L) | <0.06 | <0.06 | <0.06 | <0.06 |
| Total Ammonia ^b (mg/L) | 1.19 ^c | 1.19 ^c | 0.94 ^c | <0.03 |

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

Entered by: ASP 5/15/00
Checked by: RFP 5/15/00

^a DMW - control used in the water flea test

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

^c Caution should be used when interpreting ammonia data as there was an interference noted upon addition of the Nessler reagent.

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 |
|---------------------------|-------------------------|------------------------------|--------------------------------------|------------------------------|--------------------------|
| MAGM016041400 | 4/14/00 | 4/19/00 (0900) | <24 hrs. | DMW / 20.0 | YCT & <i>Selenastrum</i> |
| MAGM017041400 | 4/14/00 | 4/19/00 (0900) | <24 hrs. | DMW / 20.0 | YCT & <i>Selenastrum</i> |
| MAGM019042800 | 4/28/00 | 5/10/00 (0900) | <48.0 hrs. | DMW / 20.0 | YCT & <i>Selenastrum</i> |

APPENDIX C

Test Data Sheets

**Water Flea
Polymer Test**

**Water Flea
Reference Toxicant Data Sheets**