

Name of Project: Toxicity Screening of Activated Sludge Using the Microtox Toxicity Analyzer

Faculty Advisor: M. S. Switzenbaum

Student: Michael McGrath (M.S. Student)

Progress Report: May, 1987

Michael McGrath has been collecting data from the literature on both Microtox and activated sludge toxicity. In the laboratory, he has been learning to use the Gilson respirometer and BOD test. This summer he will be collecting data on the toxic response of various organic and inorganic chemicals.

Research Timetable: (2 year study)

On schedule (see January 1987 progress report)

Project: Activated Sludge Toxicity Testing with Microtox

Faculty Advisor: Dr. Michael S. Switzenbaum

Student: Mike McGrath

Progress Report: April 1988

This report summarizes work performed over the past three months on the activated sludge/Microtox project. During this time, work on the literature phase of this project continued. This work included reviewing the current literature for other toxicity screening tests and surveying publicly owned wastewater treatment plants using the Microtox Toxicity Analyzer for toxicity testing.

Tests proposed by other researchers for the screening of wastewater toxicity include dehydrogenase activity, ATP, and different types of respirometers. Each has its own particular merits. A framework for comparing the various tests has been established. (See Figure 1) At present we are examining the test methods for cost, ease of operation and maintenance, reproducibility, sensitivity, reliability, turn-around time for results, and on-line capability.

In addition to the literature review of Microtox and other proposed toxicity screening tests, a survey of publicly owned wastewater treatment plants is being conducted. We surveyed the seventeen treatment plants in the United States which own a Microtox by mailed questionnaire. A sample of the survey form is attached. Of the seventeen, we have received responses from fourteen. The results are being tabulated.

Project Completion Timetable:

April-May	Complete detailed literature review
May-June	Complete analysis of experimental results and treatment plant surveys
July-August	Prepare final report

RATINGS OF PROPOSED WASTEWATER TOXICITY SCREENING TESTS

	ONLINE	RAPID	SIMPLE	INEXPENSIVE	EASY TO MAINTAIN	PRECISE	SENSITIVE	RELIABLE
FISH BIOASSAY	-	-	-	-	+	-	+	+
DEHYDROGENASE	-	+		+	+	+	-	-
ATP		+			-	+		+
MICROTOX		+	+	+	+	+	+	+
BOD		-				-	-	+
RESPIROMETER	+	+	+	+	-	-		+
SLUDGE RESPIRATION	-	+	+	+	+	-		+

SURVEY OF MICROTOX USE IN PUBLICLY OWNED WASTEWATER TREATMENT PLANTS

TREATMENT PLANT CHARACTERISTICS:

What is Plant Classification?

- | | |
|--|--|
| <input type="checkbox"/> Conv. Activated Sludge | <input type="checkbox"/> Plug-Flow Act. Sludge |
| <input type="checkbox"/> Pure Oxygen Act. Sludge | <input type="checkbox"/> Extended Aeration Act. Sludge |
| <input type="checkbox"/> Contact Stabilization | <input type="checkbox"/> Oxidation Ditch |
| <input type="checkbox"/> Trickling Filter | <input type="checkbox"/> Lagoon |
| <input type="checkbox"/> Other. Please Specify: | |

What is Average Daily Dry Weather Flow? Please check one.

- | | |
|------------------------------------|-------------------------------------|
| <input type="checkbox"/> < 1 MGD | <input type="checkbox"/> 1-10 MGD |
| <input type="checkbox"/> 10-50 MGD | <input type="checkbox"/> 50-100 MGD |
| <input type="checkbox"/> > 100 MGD | |

What percentage of total influent flow is from industrial sources?

- | | |
|---------------------------------|---------------------------------|
| <input type="checkbox"/> 0-10% | <input type="checkbox"/> 10-20% |
| <input type="checkbox"/> 20-30% | <input type="checkbox"/> 30-40% |
| <input type="checkbox"/> 40-50% | <input type="checkbox"/> >50% |

What industries contribute to influent flow? Please check.

- | | |
|--|---|
| <input type="checkbox"/> Adhesives | <input type="checkbox"/> Pulp and paper |
| <input type="checkbox"/> Leather tanning and finishing | <input type="checkbox"/> Textile mills |
| <input type="checkbox"/> Soaps and detergents | <input type="checkbox"/> Inorganic chemicals |
| <input type="checkbox"/> Aluminum forming | <input type="checkbox"/> Timber |
| <input type="checkbox"/> Battery manufacturing | <input type="checkbox"/> Coal mining |
| <input type="checkbox"/> Coil coating | <input type="checkbox"/> Ore mining |
| <input type="checkbox"/> Copper forming | <input type="checkbox"/> Petroleum refining |
| <input type="checkbox"/> Electroplating | <input type="checkbox"/> Steam electric |
| <input type="checkbox"/> Foundries | <input type="checkbox"/> Organic chemicals |
| <input type="checkbox"/> Iron and steel | <input type="checkbox"/> Pesticides |
| <input type="checkbox"/> Nonferrous metals | <input type="checkbox"/> Pharmaceuticals |
| <input type="checkbox"/> Photographic supplies | <input type="checkbox"/> Plastic and synthetic material |
| <input type="checkbox"/> Plastics processing | <input type="checkbox"/> Rubber |
| <input type="checkbox"/> Porcelain enamel | <input type="checkbox"/> Auto and other laundries |
| <input type="checkbox"/> Gum and wood chemicals | <input type="checkbox"/> Mechanical products |
| <input type="checkbox"/> Paint and ink | <input type="checkbox"/> Electric and electronic components |
| <input type="checkbox"/> Printing and publishing | <input type="checkbox"/> Explosives manufacturing |

What are some identified pollutants in the influent? (i.e. Cyanide, Mercury)

- | | |
|---|--|
| <input type="checkbox"/> Heavy metals | <input type="checkbox"/> Refractory organics |
| <input type="checkbox"/> Pesticides | <input type="checkbox"/> Organic solvents |
| <input type="checkbox"/> Other. Please specify: | |

MICROTOX USE:

Please check uses:

- ☐ Toxicity Screening
- ☐ Toxicity Reduction Evaluation
- ☐ Pollutant Source Identification
- ☐ Establishment of Operating Parameters
- ☐ Effluent Monitoring
- ☐ Establishing Treatability of New Industry Effluents
- ☐ Billing of Specific Industries
- ☐ Other, Please Explain:

How often do you test toxicity?

OTHER TOXICITY MEASURING MEANS:

Are other toxicity measuring devices used at your plant? What are they?

- ☐ Fish assays
- ☐ ATP assays
- ☐ Other. Please specify:
- ☐ Daphnia assays
- ☐ Respirometry

How are they used?

- ☐ Toxicity Screening
- ☐ Toxicity Reduction Evaluation
- ☐ Pollutant Source Identification
- ☐ Establishment of Operating Parameters
- ☐ Effluent Monitoring
- ☐ Establishing Treatability of New Industry Effluents
- ☐ Billing of Specific Industries
- ☐ Other, Please Explain:

PERMIT REQUIREMENTS:

What effluent discharge requirements must be met?

Is Microtox used to monitor any requirement in your permit?

ADDITIONAL COMMENTS:

What are the reasons that you use the Microtox?

<input type="checkbox"/> Ease	<input type="checkbox"/> Quickness
<input type="checkbox"/> Sensitivity	<input type="checkbox"/> Cost
<input type="checkbox"/> Reproducibility	<input type="checkbox"/> Other. Please Specify:

What are the disadvantages of Microtox?

<input type="checkbox"/> Cost	<input type="checkbox"/> Lack of government standards
<input type="checkbox"/> Speed	<input type="checkbox"/> Results
<input type="checkbox"/> Sample preparation	<input type="checkbox"/> Other. Please Specify:

Please add your own comments.

Please fill in name, address, and telephone number of a person we may contact at your facility:

Name: _____
Address: _____

Telephone number: _____

Please return to:

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