

Bioassays of

Premier Refractories, Inc.

Port St. Joe, Gulf County, Florida

NPDES #FL0002607

Sampled 5/20/02

November 2002

Biology Section

Division of Resource Assessment & Management

Comprehensive Quality Assurance Plan #870346G

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Introduction

Premier Refractories Inc., SR. 382N, Port St. Joe, Gulf County, Florida, NPDES # FL0002607, tests performed 21 to 23 May 2002.

This magnesium hydroxide recovery facility has a design flow of 13.5 MGD and an average flow of 8.9 MGD (March 1999 to September 1999). At this facility seawater is pumped into a reactor and treated with calcined dolomite lime, after which magnesium hydroxide is precipitated out of the seawater. The seawater is then returned to the Gulf County Canal, which has direct discharge to the Class III marine waters of Port St. Joe Bay. This facility has a pH-mixing zone that extends 141 meters from the outfall, with a maximum allowable pH of 10.05 and a chronic toxicity mixing zone that extends 133 meters from the outfall (facility information provided by Wesley Keller, FDEP, Pensacola).

The toxicity tests discussed in this report were performed in accordance with methods described by Weber, 1993, *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, 4th Edition, EPA/600/4-90/027F.

Results and Discussion

The FDEP Biology Section performed two 48-hour static acute screening toxicity bioassays on a sample of effluent collected from the outfall of this facility. The salinity of the samples was ~32 ppt, therefore, the test species used were the mysid shrimp, *Americamysis bahia*, and the inland silverside, *Menidia beryllina* (Table 1). The sample was toxic to the *A. bahia* test organisms within 48 hours of test initiation, causing 100% mortality. However, there was no mortality observed in the *M. beryllina* test organisms.

Residual chlorine and ammonia were not detected in the bioassay sample in the laboratory. Additional samples of effluent were collected from this facility and analyzed for herbicides, nutrients, metals, organic compounds, and pesticides. One nutrient and two metals were identified (Table 2).

The chemistry results confirmed that the ion makeup of the sample was not in seawater proportions. The observed mortality in the *A. bahia* test is likely due to the seawater-ion imbalance of the sample. Previous research conducted by the FDEP Biology Section demonstrated that *A. bahia* is much more sensitive to seawater-ion imbalances than is *M. beryllina* (Wolfe, *et al*. 1995. *Protocols for determining Major-Seawater-Ion Toxicity in Membrane-Technology Water-Treatment Concentrate*. Florida Department of Environmental Protection, Bureau of Laboratories. 96pp.) The calcium concentration was measured at 1,730 mg/L at 32‰ salinity (salinity based on conductivity and temperature). This is approximately four times (4X) the normal concentration for calcium in seawater of this salinity. The elevated calcium concentration is a source of toxicity in this sample, but other unidentified sources of toxicity cannot be ruled out without performing the major-seawater-ion imbalance toxicity testing protocols cited above.

Conclusion

The sample of effluent from this facility on May 20, 2002, was acutely toxic to *A. bahia* within 48 hours. The cause of this toxicity is due, at least in part, to the imbalance in the major-seawater ions, however other sources of toxicity cannot be ruled out.

Table 1. Data recorded during the 48-hour acute screening bioassays of a sample of effluent from Premier Refractories Inc., SR. 382N, Port St. Joe, Gulf County, Florida, NPDES# FL0002607, performed from 21 to 23 May 2002.

Facility:	**Premier Refractories Inc.**	**NPDES #**	**FL0002607**	Facility Type:	**Magnesium Hydroxide**	**Analysts:**	Jacquelyn Brynda
Location:	SR. 382N	Contact/District:	Butts/NW		**Recovery from Sea water**		Joshua Ayres
County:	Gulf	Test type:	static acute screen				Gary Hardie
Sample Collection Date:	5/20/2002 Time: 1250	# tests:	2	Receiving Water:	Port St. Joe Bay		Marshall Faircloth
Test Beginning Date:	5/21/2002 Time: 1355	Chlorination Type:	Non-chlorinated		Class III Marine		
Test Ending Date:	5/23/2002 Time: 1350				**Page 1 of 1**	**Reviewer:**	David Whiting

Organism: ***Americamysis bahia*** Life stage: 3 days

	Sample/Diluent	SURVIVAL # Alive			pH			Temperature[A]			Dissolved Oxygen			Conductivity Uncorrected mmhos/cm	
Concentrations	Volume(mL)	0 hr	24 hr[D]	48 hr	0 hour	24 hour	48 hour	0 hour	24 hour	48 hour	0 hour	24 hour	48 hour	0 hour	24 hour
Control A	0/500	5	5	-	8.2	8.1	-	24.0	25.0	-	6.6	5.8	-	48.0	50.1
Control B	0/500	5	5	-	8.2	8.1	-	24.1	24.3	-	6.6	5.9	-	49.2	49.8
Control C	0/500	5	5	-	8.2	8.1	-	24.0	24.3	-	6.6	6.0	-	49.1	51.0
Control D	0/500	5	5	-	8.2	8.1	-	23.7	24.2	-	6.6	6.0	-	48.2	49.5
100% A	500/0	5	0	-	9.5	8.8	-	24.3	24.1	-	6.5	6.0	-	48.6	48.9
100% B	500/0	5	0	-	9.6	8.8	-	24.4	24.0	-	6.4	5.8	-	48.6	49.1
100% C	500/0	5	0	-	9.6	8.8	-	24.4	24.0	-	6.4	5.9	-	48.5	48.6
100% D	500/0	5	0	-	9.6	8.8	-	24.3	24.3	-	6.4	5.9	-	48.3	48.0

[A] Temperatures of room and test incubator were continuously recorded on a strip chart recorder.
Room Temperature range for the test period was 23.0-24.5 °C.
Incubator #2 temperature range for the test period was 24.5-25.0°C.

[D] Test terminated at 24 hours due to complete mortality in the 100% sample.

Organism: ***Menidia beryllina*** Life stage: 13 days

	Sample/Diluent	SURVIVAL # Alive			pH			Temperature[B]			Dissolved Oxygen			Conductivity Uncorrected mmhos/cm	
Concentrations	Volume(mL)	0 hr	24 hr	48 hr	0 hour	24 hour	48 hour	0 hour	24 hour	48 hour	0 hour	24 hour	48 hour	0 hour	48 hour
Control A	0/500	5	5	5	8.2	8.1	8.0	24.2	24.1	25.1	6.5	5.9	5.2	48.2	51.9
Control B	0/500	5	5	5	8.2	8.1	8.0	24.2	24.7	25.0	6.5	5.9	5.2	48.9	52.0
Control C	0/500	5	5	5	8.2	8.1	8.0	24.2	24.5	24.9	6.6	5.8	5.3	49.2	51.6
Control D	0/500	5	5	5	8.2	8.1	8.0	24.1	24.4	24.8	6.6	6.0	5.4	49.1	51.4
100% A	500/0	5	5	5	9.5	8.9	8.3	24.3	24.5	24.7	6.5	6.0	5.5	48.6	50.5
100% B	500/0	5	5	5	9.5	8.9	8.2	24.5	24.1	24.7	6.5	5.9	5.6	48.4	52.4
100 % C	500/0	5	5	5	9.5	8.9	8.2	24.5	24.4	24.7	6.4	6.0	5.7	48.3	53.0
100% D	500/0	5	5	5	9.5	8.9	8.5	24.4	24.0	24.8	6.4	5.9	5.7	48.4	51.1

[B] Temperatures of room and test incubator were continuously recorded on a strip chart recorder.
Room Temperature range for the test period was 23.0-24.5°C.
Incubator #3 temperature range for the test period was 24.5-25.0°C.

LIMS	
Job number:	TLH-2002-05-21-11-01
sample number:	594901

Data Transcription Verification	
date:	9/26/2002
by:	Joshua Ayres
	James Daniels

Total Residual CL2	mg/L	Method
Field:	-	-
Lab:	<0.03	Hach

Ammonia	Total (mg/L)	Unionized (mg/L)
Control water:	<0.051*	<0.051*
100% Sample:	<0.051*	<0.051*

*Method detection limit increases with increase in salinity.

Alk & Hardness	Alkalinity (mg/L)	Hardness (mg/L)
Control water:	149	-
100% Sample:	40	-

Salinity [C]	ppt
Control Water:	~32
100% Sample:	~32

[C] Salinity based on conductivity and temperature.

Table 2. Results of chemical analyses on the effluent from Premier Refractories Inc. sampled on May 20, 2002.

Metals		
Calcium	1,730	mg/L
Magnesium	461	mg/L
Pesticides and Herbicides		
None detected		
Nutrients		
Nitrates and Nitrites	0.039	mg N/L
Base, Neutral, & Acid Extractable Organics		
None detected		

The Bioassay of Premier Refractories Inc. effluent sampled on May 20, 2002, NPDES #FL0002607.

Fill Out This Section For All Surface Water Discharger Inspections(CEI, CSI, CBI, PAI, XSI-RI Optional)

Transaction Code		NPDES NUMBER		YR/MO/DA		Insp Type	Inspector	Fac Type
1 N	2 5	3 F L 0 0 0 2 6 0 7 # #		0 2 0 5 2 0		# **B**	# **S**	# 2

Remarks

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The Priority Pollutants Analysis for Premier Refractories Inc. effluent sampled on May 20, 2002, NPDES #FL0002607.

Fill Out This Section For All Surface Water Discharger Inspections(CEI, CSI, CBI, PAI, XSI-RI Optional)

Transaction Code		NPDES NUMBER		YR/MO/DA		Insp Type	Inspector	Fac Type
1 N	2 5	3 F L 0 0 0 2 6 0 7 # #		0 2 0 5 2 0		# **B**	# **S**	# 2

Remarks

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