CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2024
DateRun:	09/03/2024
Experimenters:	Cindy McClaughlin
ClientType:	Environmental Sustainability Company
ProjectNumber:	Project #2
Substrates:	Painted metal
PartType:	Coupon
Contaminants:	Algae
Cleaning Methods:	Manual Wipe
Analytical Methods:	Colorimeter, Visual
Purpose:	To evaluate the effectiveness of GeoProX in removing river biofouling for boat bilge cleaning applications.

Experimental Procedure:

This trial simulated boat bilge cleaning. Three stainless steel coupons coated with white boat paint and three coupons coated with antifouling paint were used to compare soil loads. Coupons were analyzed using a colorimeter, and the Light "L" value of each coupon as well as initial visual ratings were performed based on the visualization key listed below. Coupons were submerged in the Merrimack River for four weeks to allow biofouling to create a similar layer found in a bilge tank and dipped in common used motor oil to ensure it was present in the contaminant before air-drying for 96 hours. Dirty values were recorded visually and with a colorimeter. Coupons were then subjected to manual wiping using a straight-line washability (SLW) unit, set to a 30-second cycle with 20 wipes. Each coupon received 2.5 mL of GeoProX, with a 60-second dwell time before wiping. After cleaning, the coupons were re-analyzed visually and with a colorimeter to determine final values and overall effectiveness.

Visual Analysis Parameters

1 = 100% removal

2 = 75% removal

3 = 50% removal

4 = 25% removal

5 = No removal

Results:

The L values from the colorimeter represent the difference in lightness (higher value) and darkness (lower value). Percent detergency demonstrates the amount of restoration to the original that has occurred after the cleaning test has been performed. A higher average percent detergency indicates that the cleaner has been effective and has restored the dirty substrate and cleaned it so that it now is much closer to how it originally was measured.

Data recorded from the readings can be calculated as percent detergency in the following equation to determine the cleaning efficacy of each formulation:

% DET = R(cleaned) - R(soiled) / R(unsoiled) - R(soiled) X 100

Colorimeter Results:

Substrate	L Initial	L Dirty	L Clean	% DET	AVG %
White Painted Surface	90.44	45.64	53.60	17.77	46
	90.51	50.94	60.37	23.83	
	90.57	46.68	88.46	95.19	
Blue Antifouling Painted Surface	44.87	44.52	43.43	-311.43	95
	43.16	44.20	43.50	67.31	
	44.52	44.79	43.36	529.63	

The white-painted coupons showed a range of %DET, with a low of 17% and a high of 95%, suggesting that the level of biofouling contamination varied across the coupons. Damage to the white coupons was also observed, likely due to prolonged exposure to water affecting the surface.

The blue-painted coupons, which contained antifouling, exhibited both negative %DET (-311.43) and very high %DET (529.63). The negative value could be attributed to possible surface damage from the river water and impact on the surface during soiling or cleaning residue, which was observed after cleaning the coupons, unlike the white coupons that lacked antifouling in the paint. The high %DET might indicate that the cleaner was more effective on that surface, but it could have also altered the condition of the paint. Given the large range in %DET from the colorimeter, visual ratings were considered more reliable.

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Visual Rating Results:

Substrate	Average Initial Rating	Average Dirty Rating	Average Clean Rating
White Painted Surface	1	5	4.5
	1	5	4.5
	1	5	4.5
Blue Antifouling Painted Surface	1	4	2.8
	1	4	2.8
	1	4	2.8

There was some visible removal on the coupons, but the soil load was so heavy that the amount of cleaner and time used for this test was insufficient to remove much from the surface. However, the blue-painted coupons showed closer to a 50-60% reduction in visible biofouling contamination on the surface that had been immersed in the river water, indicating that the cleaner improved cleanliness on both surfaces.

The cleaner continuously clogged the spray-head and started to immediately separate within the solution after use which could have also contributed to the lower performance.

Summary:

Substrates:	Painted metal				
Contaminants:	Algae				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
AquOm Inc	GeoProX	1.5g per 100ml		☑	

Conclusion:

GeoProX did remove some of the simulated bilge biofouling; however, the extended dwell time and the higher amount of contamination that accumulated on the surface of the coupons may have contributed to its lower performance compared to previous tests. A follow-up test using immersion would be beneficial to give the cleaner adequate time to penetrate the soil, and a rinse step is recommended to evaluate residue removal post cleaning.