CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	25
DateRun:	09/24/2024
Experimenters:	Alicia McCarthy, Tatyanna Moreland Junior, Cindy McClaughlin, Rachael Rososky
ClientType:	Cleaner Manufacturer
ProjectNumber:	Project #2
Substrates:	Marble
PartType:	Part
Contaminants:	Calcium/lime, Calcium/Scale
Cleaning Methods:	Immersion/Soak
Analytical Methods:	Gravimetric, Visual
Purpose:	To evaluate the descaling efficacy of FB-1000 at various concentrations at room temperature (68°F) compared to a 1% Phosphoric acid solution
Experimental Procedure:	Initial weights and visual observations were recorded for four marble blocks (2.5" x 2.5"), with one block assigned to each solution tested at its specified dilution. Initial weights were taken before completely immersing each block into 150 mL of product solution for a total of 30 minutes. Observations were recorded at intervals of 1, 5, 10, 15, and 30 minutes. After 30 minutes, the blocks were removed from the solutions and rinsed in deionized (DI) water for 15 seconds. They were then manually dried using a heat gun set to 500°F for two minutes. The blocks were cooled at room temperature (68°F) for two hours before final weights were measured to assess substrate weight loss. Blocks that exhibited weight loss were considered effective at dissolving calcium. Visual observations of each marble block and the product solution were also analyzed to compare efficacy against the comparative solution: a 1% phosphoric acid solution for industrial scale removal applications.

Results:

Product/ Dilution	Initial Wt. (g)	Final Wt. (g)	Removed Wt. (g)	% Removed
Phosphoric acid 1%	14.4743	14.4620	0.0123	0.0850
FB-1000 10%	21.3636	21.2091	0.1545	0.7232
FB-1000 2%	28.7136	28.6813	0.0323	0.1125
FB-1000 1%	30.9967	30.9837	0.0130	0.0419

Visual Observations at Time Intervals

Product/ Dilution	Time (Mins)	Observations
Phosphoric acid 1%	1	little to no bubbles or foam, no color change in solution or marble, marble looks the same
	5	Tiny bubbles are covering the entire surface of the marble, no color change in solution or marble
	10	no change from previous observations
	15	no change from previous observations
	30	no change from previous observations
FB 1000 10%	1	little bubbles, foaming, rising slowly, no color change or pieces breaking off, marble looks same
	5	lighter color change, cloudy white liquid, all other observations the same
	10	more cloudy white at bottom of beaker, crack forming on marble (side corner), no other changes
	15	marble turning slight whiter in color, bubble rate slowing, another crack down middle of marble, no other changes

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	30	solution cloudier, marble got more pale in color, all other observations are the same
FB 1000 2%	1	little to no bubbles or foaming, no color change or pieces falling off, marble looks the same
	5	no change from previous observations
	10	no change from previous observations
	15	some cloudy whitening of solution at the bottom near the marble, no other changes
	30	no change from previous observation
FB 1000 1%	1	little to no bubbles or foam, no color change, marble looks the same
	5	no change from previous observation
	10	no change from previous observation
	15	no change from previous observation
	30	no change from previous observation

The FB-1000 10% caused faster degradation of the marble's surface compared to the phosphoric acid 1% solution and appeared paler after immersing for 30 minutes and with a rinse in DI water. FB-1000 2% dilution outperformed the 1% phosphoric acid solution in degrading calcium and the overall percent removed from the marble block. The FB-1000 1% was effective and removed slightly more calcium (in grams) from the block than the phosphoric acid 1% solution, although its overall percentage removal was half that of the phosphoric acid solution.

Summary:

Substrates:	Marble
Contaminants:	Calcium/lime, Calcium/Scale

Company Name:	Product Name:	Conc.:	Efficiency:	Effective:	Observations:
LD Carlson Company	Phosphoric Acid 10% Solution	1%	0.08	☑	Removed 0.0123g
Innovative Chemical Technologies, Inc.	Virdivis FB1000 (ICT 1648L)	10%	0.72	☑	Removed 0.1545g
Innovative Chemical Technologies, Inc.	Virdivis FB1000 (ICT 1648L)	2%	0.11	☑	Removed 0.0323%
Innovative Chemical Technologies, Inc.	Virdivis FB1000 (ICT 1648L)	1%	0.04	☑	Removed 0.0130g

Conclusion:

All three dilutions of FB-1000 were as effective as, or more effective than, the 1% phosphoric acid solution at dissolving calcium. The 10% FB-1000 dilution was the most effective, followed by the 2% dilution, while the 1% FB-1000 dilution performed comparably to or slightly better than the phosphoric acid 1% solution.