# CLEANING LABORATORY EVALUATION SUMMARY

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|---|---|
| SCL #: | 2010 |
| DateRun: | 06/23/2010 |
| Experimenters: | Jason Marshall, Timothy Weil |
| ClientType: | Cleaning Equipment Mfr |
| ProjectNumber: | Project #1 |
| Substrates: | Vinyl Composite Tiles |
| PartType: | Coupon |
| Contaminants: | Hucker's Soil |
| Cleaning Methods: | Mechanical Agitation |
| Analytical Methods: | Gravimetric, Gloss-Color Meter |
| Purpose: | To evaluate various cleaning liquids in hard floor cleaning scenario |

Experimental Procedure:

A four foot by eight-foot piece of plywood was covered with Armstrong Imperial texture standard Exceleron vinyl composition tiles (white). Tiles were adhered using Roberts Vinyl Composition Tile adhesive except for the center four tiles. The tiles were then coated with a standard floor wax.

The center four tiles were weighed gravimetrically using a Mettler Toledo PG802-S analytical balance (0.01g). Tiles also were evaluated using a BYK Spectro Guide gloss/color meter to determine base line L-values. The tiles were then coated with Hucker's Soil Formulation (Jiffy Creamy Peanut Butter 9.2%, Salted Butter 9.2%, Arrowhead Mills stone ground wheat flour 9.2%, Egg Yolk 9.2%, Evaporated milk 13.8%, Distilled water 45.8%, Printer's ink with boiled linseed oil 0.9%, Shaws saline solution 2.7%) using a small paint brush and allowed to dry for 24 hours at room temperature. The contaminated coupons were weighed again to determine the amount of soil added. A second set of L-values were recorded. The soiled tiles were placed in the center of the simulated floor.

A modified Tennet T5 Echo floor scrubber machine was filled with room temperature tap water. Americo Red Buff floor maintenance pads were installed, and the brush setting was set to the lowest pressure level. With the squeegee system engaged the floor tiles were cleaned in a series of 10 passes. Upon the completion of the cleaning, the four tiles were removed from the simulated floor and allowed to dry overnight before final weights and L-values were recorded.

A second set of four prepared floor tiles were inserted into the floor and the cleaning process was repeated using hot water (100 F), electrolyzed water (supplied via the Tennet T5 machine), Zep Commercial Neutral Floor Concentrate (1 oz/gallon) and ozonated water (Tersano Lotus Pro System).

Final weights were used to calculate soil removal efficiency and the L-values were used to determine how close the cleaned floor was to the original appearance.

Results:

Upon review of both sets of analytical data (gravimetric, L-values) the results showed that the cleaning performance was best for the first cleaning liquid used and the worst was the last product tested. Based on visual observations, the cleaning results may have been affected by the residual soil left on the tiles after each cleaning cycle. The first trial had no residual soil on the non-center tiles to alter results. From there the room temperature cleaned tiles left residue behind that was then transferred onto the tiles cleaned using hot water, from hot water to the electrolyzed water and so on. The first table lists the gravimetric analysis results for each liquid and the second includes the L-values recorded for the same tiles.

Soil removal by weight

| Process | Initial Wt | Dirty Wt | Final Wt | Initial wt of cont. | Final wt of cont. | %Cont Removed | Ave Removal |
|---|---|---|---|---|---|---|---|
| Cold water | 637.03 | 638.09 | 637.08 | 1.06 | 0.05 | 95.28 | 91.94 |
| | 640.77 | 642.08 | 640.90 | 1.31 | 0.13 | 90.08 | |
| | 637.96 | 639.24 | 638.05 | 1.28 | 0.09 | 92.97 | |
| | 640.33 | 641.37 | 640.44 | 1.04 | 0.11 | 89.42 | |
| Hot water | 638.21 | 639.20 | 638.60 | 0.99 | 0.39 | 60.61 | 61.51 |
| | 635.82 | 636.70 | 636.21 | 0.88 | 0.39 | 55.68 | |
| | 641.50 | 642.22 | 641.80 | 0.72 | 0.30 | 58.33 | |
| | 641.58 | 642.35 | 641.80 | 0.77 | 0.22 | 71.43 | |
| Electrolyzed water | 641.28 | 642.30 | 641.70 | 1.02 | 0.42 | 58.82 | 62.80 |
| | 641.67 | 642.51 | 641.85 | 0.84 | 0.18 | 78.57 | |
| | 640.34 | 641.13 | 640.49 | 0.79 | 0.15 | 81.01 | |

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|---|---|---|---|---|---|---|---|
| | 640.60 | 641.21 | 641.01 | 0.61 | 0.41 | 32.79 | |
| Alkaline cleaner - warm | 641.28 | 642.21 | 641.77 | 0.93 | 0.49 | 47.31 | 15.23 |
| | 642.16 | 642.65 | 642.65 | 0.49 | 0.49 | 0.00 | |
| | 641.50 | 642.37 | 642.29 | 0.87 | 0.79 | 9.20 | |
| | 638.12 | 638.80 | 638.77 | 0.68 | 0.65 | 4.41 | |

Soil removal by light-dark

| Process | Initial L-Value | Dirty L-Value | Final L-Value | % decrease | % cleaned | Ave L value |
|---|---|---|---|---|---|---|
| Cold water | 84.19 | 35.09 | 56.89 | 41.68 | 67.57 | 65.71 |
| | 84.48 | 26.79 | 54.27 | 31.71 | 64.24 | |
| | 85.04 | 29.59 | 59.60 | 34.80 | 70.08 | |
| | 85.56 | 28.24 | 52.13 | 33.01 | 60.93 | |
| Hot water | 86.41 | 28.91 | 39.50 | 33.46 | 45.71 | 54.87 |
| | 85.33 | 30.68 | 52.09 | 35.95 | 61.05 | |
| | 85.52 | 30.85 | 46.14 | 36.07 | 53.95 | |
| | 85.30 | 33.96 | 50.13 | 39.81 | 58.77 | |
| Electrolyzed water | 85.49 | 27.77 | 48.27 | 32.48 | 56.46 | 56.66 |
| | 84.12 | 27.98 | 48.86 | 33.26 | 58.08 | |
| | 85.78 | 27.75 | 47.80 | 32.35 | 55.72 | |
| | 85.05 | 27.86 | 47.94 | 32.76 | 56.37 | |
| Alkaline cleaner - warm | 82.27 | 27.50 | 49.63 | 33.43 | 60.33 | 57.44 |
| | 85.59 | 34.37 | 50.22 | 40.16 | 58.68 | |
| | 85.54 | 28.82 | 47.55 | 33.69 | 55.59 | |
| | 84.30 | 28.92 | 46.52 | 34.31 | 55.18 | |

Summary:

| **Substrates:** | Vinyl Composite Tiles |
|---|---|
| **Contaminants:** | Hucker's Soil |

| Company Name: | Product Name: | Conc.: | Efficiency: | Effective: | Observations: |
|---|---|---|---|---|---|
| Water | Water | 100 | 91.94 | ☑ | |
| Water | Water | 100 | 61.51 | ☐ | |
| ZEP Manufacturing Company | Neutral Floor Cleaner Concentrate | 0.78 | 15.23 | ☐ | |
| Fisher Scientific | Absolute Ethanol | 0 | 0.00 | ☐ | |
| Tennent Corporation | Tennent Electrolyzed Water | 100 | 62.80 | ☐ | |

Conclusion: A follow up test will be conducted to try to address soil spread. Cleaning time will be increased and the equipment will be held in a stationary location.