CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2022
DateRun:	06/07/2022
Experimenters:	Tatyanna Moreland Junior
ClientType:	Cleaner Manufacturer
ProjectNumber:	Project #1
Substrates:	Textile
PartType:	Part
Contaminants:	Dirt
Cleaning Methods:	Manual Wipe
Analytical Methods:	Colorimeter, Visual
Purpose:	To evaluate supplied product for soil removal from leather samples.

Experimental Procedure:

The company provided two sets of chemically identical cleaning formulations for performance evaluation. Heat treatment of a bottle for each formulation in an oven at 120°F was conducted for a week to test the stability of the formulations and packaging at consistent high-temperature conditions. GS-41 handwashing test soil (five grams of synthetic carpet soil and 20mL of water; AATCC Test Method 122) acted as the contaminant on the leather substrate.

Soil Efficiency Test

Two strips of leather were cut from the roll and the soil was applied. Initially, the samples were to be gravimetrically analyzed, however, the weight of the soil was so light compared to the weight of the samples themselves that it was deemed unsuitable. Going forward, the BYK-Gardner gloss/color meter and visual evaluations were used to analyze the samples. Upon application of the soil, the samples were dried with a heat gun for approximately one minute, and then allowed to sit to air dry for another 20 minutes. To test the soil's efficacy, one strip was cleaned with only water and paper towel by hand while the second strip was cleaned with the saddle soap on a paper towel. The end result showed significant visual differences, with a black stain present only on the sample cleaned with just water. This visual analysis was sufficient to determine that the handwashing soil was a suitable contaminant for testing.

Cleaning Performance Test

Twelve strips of tool leather acted as the substrate to test six standard formulations and six new formulations. For each formulation, three strips were cleaned with formulations at ambient conditions. Three additional strips were cleaned with formulations that underwent heat treatment at 120°F. Five points on each leather strip were assessed using gloss colorimeter readings and averaged. A foam applicator containing handwashing soil contaminated the leather strips before drying with a heat gun for one minute. The leather strips air dried for an additional 30 minutes. Gloss readings were repeated for contaminated values before being individually mounted on the SLW (straight line washability) unit. The strips were treated four times with a formulation from a spray bottle. A mounted microfiber cleaning cloth ran for the standard 20 cycles (37 cycles per minute). After cleaning, the leather strips air dried using a heat gun for one minute and air-dried overnight. Final readings using the gloss colorimeter were taken the next day.

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

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.

Ambient vs. Heat-treated

Product	Base	Dirty	Clean	%DET	Avg %DET
Ambient Standard Formulation	40.48	34.06	34.07	0.16	25.46
	40.07	34.40	36.37	34.74	
	38.56	31.28	34.30	41.48	
Ambient New Formulation	44.50	33.10	41.29	71.84	46.75
	38.81	33.87	35.47	32.39	
	40.40	33.85	36.21	36.03	
Heat Treated Standard Formulation	39.68	38.87	35.52	-413.58	-189.15
	41.78	39.75	37.17	-127.09	

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	41.28	39.60	39.15	-26.79	
Heat-treated New Formulation	40.01	38.68	36.37	-173.68	-195.86
	40.78	38.20	35.74	-95.35	
	39.89	38.92	35.83	-318.56	

Ambient average percent detergency for both the standard and new formulation are positive, showing an improvement between dirty and clean readings. However, all percentages are low and demonstrate outliers that skew the average for that formulation. This occurs for both ambient and heat-treated. For the ambient formulations, it may be more effective to look at the %DET rather than the overall average due to the outliers. From this perspective, it can be seen that the formulation results aren't very different from each other with results 34.74/41.48 (averaged out to be 38.11) and 36.03/32.39 (averaged out to be 36.03).

Negative %DET values indicate that the cleaner removed more color to the surface area than originally. This occurred with both heat-treated formulations. Photos taken of the cleaned leather areas are lighter in color compared to the unsoiled leather strips. Both average %DET values are close to -200 and can be considered almost twice as light as it was originally which could mean there was the removal of the substrate's original surface.

See pdf document "Client493.Project1.Trial2" for Figures 1-6.

Summary:

Conclusion: Overall, the average %DET for the standard formulation (25.46) is much lower than the average %DET for the new formulation (46.75). When looking at the individual values for %DET of ambient and heat-treated, the standard and new formulations appear to be similar. Treating the formulations at 120°F for a week changed both formulations enough that they bleached the color out of the leather resulting in negative %DET and the surface is lighter than the original base color of the substrate.