CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2022
DateRun:	11/15/2022
Experimenters:	Zoe Lawson, Tatyanna Moreland Junior, Marlen Galan, Alexander Symko
ClientType:	Cleaner Manufacturer
ProjectNumber:	Project #1
Substrates:	Textile
PartType:	Part
Contaminants:	None
Cleaning Methods:	Manual spreading
Analytical Methods:	Colorimeter, Visual, Contact Angle (Surface Tension)
Purpose:	To evaluate the product performance and stability in an extended elevated temperature range of a leather conditioner. Secondary testing will evaluate moisture repellency and rehydration of scratched leather.
Experimental Procedure:	Eighteen swatches of leather, nine per evaluation, were used to assess leather conditioner contained in 16oz tubs that were aged and unaged. The aged conditioner tubs were kept sealed and placed into an oven for seven days at 120F to simulate the back of a truck during a hot summer. The unaged conditioner tubs were used immediately at room temperature. The first evaluation was to assess the water-repellency efficacy of the conditioner, and the second evaluation was to assess the rehydration capabilities of a scratched leather surface. Two methods, contact angle measurements, and colorimeter L-values were used beyond visual observations to assess leather swatches before conditioner treatment, immediately after conditioner treatment, and 30 minutes after treatment. FTA1000 B Class contact angle instrument dropped DI water from a syringe onto the leather swatch. The FTA software measured the contact angle, and pictures of each contact angle sample and quantitative data were captured. The BYK spectro-guide color/gloss meter was used to establish the baseline L-values from the surface of each section of leather. L-values were taken before and 30 minutes after the product had been applied. Swatches were sprayed once with water after treatment to assess moisture repellency. A paperclip end was used to create three light scratches on the leather to simulate wear and tear and assess the rehydration potential of the product after treatment. In addition to calculating the % detergency of the conditioner's efficacy to rehydrate scratched areas of the leather, the % detergency indicates if there is staining or darkening of the surface. The % detergency is calculated as the following: $\%Det. = (L\ Clean - L\ Dirty)(L\ Initial - L\ Dirty) * 100\%$ The % Detergency formula is used to calculate results for the gloss L* readings. The gloss reading for L* indicates the contrast between light and darkness.
Results:	Table 1: Moisture Resistance L-Value Results

Product	L-Value Before Treatment	L-Value After Treatment	Difference between L-Values: Before & After Treatment/ Water Application	Average Difference
Original Formulation (Non-aged)	42.11	39.71	-2.40	-3.55
	44.07	38.85	-5.22	
	43.78	40.75	-3.03	
New Formulation (Non-aged)	42.10	38.37	-3.73	-3.55
	42.59	39.24	-3.35	
	42.14	38.58	-3.56	
New Formulation (Aged)	42.60	38.60	-4.00	-4.27
	43.43	37.83	-5.60	
	42.09	38.88	-3.21	

The average difference between the L-values of the leather swatches before and after the product treatment and water application was minimal with all values barely changed. Both the original and non-aged new formulation swatches experienced the same average change in L-value. The new formulation that was aged experienced a slightly greater difference between the L-values, however, no visible changes were seen on the surface of the swatches.

Table 2: Moisture Resistance Contact Angle Results

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Product	Contact Angle: Before Treatment	Average Contact Angle: Before Treatment	Contact Angle: After Treatment/ Water Spray Application	Average Contact Angle: After Treatment/ Water Spray Application	Overall Average Change In Contact Angle
Original Formulation (Non-aged)	58.14	60.38	99.15	96.09	+35.71
	53.50		93.60		
	69.50		95.53		
New Formulation (Non-aged)	52.28	50.72	98.37	97.51	+46.79
	48.48		94.64		
	51.40		99.53		
New Formulation (Aged)	66.56	71.16	98.24	87.67	+16.50
	73.30		69.82		
	73.63		94.94		

The leather swatches treated with the non-aged new formulation experienced the greatest average amount of contact angle change with an increase of 46.79 which suggests there is an increase in resistance to water on the surface and had improved water resistance compared to the original formulation. The change in contact angle for the aged new formulation was drastically lower than the non-aged new formulation version, however, visual observations could not differentiate the swatches.

Table 3: Scratched Leather L-Value Results

Product	L-Value Before Product	L-Value After Product	Difference between Before and After L-Values	Average Difference
Original Formulation (Non-aged)	43.00	39.92	-3.08	-2.83
	42.42	39.30	-3.12	
	41.66	39.37	-2.29	
New Formulation (Non-aged)	41.33	37.82	-3.51	-3.37
	42.19	38.92	-3.27	
	40.48	37.14	-3.34	
New Formulation (Aged)	43.86	37.91	-5.95	-3.83
	43.76	44.69	-0.93	
	43.74	39.11	-4.63	

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The L-values for the aged new formulation were higher overall for the L-value difference compared to the original and new formulation, however, the aged formulation visibly was closer to how the original formulation performed. The non-aged new formulation had the most pronounced scratches compared to the aged new formulation and original product.

Summary:

Conclusion: The non-aged and aged new formulation both visibly performed better than the original formulation at preventing staining after water was applied, but L-values and contact angle show all three formulations were effective and had improved moisture repellency after treatment. The aged new formulation performed as well as the original product after treatment and scratching the surface compared to the un-aged new formulation.