CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2017
DateRun:	11/02/2017
Experimenters:	Kevin Smith
ClientType:	Cleaner Manufacturer
ProjectNumber:	Project #1
Substrates:	Carpet
PartType:	Coupon
Contaminants:	Blood
Cleaning Methods:	Manual Wipe
Analytical Methods:	Gloss-Color Meter
Purpose:	To test the effectiveness of the given cleaners at removing blood from carpet.

Experimental Procedure:

L*, a*, and b* values were measured for each carpet coupon. Synthetic blood was then pipetted onto the carpet samples and allowed to dry overnight. L*, a*, and b* values were taken of the soiled carpets. The carpet was then sprayed twice with the given cleaner as was one strip of Wypall paper towel. The paper towel was then used to scrub a single carpet coupon for two minutes. The carpet samples were then allowed to dry overnight before final L*, a, and b values were taken.

Efficacy rating process:

The cleaners were rated by the amount of cleaning cycles required to clean as much contaminants from the surfaces. In addition, to calculating the % detergency of the cleaners. The % detergency indicates how much contaminant is being lifted from the surfaces of the carpet coupons using the cleaning solutions. 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. Whereas, color readings for the carpet: a* and b* values are indicative of the color of the carpet at different spectrums of the color band waves. The following formula is used for a* and b* color reading values to calculate for the % contaminant removed based on the coloration of the carpet based on the initial, before and after cleaning of the carpet.

$$\% \, Cont \, Removed = \{[(S_{Dirty} - S_{Initial}) - (S_{Clean} - S_{Initial})]/(S_{Dirty} - S_{Initial})\}*100$$

Where s is a subscript notation to be replaced by a* and b* in the actual calculation for the % Cont. Removal based on color reading results from the spectrometer machine.

Results: L* Gloss Results:

Cleaner	Initial L*	Dirty L*	Clean L*	% Det.	% Det. Avg.
Aquavert Pet Stain & Odor	63.70	47.61	52.21	28.59	22.75
	68.12	50.12	53.57	19.17	
	67.38	50.98	54.34	20.49	
Aquavert Multi-Purpose	66.59	51.48	54.76	21.71	21.14
	66.64	48.39	52.63	23.23	
	68.51	52.39	55.37	18.49	
Nature's Miracle Stain & Odor	66.82	50.05	55.01	29.58	27.97
	66.05	48.51	52.09	20.41	
	66.82	48.92	54.99	33.91	
Shout Oxy Stain Odor*	67.53	54.43	58.37	30.08	32.24
	67.70	52.79	57.95	34.61	
Resolve Pet Expert*	67.99	56.98	56.88	-0.91	1.59
	65.79	54.78	55.23	4.09	
Out Advance Severe Stain*	66.94	55.58	57.47	16.64	25.56
	66.55	53.18	57.79	34.48	
Nature's Miracle Advanced Stain & Odor*	66.56	54.98	57.35	20.47	16.99
	67.87	57.51	58.91	13.51	

* Note that these cleaning agents were only tested with two blood stained carpets because there was not enough blood serum.

The higher the % detergency, the more effective the cleaning solution is at removing the blood serum from the carpet. As shown, from the results the most effective cleaner was Shout Oxy Stain Odor with the highest average % Detergency of 32.24% as compared to the other cleaning agents. However, both Nature's Miracle Stain & Odor, and Out Advance Severe Stain were observed to only be slightly less effective as compared to Shout Oxy Stain Odor with respective average % detergency of 27.97% and 25.56%. There is a respective difference of only 4.27% and 6.67% from Shout Oxy Stain Odor. Whereas, the least observed effective cleaner in removing blood serum from carpets is Resolve Pet Expert, with an average % detergency of 1.59%.

a* Gloss Results:

Cleaner	Initial a*	Dirty a*	Clean a*	% Cont. Removed based on color a*	% Avg. Cont. Removed based on color a*
Aquavert Pet Stain & Odor	2.31	24.27	10.71	61.75	58.80
	1.90	23.08	10.44	59.68	
	2.39	21.54	11.01	54.99	
Aquavert Multi-Purpose	2.17	22.09	10.27	59.34	61.25
	2.30	25.39	12.23	56.99	
	2.43	20.26	8.24	67.41	
Nature's Miracle Stain & Odor	2.12	22.82	12.20	51.30	53.07
	2.25	23.8	13.02	50.02	
	2.18	23.26	11.06	57.87	
Shout Oxy Stain Odor*	2.43	18.03	8.24	62.76	69.01
	1.83	18.56	5.97	75.25	
Resolve Pet Expert*	2.26	16.35	7.11	65.58	65.43
	2.10	16.85	7.22	65.29	
Out Advance Severe Stain*	2.39	15.67	7.52	61.37	63.29
	2.24	18.39	7.86	65.20	
Nature's Miracle Advanced Stain & Odor*	2.56	17.72	8.15	63.13	52.30
	2.29	12.56	8.30	41.48	

* Note that these cleaning agents were only tested with two blood stained carpets because there was not enough blood serum.

A high % Cont. Removal indicates the cleaning agent has removed most of the blood serum from the carpet in accordance to the color spectrum captured from the a* color readings. From the a* color readings, the most effective cleaning agent was Shout Oxy Stain Odor; with a respective % Avg. Cont. Removed of 69.01%. However, the following cleaning agents were observed to not be significantly less effective as compared to Shout Oxy Stain Odor: Resolve Pet Expert, Out Advance Severe Stain, and Aquavert Multi-Purpose; with respective % Cont. Removal of 65.43%, 63.29% and 61.25%. The least effective cleaning agent in removing blood serum from carpets as indicated by the a* color reading is the following: Nature's Miracle Stain & Odor and Nature and Nature's Miracle Advanced Stain & Odor; with respective % Cont. Removal of 53.07% and 52.30%.

b* Gloss Results:

Cleaner	Initial b*	Dirty b*	Clean b*	% Con. Removed based on b*	Avg. % Cont. Removed based on b*
Aquavert Pet Stain & Odor	10.95	0.52	4.73	40.36	42.01
	10.05	0.60	4.48	41.06	
	10.77	0.01	4.81	44.61	
Aquavert Multi-Purpose	10.29	1.10	4.27	34.49	41.25
	10.68	-1.98	3.28	41.55	
	10.58	-0.13	4.98	47.71	
Nature's Miracle Stain & Odor	10.72	-0.60	4.65	46.38	45.37
	10.45	-0.84	3.86	41.63	
	9.88	-0.39	4.55	48.10	

Shout Oxy Stain Odor*	10.50	1.28	6.45	56.07	62.27
	10.19	1.34	7.40	68.47	
Resolve Pet Expert*	10.55	2.90	6.00	40.52	45.06
	10.11	2.71	6.38	49.59	
Out Advance Severe Stain*	9.89	2.91	7.48	65.47	63.74
	10.45	1.58	7.08	62.01	
Nature's Miracle Advanced Stain & Odor*	11.09	2.39	6.23	44.14	39.32
	10.71	4.39	6.57	34.49	

* Note that these cleaning agents were only tested with two blood stained carpets because there was not enough blood serum.

A high % Cont. Removal indicates the cleaning agent has removed most of the blood serum from the carpet in accordance to the color spectrum captured from the b* color readings. From the b* color readings, the most effective cleaning agent is Shout Oxy Stain Odor and Out Advance Severe Stain; with a respective Avg. % Cont. Removal of 62.72%, and 63.74%, a difference of 1.02%. Whereas, the remaining cleaning agents are observed to have similar Avg. % Cont. Removal within the range of 39 to 45% in Avg. % Cont. Removed in accordance to the b* color readings; with Nature's Miracle Advanced Stain & Odor's Avg. % Cont. Removal of 39.32% as being the lower end of the % Cont. Removed.

Summary:

Substrates:	Carpet				
Contaminants:	Blood				
Company Name:	Product Name:	Conc.:	Efficiency:	Effective:	Observations:
Aquavert Clean Co.	Aquavert Pet Stain & Odor	100	42.01	☐	
Aquavert Clean Co.	Aquavert Multi Purpose Sanitizer	100	41.25	☐	
Nature's Miracle	Nature's Miracle Stain & Odor Remover	100	45.37	☐	
SC Johnson & Son Inc	SHOUT Carpet Oxy	100	62.27	☑	
Reckitt Benckiser	Resolve Pet Expert Carpet Stain Remover	100	45.06	☐	
OUT! Pet Care	Out! Advanced Severe Stain & Odor Remover	100	63.74	☑	
Nature's Miracle	Advanced Stain & Odor Eliminator	100	39.32	☐	

Conclusion:

The most effective cleaning agent is listed in the following based on firstly the Avg. % Det. and subsequently the Avg. % Cont. Removed categories: Shout Oxy Stain Odor, Out Advanced Severe Stain, Aquavert Pet Stain & Odor, Aquavert Multi-Purpose, Nature's Miracle Stain & Odor, Nature's Miracle Advanced Severe Stain, and lastly Resolve Pet Expert. Despite the calculated removal of the blood, there were no significant visual changes from the carpet pieces. The cleaners had limited effect on the removal of synthetic blood from the carpets when looking at the carpet coupons.