CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2015
DateRun:	08/16/2015
Experimenters:	Loc Nguyen, George Liang
ClientType:	Cleaner Manufacturer
ProjectNumber:	Project #7
Substrates:	Textile
PartType:	Part
Contaminants:	Inks, Oil, Food
Cleaning Methods:	Mechanical Agitation
Analytical Methods:	Gloss-Color Meter
Purpose:	The purpose of the experiment is to determine the relative rate of contaminant removal from the cloths by the detergent. This test method stimulates a uniform mechanical standard to properly utilize the solution.
Experimental Procedure:	White cotton, white cotton polyester and purple nylon were soiled with the motor oil, mustard, Crisco, and grape juice. Each contaminant was soiled on three pieces of each type of cloth. Every piece of 4x5 in cloth was spread taut over a glass beaker and the soil was applied manually. Sample clothes were allowed to dry for a day and dirty gloss readings were taken. They were washed at approximately85 °F for 12 min in the Terg-O-meter at an RPM of 90 using tap water with hardness of 150ppm. One milliliter of detergent was added for 2 L of water. After washing, the cloths were rinsed in water and dried for a day. Color readings were taken at the end of the day. The second part of the experiment was to study the effect of the detergent on the color fastness of orange, blue and purple fabric. Each piece of cloth was washed for 15 cycles and color fastness was recorded in terms of gloss values. Final assessment was to look at the fabric texture and rate according to the table listed below. The cleaning analysis was done by calculating the stain removal index. SRI = 100 – ((Lc-Lw)2 +(ac –aw)2 + (bc-bw)2)1/2 where: L = reflectance, a = redness/greenness, b = yellowness/blueness, c = unstained fabric, washed in the treatment conditions, w = stained fabric, washed in the treatment conditions. Table Fabric Smoothness Grades by SA Replica Equivalents Description Grade Observations SA•5 Very smooth, pressed, finished appearance. SA•4 Smooth, finished appearance. SA•3.5 Fairly smooth but nonpressed appearance. SA•3 Mussed, nonpressed appearance. SA•2 Rumpled, obviously wrinkled appearance. SA•1 Crumpled, creased and severely wrinkled appearance.
Results:	Change in L value denotes the change in concentration of stain while a and b values denote the spectrum on blue and green shades in the sample. Thus these values denote the amount of stain that the detergent was capable of removing. Thus the SRI for all the materials when the test was performed with supplied detergent is calculates as: Table 2: Results from revised Gain detergent

Cloth	Soil	SRI	Average
Purple Nylon	Motor Oil	97.04	95.92
	Grape Juice	92.74	
	Mustard	99.14	
	Shortening	94.76	
White Cotton Polyester			
	Motor Oil	96.37	81.53
	Grape Juice	42.71	
	Mustard	97.48	
	Shortening	89.56	
White Cotton	Motor Oil	93.76	83.96
		70.31	

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	Grape Juice		
	Mustard	92.62	
	Shortening	79.13	

The SRI for all the materials when the test was performed with comparative detergent 1 is:

Table 3: Results from Arm & Hammer detergent

Cloth	Soil	SRI	Average
Purple Nylon	Motor Oil	95.37	96.64
	Grape Juice	98.59	
	Mustard	94.66	
	Shortening	97.92	
White Cotton Polyester			
	Motor Oil	68.73	67.12
	Grape Juice	70.66	
	Mustard	57.79	
	Shortening	71.28	
White Cotton	Motor Oil	80.71	86.31
	Grape Juice	93.78	
	Mustard	74.49	
	Shortening	96.29	

The SRI for all the materials when the test was performed with comparative detergent 2 is:

Table 4: Results from Purex detergent

Cloth	Soil	SRI	Average
Purple Nylon	Motor Oil	96.82	93.13
	Grape Juice	88.23	
	Mustard	88.86	
	Shortening	98.62	
White Cotton Polyester			
	Motor Oil	88.16	86.82
	Grape Juice	97.75	
	Mustard	63.75	
	Shortening	97.62	
White Cotton	Motor Oil	78.13	83.9
	Grape Juice	93.85	
	Mustard	65.8	
	Shortening	97.81	

The results of the color fastness test were as follows:

Table 5: Color fastness test of product detergent

	Initial Reading	Final reading				
Cloth color	L	a*	b*	L	a*	b*
Purple	39.77	13.07	-25.6	41.96	6.57	-20.09
	40.09	13.05	-25.67	41.91	6.63	-20.25
	39.77	13.06	-25.59	41.74	6.62	-20.05
	40.17	13.09	-25.77	47.07	6.62	-20.21
Orange	57.42	48.69	50.92	59.87	44.98	54.97
	57.34	48.58	50.66	60.08	44.97	54.97
	57.41	48.65	50.91	59.85	44.92	54.74

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	57.42	48.8	50.92	60.03	44.78	54.9
Blue	53.52	-6.3	-26.09	56.33	-13.71	-18.98
	53.18	-6.3	-26.14	56.04	-13.76	-18.97
	53.27	-6.35	-26.1	55.96	-13.7	-19.11
	53.16	-6.27	-26.18	54	-6.02	-26.82

Table 6: Color fastness test of comparative detergent 1

	Initial Reading	Final reading				
Cloth color	L	a*	b*	L	a*	b*
Purple	40.2	13.04	-25.65	39.36	13.2	-25.79
	40.32	13.05	-25.75	40.06	13.01	-25.5
	40.25	13.14	-25.82	40.07	13.49	-26.14
	40.01	13.05	-25.58	40.18	13.16	-25.61
Orange	57.54	48.42	50.63	58.18	50.92	53.74
	57.52	48.61	50.76	57.83	50.72	53.37
	57.52	48.67	50.68	58.12	50.75	53.62
	57.34	48.43	50.48	58.1	50.92	53.64
Blue	53.04	-6.25	-26.24	53.62	-5.87	-26.99
	53.39	-6.27	-26.07	54.18	-6.01	-27.16
	53.36	-6.24	-26.15	53.86	-6.07	-26.59
	53.39	-6.25	-26.24	53.83	-6.01	-26.83

Table 7: Color fastness test of comparative detergent 2

	Initial Reading	Final reading				
Cloth color	L	a*	b*	L	a*	b*
Purple	40	12.95	-25.51	40.21	13.37	-25.92
	40.33	13.04	-25.78	40.14	13.53	-26.24
	39.99	13	-25.43	39.85	13.31	-25.77
	40.25	12.5	-24.97	39.64	13.12	-25.41
Orange	57.44	48.83	51.13	57.92	50.75	53.51
	57.44	48.34	50.32	57.91	50.51	53.08
	57.36	48.47	50.41	57.81	50.31	52.44
	57.29	48.22	50.27	57.8	50.63	53.23
Blue	53.38	-6.25	-26.11	56.05	-13.68	-18.88
	53.53	-6.32	-26.02	56.19	-13.72	-18.86
	53.5	-6.29	-26.09	56.18	-13.74	-18.88
	53.38	-6.34	-26.05	56.07	-13.74	-18.92

Average percent change in fabric color:

	% Change		
Supplied	L	a*	b*
Purple	0.453	-3.586	-1.623
Orange	-0.832	-4.304	-5.014
Blue	-122.787	27.553	
Comparative 1			
Purple	-8.044	49.416	21.466
Orange	-4.46	7.739	-7.95
Blue	-4.315	-86.948	19.755
Comparative 2			
Purple	0.689	-1.107	-0.233
Orange	-1.005	-4.73	-5.836
Blue	-1.084	4.198	-2.743

Fabric Condition:

Product	Comparative 1			Comparative 2			Supplied		
Fabric	Orange	Blue	Purple	Orange	Blue	Purple	Orange	Blue	Purple
	3.5	4	3	2	5	3.5	5	5	4

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Sample 1									
Sample 2	3.5	3.5	3	3	5	3.5	5	4	5
Sample 3	4	3.5	4	4	5	4	4	3.5	3.5
Sample 4	3.5	3	3.5	3.5	4	3.5	3.5	4	5
Sample 5	3	3.5	3	3	5	3.5	3.5	3.5	3.5
Sample 6	3	3	4	2	5	3.5	4	3.5	4
Sample 7	3.5	3	3	3	5	4	5	4	4
Sample 8	3.5	4	3.5	3.5	5	4	5	3.5	3.5
Sample 9	3.5	3.5	3	2	4	3.5	4	4	3.5
Average	3.4	3.4	3.3	2.9	4.8	3.7	4.3	3.9	4
Overall Average	3.4			3.8			4.1		

Summary:

Substrates:	Textile				
Contaminants:	Inks, Oil, Food				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Arm & Hammer	Clean Burst detergent	0.1	83.63	☑	
Henkel Corporation	Purex detergent Dirt Lift	0.1	87.95	☑	
Korex Canada	Gain Formula (revised 15-359)	0.1	87.14	☑	

Conclusion:

As can be seen from the experiment the supplied product revised Gain was slightly less effective but performed very close in comparison to the comparative product Purex Dirt Lift Action at an average of 87.14 and 87.95 SRI respectively for all soils from the three fabrics types. Both products were more effective in cleaning the soils than the comparative product Arm & Hammer Clean Burst at 83.36 SRI. There were some slight changes in color readings before and after the 15 cycles with both revised Gain and Arm & Hammer Clean Burst but insignificant change for Purex Dirt Lift Action. Revised Gain had mostly loss of color from the blue fabric whereas Arm & Hammer had loss of colors in all three fabrics. When the smoothness of the cloths after washing were manually determined and analyzed, it was concluded that the supplied product leaves the fabrics smoother with finished appearance (4.1) which is slightly better than the Purex product at a rating of 3.8. Arm & Hammer was only able to achieve a fairly smooth but non pressed appearance (3.4).