# CLEANING LABORATORY EVALUATION SUMMARY

| | |
|---|---|
| SCL #: | 2015 |
| DateRun: | 03/09/2015 |
| Experimenters: | Ashwitha Rajagopal |
| ClientType: | Cleaner Manufacturer |
| ProjectNumber: | Project #1 |
| Substrates: | Textile |
| PartType: | Coupon |
| Contaminants: | Inks, Clay |
| Cleaning Methods: | Mechanical Agitation |
| Analytical Methods: | Visual, 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 and white cotton polyester and purple nylon were soiled with the grass, clay, sebum and ball point ink. Grass soil was made by grinding the grass with soil at suggested composition and filtration. 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 70 F for 12 min in the Terg-O-meter at an RPM of 90. 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.<br>The cleaning analysis was done by calculating the stain removal index.<br>SRI = 100 – ((Lc-Lw)2 +(ac –aw)2 + (bc-bw)2)1/2<br>where:<br>L = reflectance,<br>a = redness/greenness,<br>b = yellowness/blueness,<br>c = unstained fabric, washed in the treatment conditions,<br>w = stained fabric, washed in the treatment conditions.<br>Table Fabric Smoothness Grades by SA Replica Equivalents Description<br>Grade Observations<br>SA•5 Very smooth, pressed, finished appearance.<br>SA•4 Smooth, finished appearance.<br>SA•3.5 Fairly smooth but nonpressed appearance.<br>SA•3 Mussed, nonpressed appearance.<br>SA•2 Rumpled, obviously wrinkled appearance.<br>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.<br>Thus the SRI for all the materials when the test was performed with test detergent is calculates as:<br>Table 2: Results from experimental detergent |

| Cloth | Soil | SRI | Average |
|---|---|---|---|
| White Cotton Polyester | Grass | 90.15 | 82.94 |
| | Clay | 71.74 | |
| | Sebum | 88.53 | |
| | Ink | 81.33 | |
| White Cotton | Grass | 85.23 | 71.63 |
| | Clay | 64.83 | |
| | Sebum | 48.87 | |
| | Ink | 87.58 | |
| Purple Nylon | Grass | 91.08 | 88.31 |
| | Clay | 81.86 | |
| | Sebum | 89.24 | |
| | Ink | 91.04 | |

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

# CLEANING LABORATORY EVALUATION SUMMARY

| Cloth | Soil | SRI | Average |
|---|---|---|---|
| White Cotton Polyester | Grass | 92.67 | 90.49 |
| | Clay | 90.34 | |
| | Sebum | 90.58 | |
| | Ink | 88.37 | |
| White Cotton | Grass | 87.51 | 83.55 |
| | Clay | 83.76 | |
| | Sebum | 95.00 | |
| | Ink | 67.93 | |
| Purple Nylon | Grass | 95.34 | 94.86 |
| | Clay | 99.25 | |
| | Sebum | 93.54 | |
| | Ink | 91.29 | |

The results of the color fastness test were as follows.

Table 4: Color fastness test of product detergent

| | Initial reading | | | Final reading | | | Difference | | |
|---|---|---|---|---|---|---|---|---|---|
| | L | a* | b* | L | a* | b* | ΔL | Δa | Δb |
| Blue | | | | | | | | | |
| | 53.90 | -5.83 | -24.50 | 54.09 | -5.52 | -24.80 | 0.00 | 0.05 | -0.01 |
| | 53.90 | -5.66 | -24.74 | 53.97 | -5.42 | -24.95 | 0.00 | 0.04 | -0.01 |
| | 53.84 | -5.74 | -24.58 | 54.00 | -5.41 | -24.88 | 0.00 | 0.06 | -0.01 |
| | 54.01 | -5.73 | -24.42 | 54.21 | -5.52 | -24.76 | 0.00 | 0.04 | -0.01 |
| Orange | | | | | | | | | |
| | 56.13 | 47.01 | 47.68 | 55.36 | 47.18 | 45.98 | 0.01 | 0.00 | 0.04 |
| | 56.08 | 47.61 | 48.42 | 54.64 | 46.90 | 45.36 | 0.03 | 0.02 | 0.06 |
| | 56.75 | 48.22 | 48.95 | 54.34 | 46.03 | 44.45 | 0.04 | 0.05 | 0.09 |
| | 56.53 | 48.31 | 48.98 | 53.84 | 45.90 | 44.30 | 0.05 | 0.05 | 0.10 |
| Purple | | | | | | | | | |
| | 41.22 | 13.07 | -25.03 | 39.80 | 13.39 | -25.33 | 0.03 | -0.02 | -0.01 |
| | 40.23 | 12.98 | -24.56 | 40.27 | 13.34 | -25.32 | 0.00 | -0.03 | -0.03 |
| | 41.10 | 13.11 | -24.93 | 40.53 | 13.10 | -25.33 | 0.01 | 0.00 | -0.02 |
| | 41.12 | 13.21 | -25.04 | 40.90 | 13.25 | -25.31 | 0.01 | 0.00 | -0.01 |

Table 5: Color fastness test of reference detergent

| | Initial reading | | | Final reading | | | Difference | | |
|---|---|---|---|---|---|---|---|---|---|
| | L | a* | b* | L | a* | b* | ΔL | Δa | Δb |
| Blue | | | | | | | | | |
| | 52.09 | -5.670 | -22.670 | 54.180 | -5.680 | -25.340 | -0.040 | -0.002 | -0.118 |
| | 53.04 | -5.700 | -24.900 | 53.840 | -5.640 | -25.570 | -0.015 | 0.010 | -0.027 |
| | 54.2 | -5.690 | -24.690 | 83.820 | -5.640 | -25.010 | -0.550 | 0.009 | -0.013 |
| | 54.11 | -5.710 | -24.820 | 54.200 | -5.630 | -25.350 | -0.002 | 0.014 | -0.021 |
| Orange | | | | | | | | | |
| | 57.74 | 47.270 | 47.700 | 56.040 | 48.380 | 49.270 | 0.030 | -0.023 | -0.032 |
| | 57.74 | 47.070 | 47.710 | 56.580 | 48.250 | 49.350 | 0.020 | -0.025 | -0.034 |
| | 57.79 | 47.020 | 47.570 | 56.480 | 48.280 | 48.970 | 0.023 | -0.027 | -0.029 |
| | 57.64 | 47.320 | 47.840 | 56.770 | 48.450 | 49.350 | 0.015 | -0.024 | -0.032 |
| | | | | | | | | | |
| Purple | | | | | | | | | |
| | 41.82 | 13.010 | -25.130 | 41.200 | 13.290 | -25.130 | 0.010 | -0.020 | 0.000 |
| | 41.21 | 13.180 | -24.260 | 40.180 | 13.140 | -25.020 | 0.020 | 0.000 | -0.030 |
| | 41.19 | 13.150 | -24.630 | 41.290 | 13.110 | -25.230 | 0.000 | 0.000 | -0.020 |
| | 41 | 13.220 | -25.140 | 41.110 | 13.280 | -25.220 | 0.000 | 0.000 | 0.000 |

Average percent change in fabric color

| Reference | % Change | | |
|---|---|---|---|
| | ΔL | Δa | Δb |
| Blue | -0.287 | 4.743 | -1.172 |

# CLEANING LABORATORY EVALUATION SUMMARY

| | | | |
|---|---|---|---|
| Orange | 3.236 | 2.665 | 7.158 |
| Purple | 1.317 | -1.362 | -1.744 |
| Supplied | | | |
| Blue | 2.182 | -2.481 | -3.207 |
| Orange | -1.246 | 0.789 | -4.475 |
| Purple | 0.868 | -0.500 | -1.472 |

Fabric Condition

| Product | Reference | | | Supplied | | |
|---|---|---|---|---|---|---|
| Fabric | Orange | Blue | Purple | Orange | Blue | Purple |
| Sample 1 | 4 | 5 | 4 | 4 | 5 | 2 |
| Sample 2 | 5 | 5 | 3 | 4 | 5 | 2 |
| Sample 3 | 4 | 5 | 4 | 3 | 5 | 3 |
| Sample 4 | 4 | 5 | 4 | 3 | 4 | 3 |
| Sample 5 | 5 | 4 | 3 | 3 | 5 | 2 |
| Sample 6 | 5 | 4 | 4 | 4 | 5 | 2 |
| Sample 7 | 4 | 5 | 4 | 4 | 3 | 3 |
| Sample 8 | 5 | 5 | 3 | 3 | 3 | 2 |
| Sample 9 | 5 | 4 | 4 | 4 | 3 | 3 |
| Average | 4.6 | 4.7 | 3.7 | 3.6 | 4.2 | 2.4 |
| Overall Average | 4.3 | | | 3.4 | | |

Summary:

| **Substrates:** | Textile | | | | |
|---|---|---|---|---|---|
| **Contaminants:** | Inks, Clay | | | | |
| **Company Name:** | **Product Name:** | **Conc.:** | **Efficiency:** | **Effective:** | **Observations:** |
| No Specific Vendor | Ref. detergent Laundry Testing | 0.1 | 89.60 | ☑ | |
| J Tech Sales | J Tech Laundry Detergent | 0.1 | 80.96 | ☑ | |

Conclusion:

As can be seen from the experiment the supplied material was less effective in cleaning the soils than the reference product. The supplied product had an average SDI of 80.96 for all soils from the three fabrics as compared to 89.63 for the reference product. There was a small but insignificant change in the color readings before and after 15 cycles with both products fairing well. The reference product resulted in a slight loss of color from the orange fabric. When the smoothness of the cloths after washing were manually determined and analyzed, it was concluded that the reference detergent leaves the fabric smoother with finished appearance (4.3), whereas the test detergent was only able to achieve a fairly smooth but non pressed appearance (3.4).