CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2011
DateRun:	08/10/2011
Experimenters:	Jason Marshall, Johnny Le
ClientType:	Cleaner Manufacturer
ProjectNumber:	Project #1
Substrates:	Stainless Steel
PartType:	Coupon
Contaminants:	Oil
Cleaning Methods:	Immersion/Soak
Analytical Methods:	Gravimetric
Purpose:	To evaluate supplied products for Green Seal GS 34 degreasing standard.

Experimental Procedure:

Two types of soils were prepared individually. The first soil, maintenance soil, consisted of 10 grams of carbon black, 10 grams iron oxide, 100 ml WD-40, 100 ml hydraulic oil, and 100ml gear oil. Each component was placed in a 750 ml beaker and mixed for 20 minutes at room temperature using a magnetic stirrer. The second soil, production soil, was made by mixing 200ml Quench Oil and 200 ml cutting oil for 20 minutes at room temperature using a magnetic stirrer in a second 750 ml beaker.

Approximately 100 mg of each soil was applied to a precleaned and preweighed stainless steel coupon onto one side only with a hand swab. No soil was applied to the control coupons. The maintenance soil for the first set of coupons was baked in an oven for 30 minutes at a temperature of 40° C (105 F). For the production soil, the second sets of coupons were baked in an oven for thirty minutes at 105° C (220 F). The coupons were then allowed to cool to room temperature and weigh a second time (soiled mass=B).

Four products were used at room temperature. Four 500 mL beakers and four 400 ml beakers were filled with enough fresh cleaner solution to completely submerge the coupons in the degreasing solution without any overflow. Each coupon was suspended in a beaker, allowing the entire contaminated surface to be submerged in the cleaning solution. The coupons were washed for 20 minutes using immersion cleaning only.

The washing was followed by two rinse steps. The coupons were drained for 30 seconds prior to each rinse step. For each rinse step a 20-minute soak was utilized. After the two rinse steps, all coupons were first allowed to air dry for 30 minutes and then dried in an oven at 105° C for 30 minutes. The coupons were cooled to room temperature and final weights were measured (mass of coupons after cleaning = C).

The control coupons were examined to determine if there were any visible signs of corrosion. Next, the control coupons were weighed to determine if there was any loss of mass, which might occur if corrosion was in progress; or gained mass, which might occur if the degreaser had left a residue on the coupons. The following equation was applied:

[MCC – MCB] < .1mg (which is the maximum balance error).
Where: MCC = mass of the control coupon after washing and rinsing
MCB = mass of the control coupon before washing and rinsing

For the cleaned coupons, the amount of residual soil per surface area was calculated, using the following formula: RS = (C – A)/ AR
Where: RS = amount of residual soil (mg/s^2)
C = mass of the coupon after cleaning
A = initial coupon mass
Ar = surface area = .00387 m^2

If the average residual maintenance soil loading, and the average residual performance soil loading are each less than 2,000 mg/m^2, the degreaser meets the cleaning performance criteria.

Results:

The maintenance soil was more difficult than the production soil for all of the products to remove. Only the CRC Heavy Duty Degreaser removed enough soil to pass the GS 34 requirement. The second most effective product was the Liquifix Multipurpose degreaser. The Supersoy product from CRC left behind a lot of residue on the coupons. Both the Heavy-Duty Degreaser and Liquifix degreaser met GS 34 cleanliness levels on the production soil.

Product	Clean-Cont	Cont-Initial	CEF	Clean-Initial	Residual		mg/cm2	GS 34
	MX2-MX3	MX2-MX1		MX3-MX1	mg/cm2	Ave CEF	Ave RC	mg/m2
CRC Supersoy Maintenance Soil								
	0.0403	0.0952	0.4233	54.9	1.4186	0.5598	1.1835	11834

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	0.0749	0.1154	0.649	40.5	1.0465			
	0.0649	0.1069	0.6071	42	1.0853			
CRC Heavy Duty Cleaner Maintenance Soil								
	0.1021	0.1033	0.9884	1.2	0.031	0.9871	0.0336	335
	0.0959	0.0975	0.9836	1.6	0.0413			
	0.1031	0.1042	0.9894	1.1	0.0284			
Liquifix Multipurpose Degreaser Maintenance Soil								
	0.0667	0.1039	0.642	37.2	0.9612	0.7894	0.5624	5624
	0.0991	0.1099	0.9017	10.8	0.2791			
	0.0812	0.0985	0.8244	17.3	0.447			
Spartan SD-20 Maintenance Soil								
	0.022	0.1031	0.2134	81.1	2.0956	0.1433	2.174	21739
	0.0109	0.097	0.1124	86.1	2.2248			
	0.0099	0.0951	0.1041	85.2	2.2016			
CRC Supersoy Production Soil								
	0.0427	0.0858	0.4977	43.1	1.1137	0.5614	1.0508	10508
	0.0533	0.0961	0.5546	42.8	1.1059			
	0.062	0.0981	0.632	36.1	0.9328			
CRC Heavy Duty Production Soil								
	0.0883	0.0941	0.9384	5.8	0.1499	0.9759	0.0586	585
	0.0887	0.0895	0.9911	0.8	0.0207			
	0.1095	0.1097	0.9982	0.2	0.0052			
Liquifix Multipurpose Degreaser Production Soil								
	0.1189	0.1187	1.0017	-0.2	-0.0052	0.9487	0.1473	1472
	0.1169	0.1192	0.9807	2.3	0.0594			
	0.0951	0.1101	0.8638	15	0.3876			
Spartan SD-20 Production Soil								
	0.1074	0.1159	0.9267	8.5	0.2196	0.911	0.2489	2489
	0.0911	0.0984	0.9258	7.3	0.1886			
	0.0966	0.1097	0.8806	13.1	0.3385			

The control coupons were weighed to determine if there was any gain/ loss of mass. The Supersoy left significant residue on the control coupons, the CRC Heavy Duty cleaner left no residue and the Liquifix product left a small amount of residue. The table lists the weight changes for the control coupons.

Product	Control Wts	Observations
CRC Supersoy - Maintenance Soil	0.0731	residue
CRC Heavy Duty Cleaner - Maintenance Soil	0.0001	no residue

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Liquifix Multipurpose Degreaser - Maintenance Soil	0.0092	little residue
Spartan SD-20 - Maintenance Soil	-0.0094	
CRC Supersoy - Production Soil	0.0184	residue
CRC Heavy Duty Cleaner - Production Soil	0.0003	no residue
Liquifix Multipurpose Degreaser - Production Soil	0.0036	little residue
Spartan SD-20 - Production Soil	0.0009	
	GS 34 target <2000 mg/m2	GS 34 mg/ m2
Product	Maintenance	Production
CRC Supersoy	11835	10508
CRC Heavy Duty Cleaner	336	586
Liquifix Multipurpose Degreaser	5624	1473
Spartan SD-20	21740	2489

Summary:

Substrates:	Stainless Steel
Contaminants:	Oil

Company Name:	Product Name:	Conc.:	Efficiency:	Effective:	Observations:
Spartan Chemical Company	SD 20 All Purpose Degreaser Aerosol	100	52.72	☐	
CRC Industries	CRC Supersoy	100	56.06	☐	
CRC Industries	CRC Heavy Duty	100	98.15	☑	
Liquifix	Liquifix Multipurpose Degreaser	100	86.90	☑	

Conclusion:

0nly one of the supplied products, CRC Heavy Duty Cleaner, surpassed the required performance level set by the GS 34 standard. The Liquifix multipurpose product met the required residual level for the Production soil but did not meet the level for the maintenance soil. On average, the product did remove more than 85% of the soils using immersion cleaning.