

# CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2019  
 DateRun: 05/06/2019  
 Experimenters: Ted Kearney  
 ClientType:  
 ProjectNumber: Project #1  
 Substrates: Stainless Steel  
 PartType: Coupon  
 Contaminants: Oil  
 Cleaning Methods: Immersion/Soak  
 Analytical Methods: Gravimetric  
 Purpose: To evaluate second supplied product 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 100 ml gear oil. Each component was placed in a 750 beaker and mixed for 20 minutes at room temperature using a magnetic stirrer. The second soil, production soil, was made by mixing 200 ml Quench Oil and 200 ml cutting oil for 20 minutes at room temperature using a magnetic stirrer in a second 750 ml beaker.

Approximately 0.5000 g of each soil was applied to a precleaned and preweighed stainless steel coupon onto one side only with a handheld swab. No soil was applied to the two control coupons. The maintenance soil for all three coupons were baked in an oven for 30 minutes at a temperature of 40° C (105 F). For the production soil, all three 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).

Each cleaning product was as provided. The solution was used at room temperature. A beaker was filled with enough fresh degreaser solution to completely submerge the coupons in the degreasing solution without any overflow. The four beakers were suspended in the heated tank and allowing the temperature in the cleaning bath and beakers to equilibrate.

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 then cooled to room temperature and final weights were measured (mass of the coupon 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 lost 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:  $[MCC - MCB] < 0.1 \text{ mg}$  (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/m<sup>2</sup>)

C = mass of the coupon after cleaning

A = initial coupon mass

Ar = surface area = 0.0025 m<sup>2</sup>

If the average residual maintenance soil loading, and the average residual performance soil loading are each less than 2,000 mg/m<sup>2</sup>, the degreaser meets the cleaning performance criteria for GS 34.

**Results:** Both products did not meet the 2000 mg/m<sup>2</sup> soil removal rate required for GS 34 approval. When looking at the more traditional soil removal rate based on a percent soil removal rating, both products did remove over 90% of the production soil. The Crystal Simple Green did have 94% removal of the maintenance soil. The Sycamore wipes had little to no removal of the maintenance soil, removing around 3% of this soil. Blank controls had no weight change.

**GS 34 Removal Rates**

	Clean - Cont	Cont- Initial	CEF	Clean - Initial	Residual Contamination	mg/cm <sup>2</sup>	GS 34

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Product	MX2-MX3 (g)	MX2-MX1 (g)		MX3-MX1 (mg)	mg/cm2	Average CEF	Average RC	mg/m2
Sycamore M Soil	0.0146	0.4876	0.0299	473.00	18.9200	0.0292	18.3373	183373
	0.014	0.4585	0.0305	444.50	17.7800			
	0.0128	0.4706	0.0272	457.80	18.3120			
Sycamore P Soil	0.422	0.4872	0.8662	65.20	2.6080	0.9046	2.0067	20067
	0.4974	0.535	0.9297	37.60	1.5040			
	0.5327	0.5804	0.9178	47.70	1.9080			
Crystal SG M Soil	0.4803	0.5109	0.9401	30.60	1.2240	0.9460	1.0933	10933
	0.4403	0.4679	0.9410	27.60	1.1040			
	0.5295	0.5533	0.9570	23.80	0.9520			
Crystal SG P Soil	0.5386	0.5644	0.9543	25.80	1.0320	0.9548	0.9760	9760
	0.5652	0.5925	0.9539	27.30	1.0920			
	0.4384	0.4585	0.9562	20.10	0.8040			

### Gravimetric Soil Removal Rates

Cleaner	Initial wt	Final wt	% Removed
<b>Sycamore M Soil</b>			
	0.4876	0.4730	2.99
	0.4585	0.4445	3.05
	0.4706	0.4578	2.72
<b>Sycamore P Soil</b>			
	0.4872	0.0652	86.62
	0.5350	0.0376	92.97
	0.5804	0.0477	91.78
<b>Crystal SG M Soil</b>			
	0.5109	0.0306	94.01
	0.4679	0.0276	94.10
	0.5533	0.0238	95.70
<b>Crystal SG P Soil</b>			
	0.5644	0.0258	95.43
	0.5925	0.0273	95.39
	0.4585	0.0201	95.62

Summary:

<b>Substrates:</b>		Stainless Steel			
<b>Contaminants:</b>		Oil			
Company Name:	Product Name:	Conc.:	Efficiency:	Effective:	Observations:
Sycamore Group	Sycamore Big Wipes	100	90.46	<input checked="" type="checkbox"/>	Production soil
Simple Green	Crystal Simple Green Industrial Cleaner & Degreaser	100	95.00	<input checked="" type="checkbox"/>	

Conclusion:

The Sycamore cleaning product was not success on both of the two soils and the average removal rate was not under the Green Seal GS 34 requirement of 2000 mg/m2 using immersion cleaning. When comparing the two products using percent removal rates, The Sycamore product was slightly less effective on the production soil than the comparative products. The maintenance soil removal rate was significantly lower, only removing 3% of the soil compared to 94%.