# CLEANING LABORATORY EVALUATION SUMMARY

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|---|---|
| SCL #: | 2008 |
| DateRun: | 06/09/2008 |
| Experimenters: | Jason Marshall, Shweta Bansal |
| ClientType: | Cleaner Manufacturer |
| ProjectNumber: | Project #1 |
| Substrates: | Stainless Steel |
| PartType: | Coupon |
| Contaminants: | Carbon Deposits, Cutting/Tapping Fluids, Greases, Lubricating/Lapping Oils, Metal fines, Oil |
| Cleaning Methods: | Immersion/Soak |
| Analytical Methods: | Gravimetric |
| Purpose: | To evaluate supplied product following Green Seal GS 34 Degreasing standard |

Experimental Procedure:

According to Green Seal, GS 34 is a procedure for evaluating the ability of a degreaser to remove soil and is based on ASTM G-122, (1996), MIL-PRF-87937C (DOD, 1997) and MIL-C-29602 (DOD, 1995).

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 100 mg 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 was 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).

The cleaning product was diluted to 33% and preheated to 40 C (105 F). Four 600 mL beakers were 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 was any visible signs of corrosion. Next, the control coupon 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 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/m2)
C = mass of the coupon after cleaning
A = initial coupon mass
Ar = surface area = 0.0040 m2

If the average residual maintenance soil loading, and the average residual performance soil loading are each less than 2,000 mg/m2, the degreaser meets the cleaning performance criteria.

Results:

The supplied cleaning product averaged about half of the maintenance soil using immersion cleaning at 105F and removed over 90% of the process soil. The process soil cleaning had a residual soil level under the 2000 mg/m2 level but the product fell well short for the maintenance soil with an average RS greater than 13,000 mg/m2. The table lists the weights of the coupons and the calculated RS values.

| Coupon | Initial mass of | Mass of coupon after - g | Mass of coupon after - g | Residual soil | Mass difference |
|---|---|---|---|---|---|

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| | coupons -g (A) | soiling (B) | cleaning (C) | (mg/ m2) | control (mg) |
|---|---|---|---|---|---|
| M1 | 64.0548 | 64.1679 | 64.0890 | 8550 | - |
| M2 | 64.0845 | 64.1890 | 64.1526 | 17025 | - |
| M3 | 64.1489 | 64.2444 | 64.2043 | 13850 | - |
| MC | | 63.9252 | 63.9251 | - | 0.1000 |
| Average | | | | 13142 | |
| P1 | 64.0214 | 64.1308 | 64.0227 | 325 | - |
| P2 | 63.7795 | 63.8918 | 63.7886 | 2275 | - |
| P3 | 64.074 | 64.1752 | 64.0862 | 3050 | - |
| PC | | 64.1419 | 64.142 | - | 0.1000 |
| Average | | | | 1883 | |

Summary:

| **Substrates:** | Stainless Steel |
|---|---|
| **Contaminants:** | Carbon Deposits, Cutting/Tapping Fluids, Greases, Lubricating/Lapping Oils, Metal fines, Oil |

| **Company Name:** | **Product Name:** | **Conc.:** | **Efficiency:** | **Effective:** | **Observations:** |
|---|---|---|---|---|---|
| Keteca USA | Water Works Heavy Duty Degreaser | 33 | 48.86 | ☐ | maintenance soil |
| Keteca USA | Water Works Heavy Duty Degreaser | 33 | 92.88 | ☑ | process soil |

Conclusion:

The supplied cleaning product was success for only one of the two soils and would not meet the Green Seal GS 34 requirement of an average of 2000 mg/m2 for both soils using immersion cleaning.