

# CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2008  
 DateRun: 06/13/2008  
 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, Oil  
 Cleaning Methods: Ultrasonics  
 Analytical Methods: Gravimetric  
 Purpose: To reevaluate supplied product for 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 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 50% and preheated to 46 C (115 F). Four 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 using 40 kHz ultrasonic energy for 20 minutes. 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 cycle 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:

For the cleaned coupons, the amount of residual soil per surface area was calculated, using the following formula:  $RS = (C-A)/Ar$

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.

**Results:** The effectiveness of the supplied cleaning formulation for cleaning soil 1, maintenance soil, improved with the increase in concentration and the addition of ultrasonic cleaning. However, the removal rate still did not meet the GS 34 level of 2000 mg/m<sup>2</sup>.

Coupon	Initial mass - g (A)	After soiling - g (B)	After - g cleaning (C)	Residual soil (mg/m <sup>2</sup> )	Mass control (mg)
M1	64.132	64.2406	64.1781	11525	-
M2	64.0091	64.1065	64.0412	8025	-
M3	63.9846	64.1001	63.9928	2050	-
MC		63.9417	63.9416	-	0.1000
Average				7200	
P1	64.1346	64.2339	64.1361	375	-
P2	64.0735	64.1773	64.0858	3075	-
P3	64.0341	64.1479	64.04	1475	-
PC		64.0835	64.0834	-	0.1000

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Average				1642	
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Summary:

<b>Substrates:</b>		Stainless Steel			
<b>Contaminants:</b>		Carbon Deposits, Cutting/Tapping Fluids, Greases, Lubricating/Lapping Oils, Oil			
<b>Company Name:</b>	<b>Product Name:</b>	<b>Conc.:</b>	<b>Efficiency:</b>	<b>Effective:</b>	<b>Observations:</b>
Keteca USA	Water Works Heavy Duty Degreaser	50	72.50	<input type="checkbox"/>	Maintenance soil
Keteca USA	Water Works Heavy Duty Degreaser	50	93.82	<input checked="" type="checkbox"/>	process soil

Conclusion:

The product at the 50% dilution using ultrasonic cleaning did not meet the GS 34 requirement of 2000 mg/m2 for the maintenance soil. The combined average for both soils was 4421 mg/m2.