CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2020

DateRun: 11/18/2020

Experimenters: Justin Kiander

ClientType: Metal Working

ProjectNumber: Project #1

Substrates: Stainless Steel

PartType: Coupon

Contaminants: Oil

Cleaning Methods: Immersion/Soak

Analytical Methods: Gravimetric, Visual

Purpose: The purpose of this experiment was to determine the effectiveness of cleaners in removing grind oil from stainless steel coupons via heated immersion at increased time.

Experimental Procedure: Cleaners were prepared to the following concentrations: Dimethyl glutarate 100%, SC Aircraft & Metal Cleaner 20%, SC Supersolve 20%, Crystal Simple Green Industrial Cleaner 30 parts water. Solutions were then heated to 100°F. Three stainless steel coupons were obtained and weighed for each of the cleaners being tested. Coupons were then soiled with grind oil provided by the company and a dirty weight was recorded. Once solutions reached the proper temperature, coupons were submerged into their respective cleaners for 30 minutes. After the 30 minutes had passed, coupons cleaned with SC Aircraft and SC Supersolve were placed into a deionized water bath at 100°F for 30 seconds. All coupons were then partially dried with a heat gun and allowed to finish drying in air. After the drying process, coupons were weighed and a clean weight was recorded. Effectiveness of the cleaners was determined.

Results:

Cleaner	Initial wt of cont	Final wt of cont	%Cont Removed	%AVG
Dimethyl glutarate	0.0314	0.0062	80.25	80.80%
	0.0231	0.0051	77.92	
	0.0203	0.0032	84.24	
SC Aircraft & Metal	0.0205	0.0048	76.58	88.43%
	0.0200	0.0052	74.00	
	0.0163	-0.0024	114.72	
SC Supersolve	0.0153	0.0080	47.71	72.59%
	0.0173	0.0070	59.54	
	0.0152	-0.0016	110.53	
Crystal Simple Green	0.0140	0.0072	48.57	34.91%
	0.0138	0.0135	2.17	
	0.0150	0.0069	54.00	

SC Aircraft & Metal Cleaner was the most effective cleaner in removing grind oil from stainless steel with an average of 88.43%. Dimethyl glutarate was the second most effective with an average removal of 80.8%. Compared to the 15-minute heated immersion at 100°F, Dimethyl glutarate and SC Aircraft displayed overall improvement. There was so significant change in performance for SC Supersolve. However, Crystal Simple Green performed significantly worse.

During the cleaning process, solutions again developed a pale-yellow color indicating removal of the soil. Coupons cleaned with SC Aircraft and Crystal Simple Green were noted to have a small layer of oil residue forming where the substrate met the meniscus of solution. After the cleaning process, Dimethyl glutarate appeared clean with no oil residue left behind, only some solvent. Both SC Aircraft and SC Supersolve appeared mostly clean with very minimal oil residue left behind located at the top line of the cleaned area. Crystal Simple Green possessed a solution and oil residue mix all over the cleaned area. Following the drying process, Dimethyl glutarate appeared clean with most of the solvent evaporated that was originally left behind. SC Aircraft also appeared clean with slightly more solvent left behind. SC Supersolve still had solvent left on the coupons a minuscule amount of oil residue at the top portion of the cleaned area. Crystal Simple Green still possessed a heavy solvent and oil residue all over the cleaned area.

Cleaned weights were not obtained until 5 days after original testing. This could contribute to increased performance with more time for solvent to evaporate, or solvent residues could have potentially damaged substrates by remaining for too long. Heat for Dimethyl glutarate, SC Aircraft, and SC Supersolve should be increased to 120°F. Crystal Simple Green cannot go beyond 100°F per vendor instructions.

Summary:

CLEANING LABORATORY EVALUATION SUMMARY

Substrates:	Stainless Steel				
Contaminants:	Oil				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Fisher Scientific	Dimethyl glutarate (CAS: 1119-40-0)	100%	80.80	☐	Coupons appeared clean with no oil residue, but further optimization could show improvement
Gemtek Products	SC Aircraft & Metal Cleaner Super Concentrate	20%	88.43	☑	Coupons appeared clean with no oil residue, but further optimization could show improvement
Gemtek Products	SC Supersolve Safety Solvent	20%	72.59	☐	Slight amount of oil residue left behind, further improvement necessary
Simple Green	Crystal Simple Green Industrial Cleaner & Degreaser	30 parts water	34.91	☐	Significant amount of oil residue left behind. A new solution is necessary for further cleaning. Agitation will be added with heated immersion since temperature cannot exceed 100°F.

Conclusion: Upon completion of testing, it was observed that 30 minutes of heated immersion at 100°F improved cleaning performance for Dimethyl Glutarate and SC Aircraft. However, all cleaners still require further optimization. Next steps would be to conduct heated immersion at 120°F for 30 minutes.