CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2020

DateRun: 12/01/2020

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 via heated immersion with agitation

Experimental Procedure: Solutions were prepared to the following concentrations: Dimethyl glutarate 100%, SC Aircraft & Metal Cleaner 20%, SC Supersolve 20%. Stir bars were added to each solution for agitation. Solutions were heated to a temperature of 120°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 with agitation from the stir bars. After the 30 minutes had passed, coupons cleaned with SC Aircraft and SC Supersolve were rinsed in a deionized water bath at 120°F for 30 seconds. Coupons were then dried with a heat gun and allowed to finish drying in air. After the drying process, a final clean weight was recorded. Effectiveness of the cleaners was then determined.

Results:

Cleaners	Initial wt of cont	Final wt of cont	%Cont Removed	%AVG
Dimethyl glutarate	0.0214	-0.0004	101.87	101.27%
	0.0200	-0.0003	101.50	
	0.0224	-0.0001	100.45	
SC Aircraft & Metal	0.0169	0.0005	97.04	85.02%
	0.0171	0.0009	94.74	
	0.0177	0.0065	63.28	
SC Supersolve	0.0176	0.0048	72.73	83.36%
	0.0141	0.0029	79.43	
	0.0144	0.0003	97.92	

Dimethyl glutarate was the most effective cleaner removing an average of 101.27% of oil from stainless steel substrates. SC Aircraft & Metal Cleaner was the second most effective removing an average of 85.02%. After the cleaning process, Dimethyl glutarate appeared fully clean with no visible oil residue and only very small droplets at the top portion of the cleaned area. SC Aircraft possessed a small layer of solvent residue at the top portion of the cleaned area, but there was also no visible oil residue left behind. SC Supersolve possessed a layer of solvent and oil residue across the cleaned area.

Following the drying process, Dimethyl glutarate appeared fully clean with no oil or solvent residue left behind. SC Aircraft still possessed small pockets of solvent at the top of the cleaned area, but no oil remained behind. Two of the three coupons cleaned with SC Supersolve still possessed oil and solvent residue across the cleaned area.

Agitation showed significant improvement for Dimethyl glutarate. On average, SC Aircraft also significantly improved, as previous trials could not achieve single coupon removals above 80%. Because there was no visible oil remaining, the larger final weight for the third coupon could be due to excess solvent still present. SC Supersolve has consistently possessed oil and solvent residue following clean and dry steps and will be removed from further testing. Crystal Simple Green has not achieved the same success with heat and agitation as SC Aircraft has and will also be removed from further testing. Next steps would be to proceed to parts testing using the optimized conditions for Metalnox 6386, Smart Solve 605, Dimethyl glutarate, and SC Aircraft & Metal Cleaner.

Summary:

Substrates:	Stainless Steel				
Contaminants:	Oil				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Fisher Scientific		100%	101.27	☑	Following clean and dry stages: there was no visible oil or solvent remaining.

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	Dimethyl glutarate (CAS: 1119-40-0)				
Gemtek Products	SC Aircraft & Metal Cleaner Super Concentrate	20%	85.02	☑	Adding agitation showed significant improvement for single coupon performance. There was no visible oil following clean and dry stages, but some solvent pockets remained.
Gemtek Products	SC Supersolve Safety Solvent	20%	83.36	☐	Following clean and dry stages: oil and solvent residue still present in cleaned areas. Discontinued from further testing.

Conclusion:

Upon completion of testing, it was determined that adding agitation significantly improved soil removal for Dimethyl glutarate. Additionally, agitation on average significantly improved single coupon performance for SC Aircraft & Metal. SC Supersolve and Crystal Simple Green have not achieved the same successful removal rates and will be discontinued from further testing. With optimized conditions for four cleaners, next steps will be to progress testing to parts for the client using Metalnox 6386, Smart Solve 605, Dimethyl glutarate, and SC Aircraft & Metal.