CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2020

DateRun: 11/16/2020

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 unheated immersion at an increased time.

Experimental Procedure: Cleaners were prepared to the following concentrations: Metalnox 6386 100%, Dimethyl glutarate 100%, Smart Solve 605 100%, SC Aircraft & Metal Cleaner 20%, SC Supersolve 20%, Crystal Simple Green Industrial Cleaner 30 parts water. Three stainless steel coupons were obtained and weighed for each cleaner. Coupons were then soiled with grind oil provided by the company and a dirty weight was recorded. After soiling, coupons were submerged into their respective cleaners at room temperature for 30 minutes. After 30 minutes had passed, coupons cleaned in SC Aircraft, SC Supersolve, and Smart Solve were submerged into a deionized water bath at room temperature for 30 seconds. All coupons were then initially dried with a heat gun and allowed to finish drying in air for 24 hours. After the drying period, 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
Metalnox 6386	0.0273	-0.0011	104.03	104.70%
	0.0211	-0.0012	105.69	
	0.0205	-0.0009	104.39	
Dimethyl glutarate	0.0228	0.0088	61.40	57.80%
	0.0199	0.0081	59.29	
	0.0148	0.0070	52.70	
Smart Solve 605	0.0165	0.0014	91.52	91.24%
	0.0159	0.0001	99.37	
	0.0134	0.0023	82.83	
SC Aircraft & Metal	0.0147	0.0075	48.98	39.31%
	0.0128	0.0052	59.38	
	0.0094	0.0085	9.57	
SC Supersolve	0.0121	0.0047	61.16	72.9%
	0.0127	0.0031	75.59	
	0.0133	0.0024	81.95	
Crystal Simple Green	0.0115	0.0088	23.48	6.80%
	0.0086	0.0121	-40.70	
	0.0109	0.0068	37.61	

Metalnox was the most effective cleaner in removing grind oil from stainless steel with an average of 104.7%. Smart Solve 605 was the second most effective with an average removal of 91.24%. Compared to the 15-minute unheated immersion trial, Dimethyl glutarate and Smart Solve display significant improvement while SC Supersolve slightly improved. A rinse step was added for SC Supersolve which could be attributed to the improvement. Unexpectedly, SC Aircraft and Crystal Simple Green performed significantly worse. During the cleaning process, all clear solutions, including SC Aircraft and Crystal Simple Green, developed a slight pale-yellow color indicating that oil was being removed. Additionally, after the cleaning process, all solutions had a small oil layer on top. After the cleaning and drying process, coupons cleaned with Metalnox appeared to be fully clean and dry. The cleaned area did appear "restored" compared to the rest of the coupon indicating some substrate stripping may have occured. Coupons cleaned with Smart Solve appeared clean, but with a small amount of water remaining on some coupons. All other coupons possessed a water and yellow oil residue in the cleaned area.

Time to clean for Metalnox should be reduced back to 15 minutes to ensure substrate is not damaged. Unheated immersion for 30 minutes is an effective method for Smart Solve 605 to remove the grind oil from stainless steel. The remaining cleaners should be tested with heated immersion for 30 minutes to improve removal efficiency.

CLEANING LABORATORY EVALUATION SUMMARY

Summary:

Substrates:	Stainless Steel				
Contaminants:	Oil				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Kyzen Corporation	Metalnox M6386	100%	104.70	☑	Time to clean should be reduced back to 15 minutes.
Fisher Scientific	Dimethyl glutarate (CAS:1119-40-0)	100%	57.80	☐	Improvement from 15 minutes unheated immersion. Heated trials could further increase removal efficiency.
United Laboratories International	Smart Solve 605	100%	91.24	☑	Significant improvement from 15 minute unheated immersion. No further optimization required.
Gemtek Products	SC Aircraft & Metal Cleaner Super Concentrate	20%	39.31	☐	Significant decrease in performance from 15 minute unheated immersion. Heated trials are necessary for improvement.
Gemtek Products	SC Supersolve Safety Solvent	20%	72.90	☐	Slight improvement from 15 minute unheated immersion. Heated trials could be beneficial.
Simple Green	Crystal Simple Green Industrial Cleaner & Degreaser	30 parts water	6.80	☐	Significant decrease in performance from 15 minute unheated immersion. Heated trials necessary for improvement.

Conclusion:

Upon completion of the testing, it was observed that 30 minutes of unheated immersion is an effective cleaning method for Smart Solve 605. Metalnox 6386 should be reduced back to 15 minutes to ensure substrates are not damaged. Increasing the time of unheated immersion for the remaining cleaners was not as effective. Next steps would be to conduct heated immersion trials to improve removal efficiency.