CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2021

DateRun: 02/03/2021

Experimenters: Zoe Lawson, Justin Kiander

ClientType: Precision Instrument Manufacturer

ProjectNumber: Project #1

Substrates: Aluminum

PartType: Coupon

Contaminants: Greases

Cleaning Methods: Ultrasonics

Analytical Methods: Gravimetric, Visual

Purpose: The purpose of this experiment was to determine the effectiveness of cleaners via heated ultrasonic cleaning.

Experimental Procedure: Cleaners were prepared to the following concentrations: Metalnox 6386 100%, Dimethyl Glutarate 100%, Water Works Heavy Duty Degreaser 7:1, SC Aircraft & Metal Cleaner 20%, Crystal Simple Green Industrial Cleaner 30 parts water. Solutions were heated to 100°F and placed in an ultrasonic bath also at 100°F. Three aluminum coupons were obtained and weighed for each of the cleaners being tested. Coupons were then soiled with aviation grease and a dirty weight was recorded. Once solutions reached the proper temperature, coupons were submerged into their respective cleaners and ultrasonic cleaning was conducted for 15 minutes. After 15 minutes, coupons cleaned with SC Aircraft were submerged into a deionized water bath at 100°F for 30 seconds. All coupons were then partially dried with a heat gun to remove excess solution and allowed to finish drying in air for 24 hours. Following the drying step, coupons were weighed again 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	0.1382	0.0006	99.57	97.48%
	0.1275	0.0027	97.88	
	0.1001	0.005	95	
Dimethyl Glutarate	0.107	0.0639	40.28	55.31%
	0.1055	0.0221	79.05	
	0.1225	0.0654	46.61	
Water Works	0.1534	0.033	78.49	71.09%
	0.1825	0.0566	68.99	
	0.1143	0.0391	65.79	
SC Aircraft & Metal	0.1642	0.1062	35.32	44.89%
	0.1121	0.033	70.56	
	0.1625	0.1157	28.8	
Crystal Simple Green	0.1638	0.1423	13.13	25.01%
	0.148	0.0985	33.45	
	0.1999	0.143	28.46	

Metalnox 6386 was the highest performing cleaner removing an average of 97.48% of soil. However, Water Works and SC Aircraft, which were top contenders in the unheated ultrasonic trial, decreased in performance. This could be due to the beaker chosen. Adding heat was expected to further improve the performance of those cleaners, and a retrial using a larger beaker to give space between the substrates will allow the grease to potentially be broken down instead of clumping along the tops of the coupons. Dimethyl glutarate showed significant improvement and could also benefit from testing in a larger beaker. Crystal Simple Green slightly decreased in performance and has overall been ineffective in dissolving the grease. Crystal Simple Green will be dropped from further testing.

Summary:

Substrates:	Aluminum				
Contaminants:	Greases				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Kyzen Corporation	Metalnox M6386	100%	97.48	☑	
Fisher Scientific	Dimethyl glutarate (CAS:1119-40-0)	100%	55.31	☐	

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Keteca USA	Water Works Heavy Duty Degreaser	7:1	71.09	☐	
Gemtek Products	SC Aircraft & Metal Cleaner Super Concentrate	20%	44.89	☐	
Simple Green	Crystal Simple Green Industrial Cleaner & Degreaser	30 parts water	25.01	☐	

Conclusion:

Upon completion of testing it was determined that heated ultrasonic cleaning at 100°F for 15 minutes was an effective method for Metalnox 6386 and no further optimization is required. Water Works and SC Aircraft performed worse than expected, but this could be due to the beaker chosen. A retrial with a larger beaker for more space between the substrates could be beneficial. Dimethyl glutarate performed significantly better and a larger beaker could also benefit performance. Crystal Simple Green slightly decreased in performance, and will be dropped from further testing due to overall poor removal of soil.