CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2021

DateRun: 08/02/2021

Experimenters: Zoe Lawson, Justin Kiander

ClientType: Metal Finishing

ProjectNumber: Project #3

Substrates: Stainless Steel

PartType: Coupon

Contaminants: Oil

Cleaning Methods: Ultrasonics

Analytical Methods: Gravimetric, Visual

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

Experimental Procedure: Cleaners were prepared to the following concentrations: Citranox 2%, Mirachem 500 20%, Water Works Heavy Duty 7:1, SC Aircraft & Metal 20%, Aquaease 732 5%, Aquavantage 3800 GD 5%. All cleaners and an ultrasonic bath were heated to 110°F. Three stainless steel coupons were obtained and weighed for each of the cleaners being tested. Coupons were then soiled with oil provided by the company and a dirty weight was recorded. Once solutions and the ultrasonic bath reached the proper temperature, coupons were submerged into their respective cleaners and ultrasonic cleaning was conducted for 15 minutes. After 15 minutes had passed, coupons cleaned with SC Aircraft & Metal were rinsed in a deionized water bath, also at 110°F, for 5 minutes. All coupons were allowed to dry in air for 24 hours. Following the drying period, 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
Citranox	0.0535	0.0176	67.10	78.04
	0.1789	0.0227	87.31	
	0.0798	0.0162	79.70	
Mirachem 500	0.1346	0.0093	93.09	89.34
	0.1261	0.0114	90.96	
	0.1442	0.0231	83.98	
Water Works	0.1382	0.0087	93.70	92.97
	0.1546	0.0092	94.05	
	0.1529	0.0135	91.17	
SC Aircraft & Metal	0.1247	0.0272	78.19	85.94
	0.1194	0.0131	89.03	
	0.1533	0.0144	90.61	
Aquaease 732	0.1902	0.0129	93.22	88.16
	0.1941	0.0153	92.12	
	0.1137	0.0237	79.16	
Aquavantage 3800 GD	0.1914	0.0226	88.19	90.98
	0.1169	0.0106	90.93	
	0.2139	0.0132	93.83	

Water Works was the most successful cleaner removing an average of 92.97% of the oil from stainless steel substrates. However, all cleaners had decreased performance compared to the stir bar agitation trial. A heated rinse was used for all cleaners in the stir bar trial, and may be necessary to use after ultrasonic cleaning to remove the residue as well. Next steps would be to repeat heated ultrasonic cleaning and incorporating a heated rinse step into the process.

Summary:

Substrates:	Stainless Steel				
Contaminants:	Oil				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Alconox Inc	Citranox	2%	78.04	☐	
Mirachem Corporation	Mirachem 500	20%	89.34	☑	

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Keteca USA	Water Works Heavy Duty Degreaser	7:1	92.97	☑	
Gemtek Products	SC Aircraft & Metal Cleaner Super Concentrate	20%	85.94	☑	
Hubbard Hall Inc	Aquaease PL 732	5%	88.16	☑	
Brulin Corporation	Aquavantage 3800 GD	5%	90.98	☑	

Conclusion:

Upon completion of testing, it was determined that Water Works was the most successful cleaner removing an average of 92.97% oil from stainless steel substrates. However, these removal percentages are lower compared to the stir bar agitation trial. Next steps will be to incorporate a heated rinse into the ultrasonic cleaning process to remove the lingering residue.