CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2019
DateRun:	08/27/2019
Experimenters:	Julie Nguyen
ClientType:	Capacitor Manufacturer
ProjectNumber:	Project #3
Substrates:	Aluminum, Ceramics
PartType:	Coupon
Contaminants:	Oil
Cleaning Methods:	Immersion/Soak
Analytical Methods:	Gravimetric, Visual
Purpose:	To evaluate the effectiveness of three low foam cleaners at removing canola oil, expoxidized soybean oil, and SAS-60E from aluminum and ceramic coupons.
Experimental Procedure:	Fifty-four pre-weighed coupons, eighteen for each cleaner, were soiled with Canola Oil, Soybean Oil, and SAS 60E using a clean swab. Each set of coupons was immersed in a 250mL beaker with the diluted cleaners for one minute at the vendor recommended temperature. Coupons were then transferred to a (140F) heated rinse for one minute before getting an additional one-minute dry with an air gun. Observations were made and final weights were recorded.

Results:

Cleaner	Soil	Substrate	Initial Wt. of Cont.	Final Wt. of Cont.	% Cont. Removed	% Average
SC Aircraft & Metal	Canola Oil	Aluminum	0.2491	0.0301	87.92	90.33
			0.2409	0.0093	96.14	
			0.2781	0.0363	86.95	
		Ceramic	0.2552	0.0112	95.61	93.29
			0.2829	0.0241	91.48	
			0.1859	0.0134	92.79	
	Soybean Oil	Aluminum	0.3118	0.0716	77.034	82.80
			0.3032	0.0333	89.02	
			0.2926	0.0516	82.36	
		Ceramic	0.2182	0.0174	92.02	93.83
			0.2629	0.0197	92.51	
			0.2498	0.0076	96.96	
	SAS-60E	Aluminum	0.3004	0.0246	91.81	90.75
			0.2961	0.0145	95.10	
			0.186	0.0273	85.32	
		Ceramic	0.229	0.0155	93.23	96.07
			0.3552	0.0139	96.09	
			0.1962	0.0022	98.88	
LF2100	Canola Oil	Aluminum	0.2994	0.0181	93.95	93.17
			0.3714	0.0122	96.71	
			0.2799	0.0312	88.85	
		Ceramic	0.3887	0.005	98.71	97.31
			0.2018	0.0053	97.37	
			0.2616	0.0108	95.87	
	Soybean Oil	Aluminum	0.259	0.1128	56.45	55.01
			0.2114	0.1127	46.69	
			0.2314	0.0882	61.88	
		Ceramic	0.2017	0.0024	98.81	97.57
			0.3269	0.0173	94.71	
			0.2441	0.002	99.18	
	SAS-60E	Aluminum	0.2329	0.0041	98.24	90.29
			0.2252	0.0483	78.55	

CLEANING LABORATORY EVALUATION SUMMARY

			0.2623	0.0155	94.09	
		Ceramic	0.2623	0.004	98.47	96.85
			0.2555	0.0029	98.86	
			0.2237	0.0152	93.20	
Aquavantage 3800 GD	Canola Oil	Aluminum	0.2811	0.0698	75.17	76.08
			0.2339	0.083	64.51	
			0.2106	0.0241	88.56	
		Ceramic	0.2448	0.0855	65.07	73.34
			0.1772	0.0767	56.71	
			0.1917	0.0034	98.23	
	Soybean Oil	Aluminum	0.2358	0.1218	48.345	56.42
			0.2548	0.077	69.78	
			0.2835	0.1385	51.15	
		Ceramic	0.2827	0.0225	92.04	70.62
			0.1959	0.1346	31.29	
			0.2522	0.0289	88.54	
	SAS-60E	Aluminum	0.2006	0.0032	98.40	96.93
			0.2271	0.0069	96.96	
			0.2185	0.0100	95.42	
		Ceramic	0.2466	0.0769	68.81	88.97
			0.2169	0.0040	98.15	
			0.1998	0.0001	99.95	

Cleaner Visual Observations

Cleaner	Substrate	Soil	Observation	Rinse
SC Aircraft & Metal Cleaner	Aluminum	Canola Oil	- no change	- oil spots
		Soybean Oil	- no change	- oil spots
		SAS-60E	- no change	- strong odor
	Ceramic	Canola Oil	- small amount of bubbles of coupon	- no change
		Soybean Oil	- small amount of bubbles of coupon	- no change
		SAS-60E	- small amount of bubbles of coupon	- strong odor
LF2100	Aluminum	Canola Oil	- sizzling sound/ bubbles	- oil and bubbles at top
		Soybean Oil	- foam line along top of coupon	- dilution turned cloudy
		SAS-60E	- thin foam layer at top of dilution	- very strong odor
	Ceramic	Canola Oil	- oil spots at top of dilution	- thin oil layer at top
		Soybean Oil	- oil spots at top of dilution	- thin oil layer at top
		SAS-60E	- oil spots at top of dilution	- oil layer/

CLEANING LABORATORY EVALUATION SUMMARY

				strong odor
Aquavantage 3800 GD	Aluminum	Canola Oil	- dilution cloudy/oil spots floating	- no change
		Soybean Oil		- no change
		SAS-60E	- no change	- strong odor
	Ceramic	Canola Oil	- no change	- no change
		Soybean Oil	- no change	- no change
		SAS-60E	- no change	- strong odor

LF2100 and Aquavantage 3800 GD had lesser overall averages due to their lack of performance on the expoxidized soybean oil. SC Aircraft & Metal Cleaners had more consistent results with all of the substrates and soils.

Summary:

Substrates:	Aluminum, Ceramics				
Contaminants:	Oil				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Gemtek Products	SC Aircraft & Metal Cleaner Super Concentrate	10%	87.96	☑	More consistent results with all of the substrates and soils.
International Products Corporation	LF 2100 (Liquid Foam Cleaner)	5%	79.49	☑	Lesser overall averages due to their lack of performance on the expoxidized soybean oil.
Brulin Corporation	Aquavantage 3800 GD	140F	76.48	☑	Lesser overall averages due to their lack of performance on the expoxidized soybean oil

Conclusion:

SC Aircraft & Metal cleaner yielded the best results in removing the three tested soils. Although the acquired results don’t show 100% removal, adding high-pressure agitation will likely lead to even higher overall averages than shown for all of the cleaners tested.