CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2017
DateRun:	12/28/2017
Experimenters:	Alicia McCarthy, Hayley Byra
ClientType:	General
ProjectNumber:	Project #1
Substrates:	Aluminum
PartType:	Coupon
Contaminants:	Lubricating/Lapping Oils, Oil
Cleaning Methods:	Ultrasonics
Analytical Methods:	Gravimetric
Purpose:	To compare the effectiveness of alternative solvents to Trichloroethylene (TCE) when removing lubricating oils from aluminum alloy coupons.
Experimental Procedure:	Aluminum coupons were vapor degreased for five minutes in heated TCE to provide a baseline for cleanliness. Fifteen coupons, three for each soil, were used for each solvent and initial weights were recorded. Coupons were soiled with Blasocut 2000 Universal Lubricant (CAS: 64742-52-5; 61790-44-1; 68608-26-4; 63449-39-8; 107-41-5; 770-35-4); Oak 7a (CAS: 64742-53-6; 68909-65-9); Rustlick EDM30 lubricant (CAS:64742-47-8; 8042-47-5); Accu-Lube LB 6000 Lubricant (CAS 68583-51-7); and Lenox Lube Tube Wax (CAS:8002-74-2; 57-11-4; 5989-27-5) using a swab to cover the bottom third of the substrate before taking the dirty weights. Coupons were cleaned with Opteon™ Sion SF79 and Tergo Metal Cleaner using heated (95 F) ultrasonics for five minutes. Coupons cleaned with TCE were placed back into the heated open-top vapor degreaser for five minutes. Coupons were completely submerged in the solvents during testing, and the cleaned coupons were placed on a clean foam surface. Final weights were taken shortly after testing.
Results:	Opteon™ Sion SF79 and Tergo Metal Cleaner, both visually and gravimetrically, removed the lubricating oils from the coupon surface. The gravimetric results for the TCE cleaned coupons have outliers that are above 100-101 percent removal. Since only the TCE cleaned coupons had this issue, it is assumed that it is due to TCE's corrosivity to aluminum and alloys (unspecified) when unstabilized, heated, or in the presence of water[1]. Coupons had been cleaned before use with soap and water in the laboratory, and the coupons could potentially have had water or an aqueous residue on the surface. This does not impact the results of the other two solvents.

Cleaner	Soil	Initial wt. of cont.	Final wt. of cont.	% Removed	Average % Removal	Overall % Removal
Opteon™ Sion SF79	Blasocut	0.0032	0.0001	96.88	97.43	97.79
		0.0213	0.0009	95.77		
		0.0277	0.0001	99.64		
	Oak 7a	0.0482	0.0000	100.00	99.16	
		0.1101	0.0013	98.82		
		0.0671	0.0009	98.66		
	EDM 30	0.0487	0.0004	99.18	98.90	
		0.0550	0.0010	98.18		
		0.0304	0.0002	99.34		
	Accu-Lube	-0.2474	-0.0002	99.92	96.16	
		0.0388	0.0039	89.95		
		0.1284	0.0018	98.60		
	Lenox Wax	0.0121	0.0006	95.04	97.33	
		0.0293	0.0005	98.29		
		0.0074	0.0001	98.65		
Tergo Metal Cleaner	Blasocut	0.0148	-0.0001	100.68	99.28	97.99
		0.0330	0.0011	96.67		
		0.0395	-0.0002	100.51		
	Oak 7a	0.1240	-0.0004	100.32	98.37	
		0.0474	0.0010	97.89		
		0.0225	0.0007	96.89		
	EDM 30	0.0459	-0.0004	100.87	95.63	

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		0.0663	0.0027	95.93		
		0.0676	0.0067	90.09		
	Accu-Lube	0.0494	-0.0003	100.61	99.90	
		0.0763	0.0007	99.08		
		0.1259	0.0000	100.00		
	Lenox Wax	0.0382	0.0003	99.21	96.79	
		0.0022	0.0002	90.91		
		0.0407	-0.0001	100.25		
TCE	Blasocut	0.0407	0.0001	99.75	101.39	101.27
		0.0141	0.0004	97.16		
		0.0179	-0.0013	107.26		
	Oak 7a	0.0590	0.0001	99.83	100.85	
		0.0484	-0.0011	102.27		
		0.0658	-0.0003	100.46		
	EDM 30	0.0324	-0.0001	100.31	102.79	
		0.0293	-0.0017	105.80		
		0.0529	-0.0012	102.27		
	Accu-Lube	0.0370	-0.0011	102.97	101.08	
		0.0366	-0.0001	100.27		
		0.0354	0.0000	100.00		
	Lenox Wax	0.0449	-0.0003	100.67	100.24	
		0.0729	-0.0005	100.69		
		0.0472	0.0003	99.36		

[1] http://www.ccohs.ca/oshanswers/chemicals/chem_profiles/trichloroethylene.html

Summary:

Substrates:	Aluminum
Contaminants:	Lubricating/Lapping Oils, Oil

Company Name:	Product Name:	Conc.:	Efficiency:	Effective:	Observations:
Micro Care	Opteon Sion SF79	100%	97.79	☑	
Micro Care	Tergo Metal Cleaning Fluid	100%	97.99	☑	
Ashland Specialty Chemical Company	Trichloroethylene	100%	101.27	☑	For Comparison Purposes Only

Conclusion: The cleaning evaluation suggests that both Opteon™ Sion SF79 and Tergo Metal Cleaner are viable replacements for TCE.