CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2019

DateRun: 02/05/2020

Experimenters: Othon Pagounes, Harry Rankin

ClientType: Adhesive Manufacturer

ProjectNumber: Project #3

Substrates: Stainless Steel

PartType: Part

Contaminants: Adhesive

Cleaning Methods: Immersion/Soak

Analytical Methods: Gravimetric, Visual

Purpose: To evaluate the effectiveness of a solvent and aqueous based cleaners on the removal of acrylic and silicone adhesives from stainless steel coupons using unheated and heated immersion as a replacement for NMP.

Experimental Procedure: Twelve pre-weighed stainless steel coupons, three for each cleaner, were soiled for each contaminant tested. Approximately 0.5 g of the soil was applied using a hand held swab. Each set of coupons were placed into a beaker and immersed for 30 minutes. During this process, any noticeable soil removal was observed at ten minute intervals. Coupons were allowed to dry for 24 hours, and afterwards final weights were recorded as well as efficiency of removal was calculated for each coupon cleaned. This process was then repeated with the application of a heated immersion.

Results:

Table 1: Unheated Immersion Acrylic

Cleaner	Conc.	Initial wt. of cont. (g)	Final wt. of cont. (g)	% Cont. Removed	% Average
Aquavantage 1400 GD	10%	0.5078	0.4125	18.77	19.04
		0.4132	0.3398	17.76	
		0.7461	0.5924	20.60	
Surface Clean 930	2%	0.4284	0.3319	22.53	26.40
		0.5068	0.3369	33.52	
		0.4074	0.3131	23.15	
SC Aircraft and Metal Cleaner	1%	0.3893	0.2876	26.12	25.95
		0.5171	0.4175	19.26	
		0.636	0.4296	32.45	
Sta-Sol® ESS 160	100%	0.4052	0.3683	9.11	18.67
		0.5334	0.4288	19.61	
		0.5471	0.3977	27.31	

Table 2: Unheated Immersion Silicone

Cleaner	Conc.	Initial wt. of cont. (g)	Final wt. of cont. (g)	% Cont. Removed	% Average
Aquavantage 1400 GD	10%	0.5603	0.502	10.41	7.24
		0.591	0.5456	7.68	
		0.552	0.532	3.62	
Surface Clean 930	2%	0.4133	0.391	5.40	6.06
		0.6106	0.5706	6.55	
		0.519	0.4866	6.24	
SC Aircraft and Metal Cleaner	1%	0.5225	0.4986	4.57	5.21
		0.5579	0.5226	6.33	
		0.4982	0.4747	4.72	
Sta-Sol® ESS 160	100%	0.5504	0.5473	0.56	1.78
		0.5818	0.5639	3.08	
		0.4602	0.4524	1.69	

Table 3: Heated Immersion Acrylic

Cleaner	Conc.	Temp.				

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			Initial wt. of cont.	Final wt. of cont.	% Cont. Removed	% Average
Aquavantage 1400 GD	10%	145° F	0.4011	0.291	27.45	25.67
			0.4632	0.37	20.12	
			0.5516	0.3892	29.44	
Surface Clean 930	2%	90° F	0.5563	0.4179	24.88	26.98
			0.293	0.212	27.65	
			0.5133	0.3674	28.42	
SC Aircraft and Metal Cleaner	1%	140° F	0.4291	0.3647	15.01	16.27
			0.3131	0.264	15.68	
			0.3738	0.3061	18.11	
Sta-Sol® ESS 160	100%	130° F	0.5067	0.379	25.20	18.82
			0.3531	0.3376	4.39	
			0.5076	0.3712	26.87	

Table 4: Heated Immersion Silicone

Cleaner	Conc.	Temp.	Initial wt. of cont.	Final wt. of cont.	% Cont. Removed	% Average
Aquavantage 1400 GD	10%	145° F	0.6875	0.6757	1.72	5.67
			0.6501	0.6277	3.45	
			0.3591	0.3165	11.86	
Surface Clean 930	2%	90° F	0.504	0.5	0.79	1.80
			0.5575	0.5328	4.43	
			0.5587	0.5577	0.18	
SC Aircraft and Metal Cleaner	1%	140° F	0.4012	0.2981	25.70	11.25
			0.634	0.6167	2.73	
			0.7278	0.689	5.33	
Sta-Sol	100%	130° F	0.5114	0.4913	3.93	3.79
			0.4732	0.452	4.48	
			0.5676	0.5508	2.96	

Manufacturer	Product Name	Immersion Method	Acrylic Adhesive	Silicone Adhesive
			Efficiency %	Efficiency %
Brulin Holding Company	Aquavantage 1400 GD (10%)	Unheated	19.04	7.24
		Heated (145° F)	25.67	5.67
International Products	Surface Clean 930 (2%)	Unheated	26.40	6.06
		Heated (90° F)	26.98	1.80
Gemtek	SC Aircraft and Metal Cleaner (1%)	Unheated	25.95	5.21
		Heated (140° F)	16.27	11.25
JR Hess	Sta-Sol® ESS 160	Unheated	18.67	1.78
		Heated (130° F)	18.82	3.79

Summary:

Substrates:	Stainless Steel				
Contaminants:	Adhesive				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Brulin Corporation	Aquavantage 1400	10%	19.04	☐	Acrylic Adhesive
Brulin Corporation	Aquavantage 1400	10%	25.67	☐	Acrylic Adhesive
Brulin Corporation	Aquavantage 1400	10%	7.24	☐	Silicone Adhesive
	Aquavantage 1400	10%	5.67	☐	

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Brulin Corporation					Silicone Adhesive. Heat didn't really impact this adhesive.
International Products Corporation	Surface Cleanse Concentrated Neutral 930	2%	26.40	☐	Acrylic Adhesive
International Products Corporation	Surface Cleanse Concentrated Neutral 930	2%	26.98	☐	Acrylic Adhesive. Heat didn't improve effectiveness.
International Products Corporation	Surface Cleanse Concentrated Neutral 930	2%	6.06	☐	Silicone Adhesive
International Products Corporation	Surface Cleanse Concentrated Neutral 930	2%	1.80	☐	Silicone Adhesive. Heat didn't improve effectiveness.
Gemtek Products	SC Aircraft & Metal Cleaner Super Concentrate	1%	25.95	☐	Acrylic Adhesive
Gemtek Products	SC Aircraft & Metal Cleaner Super Concentrate	1%	16.27	☐	Acrylic adhesive. Heat didn't improve effectiveness.
Gemtek Products	SC Aircraft & Metal Cleaner Super Concentrate	1%	5.21	☐	Silicone Adhesive
Gemtek Products	SC Aircraft & Metal Cleaner Super Concentrate	1%	11.25	☐	Silicone Adhesive. Heat did slightly improve effectiveness.
JR Hess & Co., Inc.	Sta-Sol ESS 160	100%	18.67	☐	Acrylic Adhesive
JR Hess & Co., Inc.	Sta-Sol ESS 160	100%	18.82	☐	Acrylic Adhesive. Sta Sol ESS 160 seems to do better from previous tests around 140/150F.
JR Hess & Co., Inc.	Sta-Sol ESS 160	100%	1.78	☐	Silicone Adhesive
JR Hess & Co., Inc.	Sta-Sol ESS 160	100%	3.79	☐	Silicone Adhesive. Heat barely improved effectiveness.

Conclusion: All of the chemistries evaluated were not efficient in the removal of acrylic or silicone adhesive in both unheated and heated immersion, but an improvement was seen with heat. The next step will be to apply agitation using ultrasonics. Silicone will be the only contaminant tested going forward due to it being the hardest contaminant to remove thus far.