CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2021
DateRun:	04/21/2021
Experimenters:	Alicia McCarthy, Zoe Lawson
ClientType:	Plating Company
ProjectNumber:	Project #1
Substrates:	Brass
PartType:	Coupon
Contaminants:	Coatings
Cleaning Methods:	
Analytical Methods:	Gravimetric, Visual
Purpose:	To test the effectiveness of HSPiP alternatives.
Experimental Procedure:	Alternatives were prepared to the following concentrations: Acetone 100%, Acetone 50%, Thiophene 100%, Cyclopentanone 100%, Anisole 100%, Dimethyl Glutarate 100%, and Ethyl Lactate 100%. Dimethyl Glutarate was heated to 150°F while the other alternatives were kept at room temperature. Three brass coupons were obtained and weighed for each of the solutions being tested. Coupons were then coated on one side with the lacquer soil and allowed to dry for 30 minutes. Once soiled and dry, a dirty weight was obtained and recorded for all coupons. Coupons were then submerged into their respective solutions for 30 minutes, checking the progress of cleaning every five minutes. Coupons were allowed air dry. Following the drying period, coupons were weighed again and a clean weight was recorded. Effectiveness of the cleaners was determined.

Results:

Cleaner	Initial weight of Cont	Final weight of Cont	%Cont Removed	%AVG
100% Acetone	0.0263	-0.0012	104.56	95.93
	0.0238	0.0016	93.28	
	0.0527	0.0053	89.94	
50% Acetone	0.0364	0.0333	8.52	9.11
	0.0391	0.0358	8.44	
	0.0241	0.0216	10.37	
Thiophene	0.0307	0.0093	69.71	67.44
	0.0333	0.0123	63.06	
	0.0289	0.0088	69.55	
Cyclopentanone	0.0283	0.0345	-21.91	64.20
	0.0248	-0.0025	110.08	
	0.0203	-0.0009	104.43	
Anisole	0.0249	0.0028	88.76	91.11
	0.0163	0.0008	95.09	
	0.0247	0.0026	89.47	
Dimethyl Glutarate	0.0228	-0.0003	101.32	104.60
	0.0322	-0.0021	106.52	
	0.0252	-0.0015	105.95	
Ethyl Lactate	0.0290	0.0158	45.52	43.41
	0.0343	0.0210	38.78	
	0.0233	0.0126	45.92	

Dimethyl Glutarate was the most effective cleaner removing an average of 104.60% of lacquer from the brass substrates. Acetone 100% and Anisole were the secondary most effective solvent alternatives removing an average of 95.93% and 91.11% respectively. Percent removals over 100 indicate that the solvent has removed additional soils which were present on the coupon prior to testing.

During the cleaning process, all solutions excluding Acetone 50% underwent a color change from clear to a deep red almost immediately after adding coupons into the solution. This color change verifies that the solutions are able to remove the lacquer. Acetone 100%, Acetone 50%, Thiophene, and Cyclopentanone had partial to a fair amount of removal at the 10-minute mark. Anisole, Dimethyl Glutarate, and Ethyl Lactate showed similar removal by the 15-minute mark.

Summary:

Substrates:	Brass

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Contaminants:	Coatings				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Fisher Scientific	Acetone (CAS: 67-64-1)	100%	95.93	☑	Lacquer color could be seen immediately in solvent. Red lacquer almost completely removed at approximately 10 minutes.
Fisher Scientific	Acetone (CAS: 67-64-1)	50%	9.11	☐	Solvent formed bubbles around coupons and little coloring could be seen in the solution from the lacquer. Red lacquer was still on coupon after 10 minutes.
Alfa Aesar	Thiophene	100%	67.44	☐	Immediately showed red lacquer in solvent. Partial removal at approximately 10 minutes.
Aldrich Chemical Company Inc.	Cyclopentanone	100%	64.20	☐	Lacquer turned solution red quickly and majority of soil removed after 10 minutes.
Fisher Scientific	Anisole (CAS: 100-66-3)	100%	91.11	☑	Solution turned red quickly and lacquer appeared to be partially removed after 15 minutes.
Fisher Scientific	Dimethyl glutarate (CAS:1119-40-0)	100%	104.60	☑	Solution turned red immediately from lacquer and almost complete removal at 15 minutes.

Conclusion: From the percent effectiveness, Acetone 100%, Anisole, and Dimethyl Glutarate were chosen to proceed with to test on company parts.