CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2021
DateRun:	01/21/2021
Experimenters:	Justin Kiander
ClientType:	Metal Working
ProjectNumber:	Project #1
Substrates:	Stainless Steel
PartType:	Part
Contaminants:	Lubricating/Lapping Oils
Cleaning Methods:	Immersion/Soak
Analytical Methods:	Gravimetric, Visual
Purpose:	This is a final report summarizing all of TURI testing.
Experimental Procedure:	Unheated immersion, heated immersion at 100°F, heated immersion at 120°F, and heated immersion at 120°F with agitation were all conducted throughout trial testing. The following are the ideal cleaners and their suggested method: Metalnox 6386 100% concentration unheated immersion for 15 minutes. Dimethyl Glutarate 100% concentration heated immersion with a stir bar for agitation at 120°F for 30 minutes. SC Aircraft & Metal 20% concentration heated immersion with a stir bar for agitation at 120°F for 30 minutes followed by a 30 second deionized water rinse at 120°F. All parts are dried with a heat gun.
Results:	The following is a summary of all TURI testing results:

Trial 0 Unheated Immersion 15 min

Cleaner	Initial wt of Cont	Final wt of Cont	%Cont Removed	%AVG
Metalnox 6386	0.0375	0.0016	95.73	96.56%
	0.0390	0.0009	97.69	
	0.0775	0.0029	96.26	
Dimethyl Glutarate	0.0432	0.0664	-53.70	15.53%
	0.1002	0.0511	49.00	
	0.0854	0.0416	51.29	
Smart Solve 605	0.1169	0.1168	0.09	-10.50%
	0.0918	0.1088	-18.52	
	0.1239	0.1401	-13.08	
SC Aircraft and Metal	0.1096	0.0435	60.31	68.25%
	0.1480	0.0338	77.16	
	0.1076	0.0352	67.29	
SC Supersolve	0.1115	0.0502	54.98	60.96%
	0.0633	0.0356	43.76	
	0.1382	0.0219	84.15	
Crystal Simple Green	0.1266	0.0349	72.43	71.30%
	0.1875	0.0430	77.07	
	0.1475	0.0525	64.41	

Trial 1 Heated Immersion at 100°F 15 min

Cleaner	Initial wt of cont	Final wt of cont	%Cont Removed	%AVG
Dimethyl glutarate	0.0192	0.0064	66.67	68.02%
	0.0438	0.0118	73.06	
	0.0387	0.0138	64.34	
Smart Solve 605	0.0250	0.0076	69.60	74.31%
	0.0344	0.0086	75.00	
	0.0226	0.0049	78.32	
SC Aircraft & Metal	0.0301	0.0048	84.05	79.55%
	0.0272	0.0045	83.46	
	0.0239	0.0069	71.13	

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SC Supersolve	0.0692	0.0177	74.42	74.35%
	0.0579	0.0202	65.11	
	0.1123	0.0185	83.53	
Crystal Simple Green	0.0926	0.0026	97.19	82.87%
	0.0731	0.0081	88.92	
	0.0408	0.0153	62.50	

Trial 2 Heated Immersion at 120°F 15 min

Cleaner	Initial wt of cont	Final wt of cont	%Cont Removed	%AVG
Dimethyl Glutarate	0.0325	0.0064	80.31	84.51%
	0.0224	0.0032	85.71	
	0.0168	0.0021	87.50	
Smart Solve 605	0.0162	0.0007	95.68	93.98%
	0.0132	0.0011	91.67	
	0.0166	0.0009	94.58	
SC Aircraft & Metal	0.0282	0.0060	78.72	71.32%
	0.0224	0.0054	75.89	
	0.0214	0.0087	59.35	
SC Supersolve	0.0473	0.0097	79.49	64.71%
	0.0214	0.0104	51.40	
	0.0155	0.0057	63.23	
Crystal Simple Green	0.0135	-0.0021	115.56	95.21%
	0.0192	0.0045	76.56	
	0.0154	0.0010	93.51	

Trial 3 Unheated Immersion 30 min

Cleaner	Initial wt of cont	Final wt of cont	%Cont Removed	%AVG
Metalnox 6386	0.0273	-0.0011	104.03	104.7%
	0.0211	-0.0012	105.69	
	0.0205	-0.0009	104.39	
Dimethyl glutarate	0.0228	0.0088	61.40	57.80%
	0.0199	0.0081	59.29	
	0.0148	0.0070	52.70	
Smart Solve 605	0.0165	0.0014	91.52	91.24%
	0.0159	0.0001	99.37	
	0.0134	0.0023	82.83	
SC Aircraft & Metal	0.0147	0.0075	48.98	39.31%
	0.0128	0.0052	59.38	
	0.0094	0.0085	9.57	
SC Supersolve	0.0121	0.0047	61.16	72.90%
	0.0127	0.0031	75.59	
	0.0133	0.0024	81.95	
Crystal Simple Green	0.0115	0.0088	23.48	6.80%
	0.0086	0.0121	-40.70	
	0.0109	0.0068	37.61	

Trial 4 Heated Immersion 100°F 30 min

Cleaner	Initial wt of cont	Final wt of cont	%Cont Removed	%AVG
Dimethyl glutarate	0.0314	0.0062	80.25	80.80%
	0.0231	0.0051	77.92	
	0.0203	0.0032	84.24	
SC Aircraft & Metal	0.0205	0.0048	76.58	88.43%
	0.0200	0.0052	74.00	
	0.0163	-0.0024	114.72	
	0.0153	0.0080	47.71	72.59%

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SC Supersolve	0.0173	0.0070	59.54	
	0.0152	-0.0016	110.53	
Crystal Simple Green	0.0140	0.0072	48.57	34.91%
	0.0138	0.0135	2.17	
	0.0150	0.0069	54.00	

Trial 5 Heated Immersion 120°F 30 min

Cleaner	Initial wt of Cont	Final wt of Cont	%Cont Removed	%AVG
Dimethyl glutarate	0.0220	0.0034	84.54	86.89%
	0.0290	0.0033	88.62	
	0.0240	0.0030	87.50	
SC Aircraft & Metal	0.0215	0.0056	73.95	84.62%
	0.0184	0.0036	80.43	
	0.0196	0.0001	99.49	
SC Supersolve	0.0160	0.0068	57.50	59.36%
	0.0147	0.0057	61.22	
	0.0028	-0.0237	946.43	
Crystal Simple Green	0.0062	-0.0027	143.55	83.31%
	0.0123	0.0031	74.80	
	0.0159	0.0013	91.82	

Bold numbers excluded from average calculations; too little soil was applied to these coupons, and do not represent cleaner performance. Soil was most likely removed quickly then the substrate was damaged due to overexposure to solvent.

Trial 6 Heated Immersion 120°F 30 min with stir bar for agitation

Cleaners	Initial wt of cont	Final wt of cont	%Cont Removed	%AVG
Dimethyl glutarate	0.0214	-0.0004	101.87	101.27%
	0.0200	-0.0003	101.50	
	0.0224	-0.0001	100.45	
SC Aircraft & Metal	0.0169	0.0005	97.04	85.02%
	0.0171	0.0009	94.74	
	0.0177	0.0065	63.28	
SC Supersolve	0.0176	0.0048	72.73	83.36%
	0.0141	0.0029	79.43	
	0.0144	0.0003	97.92	

Trial 7 Parts Testing

Cleaner	Observations
Metalnox 6386	Post Clean & Dry: Appears to be effective, no oil residue visible
Smart Solve 605	May not have had enough solution for accurate testing. Post Clean: Appeared to be a residue which disappeared with drying.
Dimethyl Glutarate	Post Clean & Dry: Appears to be effective, no oil residue visible
SC Aircraft & Metal	During the cleaning process: oil droplets forming and falling into solution. Solution became foggy, indicating removal of soil occurring. Post Clean: Appeared to be a residue that disappeared with drying.

Smart Solve 605 was removed from the recommendation list due to difficulties trying to contact the vendor for several months

Summary:

Substrates:	Stainless Steel				
Contaminants:	Lubricating/Lapping Oils				
	Product Name:	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**

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Company Name:					
Kyzen Corporation	Metalnox M6386	100%	0.00	☑	15 minutes of unheated immersion, dried with a heat gun
Fisher Scientific	Dimethyl glutarate (CAS: 1119-40-0)	100%	0.00	☑	Heated Immersion for 30 minutes at 120°F with a stir bar for agitation, dried with a heat gun
Gemtek Products	SC Aircraft & Metal Cleaner Super Concentrate	20%	0.00	☑	Heated Immersion at 120°F for 30 minutes with a stir bar for agitation, rinsed in a deionized water bath at 120°F for 30 seconds, dried with a heat gun

Conclusion: Unheated immersion for 15 minutes with Metalnox 6386 at 100% concentration, Heated Immersion at 120°F with a stir bar for agitation for 30 minutes with Dimethyl Glutarate at 100% concentration, or Heated Immersion at 120°F with a stir bar for agitation for 30 minutes with SC Aircraft & Metal at 20% concentration, followed by a 30 second deionized water rinse at 120°F, are all effective potential alternative cleaning methods.