

# CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2021  
DateRun: 01/22/2021  
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	
SC Supersolve	0.0153	0.0080	47.71	72.59%

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	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:

<b>Substrates:</b>	Stainless Steel
<b>Contaminants:</b>	Lubricating/Lapping Oils

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Company Name:	Product Name:	Conc.:	Efficiency:	Effective:	Observations:
Kyzen Corporation	Metalnox M6386	100%		<input checked="" type="checkbox"/>	15 minutes of unheated immersion, dried with a heat gun
Fisher Scientific	Dimethyl glutarate (CAS: 1119-40-0)	100%		<input checked="" type="checkbox"/>	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%		<input checked="" type="checkbox"/>	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.