CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2019
DateRun:	08/14/2019
Experimenters:	Sabrina Apel, Othon Pagounes
ClientType:	Medical Instrument Mfr
ProjectNumber:	Project #1
Substrates:	Titanium
PartType:	Coupon
Contaminants:	Oil
Cleaning Methods:	Ultrasonics
Analytical Methods:	Gravimetric, Visual
Purpose:	To evaluate the effectiveness of solvent and aqueous based cleaners at the removal of J2 on titanium substrates.
Experimental Procedure:	Six sets of three pre-weighed clean titanium coupons were contaminated on the bottom 1/3 of the coupon with J2 soil using a cotton swab. Cleaners were heated to vendor recommended temperatures, and coupons were immersed and sonicated, three at a time, into a beaker for 15 minutes. Visual observations were recorded every five minutes, and final weights were recorded after cleaning.

Results:

Gravimetric Results:

Cleaner	Conc. (%)	Temperature (°F)	Initial wt of cont.	Final wt of cont.	%Cont Removed	% Average
Dowanol PnBGE	100	100	0.8042	0.0008	99.90	99.87
			1.1057	0.0010	99.91	
			0.8855	0.0019	99.79	
Metalnox 6386	100	110	0.8975	0.0094	98.95	99.53
			0.7417	0.0017	99.77	
			0.7898	0.0011	99.86	
Dimethyl glutarate	100	130	0.8755	0.0105	98.80	97.80
			0.7959	0.0183	97.70	
			0.6964	0.0215	96.91	
Liquinox	1	150*	0.8485	0.1618	80.93	87.27
			0.6975	0.0836	88.01	
			0.7780	0.0554	92.88	
Ozzy Juice 3	100	106	0.9661	0.1439	85.11	85.59
			1.0291	0.2203	78.59	
			1.1189	0.0774	93.08	

*Temperature for Liquinox was lowered due to the temperature range limitations of the ultrasonic tank in the lab.

Visual Observations

Dowanol PnBGE

- Majority of soil was removed after 15 minutes of cleaning.
- Substrates stacked on top of each other after 10 minutes of cleaning. Part configuration may have affected results.
- The soil was highly viscous.
- The cleaner is clear.

Metalnox 6386

- Some residue of the soil remained on the coupons after 15 minutes of cleaning.
- Substrates stacked on top of each other after 10 minutes of cleaning. Part configuration may have affected results.
- The soil was highly viscous.
- The cleaner is clear.

Dimethyl glutarate

- Majority of soil was removed after 15 minutes of cleaning.
- The soil was highly viscous.

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- The cleaner is clear.

Liquinox

- Majority of soil was removed after 15 minutes of cleaning.
- Substrates stacked on top of each other after 10 minutes of cleaning. Part configuration may have affected results.
- The soil was highly viscous.
- The cleaner became cloudy after 15 minutes of cleaning, and soil residue submerged to the bottom of beaker.

Ozzy Juice 3

- Majority of soil was removed after 15 minutes of cleaning.
- The soil was highly viscous.
- The cleaner was initially a slight brownish color, and became cloudy after 10 minutes of cleaning.

Other Observations:

The amount used during this testing was higher than the heated immersion test. This may have contributed to the decrease in performance for some of the cleaners. The table below shows the increase of J2 between the two tests. Considering many of the cleaners worked between 85%-99% with heated ultrasonics, it would make sense to still move forward with these alternatives to test on the parts provided by the client.

	Initial wt. (g) of contaminant	
Product	Heated Immersion	Heated Ultrasonics
Downanol PnBGE	0.2660	0.8042
	0.2716	1.1057
	0.2971	0.8855
Metalnox 6386	0.4257	0.8975
	0.3608	0.7417
	0.3755	0.7898
Dimethyl glutarate	0.4796	0.8755
	0.2905	0.7959
	0.2362	0.6964
Liquinox 1%	0.5055	0.8485
	0.4376	0.6975
	0.3164	0.7780
Ozzy Juice 3	0.3677	0.9661
	0.3562	1.0291
	0.3015	1.1189

Summary:

Substrates:	Titanium				
Contaminants:	Oil				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Dow Chemical Company	Dowanol PnBGE	100%	99.87	☑	
Kyzen Corporation	Metalnox M6386	100%	99.53	☑	
Fisher Scientific	Dimethyl glutarate (CAS: 1119-40-0)	100%	97.80	☑	
Alconox Inc	Liquinox	1%	87.27	☑	
Chem Free Corporation	SW-3 Ozzy Juice (Improved Low Odor)	100%	85.58	☑	

Conclusion:

Dowanol PnBGE, Metalnox 6386, and Dimethyl glutarate were the most effective at removing J2 soil from bead blasted titanium substrates using heated ultrasonics.