

# CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2002  
 DateRun: 01/24/2002  
 Experimenters: Jason Marshall  
 ClientType: Electromagnetic Manufacturer  
 ProjectNumber: Project #2  
 Substrates: Sterling/Silver  
 PartType: Part  
 Contaminants: Greases, Lubricating/Lapping Oils  
 Cleaning Methods: Ultrasonics  
 Analytical Methods: Goniometry, Gravimetric  
 Purpose: To evaluate cleaners with supplied parts.

**Experimental Procedure:** Four of the top eight cleaners from previous trial were selected for testing. Each was diluted to 5% using DI water in 600 ml beakers. Water was used as a control. The solutions were heated to 140 F in a Crest 25 kHz ultrasonic tank. Five, 2.5 inch pieces of silver tape were cut from the supplied materials. Each were weighed to establish a baseline weight. The pieces were then washed in a dish washing soap for 20 seconds to remove any residue oils or dust. The pieces were reweighed to determine if parts were clean. For pieces that had significant weight change, a second washing was performed.

Once weights were constant, the parts were then submitted to contact angle goniometry. A 2 micro-liter drop of DI water was placed on the silver surface. The image of the bubble on the surface was then captured by computer software. The angle of the interface between the bubble and the silver tape was measured.

After recording the baselines for gravimetric and goniometry, the five pieces of tape were thinly coated with Richard Apex D644 CPD drawing compound. The contaminant was applied with a hand held swab and then wiped with a second clean swab to simulate the drawing process. Contaminated weights and contact angles were measured and recorded. Each piece of tape was cleaned in a solution for two 1 second intervals and rinsed in a ultrasonic tap water bath for 1 second. Parts were dried for 10 second using a heat gun at 500 F. Final weights and contact angles were measured.

**Results:** The weights of the parts, with and without contamination, were not conclusive enough to be used as a way to measure the cleanliness of the tape. There was not enough of an establish difference between initial and dirty weights. The weights are listed in the table below. Contact angle goniometry was more successful in determining the cleanliness of the silver tape. The angles were found to decrease when the tape was coated with the drawing compound. After cleaning, the contact angle returned to the initial angle. Only one product did not result in an angle equal to (or greater than) the initial contact measurement. Even though the water cleaned tape had an angle close to the initial measurement, the tape still looked like it had drawing compound on it. The angles are also listed in the table below. Images of the bubble/tape interface have also been sent.

Table 1. Gravimetric and Contact Angle Measurements

Cleaner	Part Description	Analysis Method	Initial	Dirty	Clean
Exp 100	Long	Gravimetric	0.6862	0.6871	0.6861
		Contact Angle	61	59	72
Beyond 2005	Bent End	Gravimetric	0.7179	0.7183	0.7178
		Contact Angle	72	48	73
Crystal Simple	Short	Gravimetric	0.5573	0.5578	0.5578
		Contact Angle	72	48	73
Inproclean	Tape	Gravimetric	0.6636	0.6673	0.6624
		Contact Angle	68	49	76
Water	Right Bend	Gravimetric	0.6491	0.6502	0.6503
		Contact Angle	72	37	25

Summary:

<b>Substrates:</b>	Sterling/Silver
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<b>Contaminants:</b>		Greases, Lubricating/Lapping Oils			
<b>Company Name:</b>	<b>Product Name:</b>	<b>Conc.:</b>	<b>Efficiency:</b>	<b>Effective:</b>	<b>Observations:</b>
Brulin Corporation	Aquavantage 1400	5		<input checked="" type="checkbox"/>	
Today & Beyond	Beyond 2005	5		<input type="checkbox"/>	
Simple Green	Crystal Simple Green Industrial Cleaner & Degreaser	5		<input checked="" type="checkbox"/>	
Oakite Products	Inproclean 3800	5		<input checked="" type="checkbox"/>	
Water	Water	100		<input type="checkbox"/>	Visibly looked dirty

Conclusion:

An additional trial will be conducted using the top three cleaners. Operating conditions will remain the same. An attempt to use OSEE for an analysis tool.