CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2019
DateRun:	07/01/2019
Experimenters:	Sabrina Apel, Phillip Demers, Julie Nguyen
ClientType:	Electroplating Company
ProjectNumber:	Project #1
Substrates:	Copper
PartType:	Coupon
Contaminants:	Oil
Cleaning Methods:	Immersion/Soak
Analytical Methods:	Gravimetric, Visual, Wipe
Purpose:	To evaluate the effectiveness of six cleaning products for removing Mystery Oil and Rustlick 50/50 from copper coupons.
Experimental Procedure:	Eighteen aluminum coupons, three for each cleaner and soil, were weighed before soiling halfway on one side using a hand-held swab. Dirty weights were recorded before placing three coupons at a time into a 250 mL beaker with a diluted cleaning solution. Coupons were immersed completely for 15 minutes with written observations being made every five minutes. A rinse step was added with heated water for five minutes before drying with an air gun for five minutes. A white glove test was performed using a clean swab to look for residue and final weights were taken.
Results:	1 Aquavantage 1400, 2 Emerald HD2, 3 Mirro 90, 4 Alconox, 5 Liquinox, 6 Immersion Cleaner

Cleaner	Contaminant	Initial wt. of cont.	Final wt. cont.	% Cont. Removed	Average
1	Mystery Oil	0.0574	0.0203	64.63	88.21
		0.0997	0.0000	100.00	
		0.1299	0.0000	100.00	
	Rustlick 50/50	0.2147	0.0137	93.62	93.94
		0.2042	0.0123	93.98	
		0.2534	0.0146	94.24	
2	Mystery Oil	0.1158	0.0010	99.14	99.14
		0.1328	0.0005	99.62	
		0.1356	0.0018	98.68	
	Rustlick 50/50	0.2543	0.0172	93.24	93.85
		0.2886	0.0174	93.97	
		0.2349	0.0133	94.34	
3	Mystery Oil	0.1414	0.0016	98.87	97.69
		0.0988	0.0004	99.59	
		0.1276	0.0069	94.59	
	Rustlick 50/50	0.2532	0.0122	95.18	94.75
		0.2762	0.0148	94.64	
		0.2729	0.0152	94.43	
4	Mystery Oil	0.0870	0.0096	88.96	89.60
		0.1091	0.0079	92.76	
		0.1678	0.0217	87.07	
	Rustlick 50/50	0.0808	0.0038	95.30	93.69
		0.0770	0.0073	90.52	
		0.0800	0.0038	95.25	
5	Mystery Oil	0.0890	0.0017	98.09	96.85
		0.1012	0.0061	93.97	
		0.0858	0.0013	98.48	
	Rustlick 50/50	0.0888	0.0092	89.64	87.04
		0.1495	0.0202	86.49	
		0.0940	0.0141	85.00	
6	Mystery Oil	0.1162	0.0013	98.88	91.91
		0.0493	0.0102	79.31	

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		0.1140	0.0028	97.54	
	Rustlick 50/50	0.2310	0.0402	82.60	85.89
		0.2416	0.0279	88.45	
		0.2444	0.0328	86.58	

Visual Observations for Mystery Oil Coupons:

Cleaner	5 Mins	10 Mins	15 Mins	Rinse
1	- soil immediately turned pale white - soil floating to top of water	- white rim forming at top of water - soil smoothly spread on coupon	- soil seems to all float to the top of the water	- very thin white rim at top of water -thin white film on coupon
2	- soil immediately turned pale white - water turned slightly white	- white rim forming at top of the water - soil smoothly spread on coupon - water slightly turning white	- soil seems to all float to the top of the water	- very light streaks on coupon
3	- soil immediately turned pale white - soil floating off of coupon, to the top of water	- thick white rim at top of water	- soil seems to all float to the top of the water - remaining white layer of soil on coupon	- thin white rim on top coupon
4	- soil immediately turned pale white - soil coming off coupon, floating to top of the water	- thin white rim forming at top of water - water slightly cloudy/ white	- white rim at top of water - visible white streaks along coupon	- water slightly cloudy - white streaks in water
5	- soil immediately turned pale white - water is turning light white	- thick + bubbly white rim at top of water	- soil seems to all float to the top of the water	- very faint white film on coupon
6	- soil turning slight white	- very thin	- think white rim	

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		white rim forming at top of water - visible white streaks along coupon	at top of water - visible white streaks along coupon	- water turning cloudy - white rim at top of water

Visual Observations for Rustlick 50/50 Oil Coupons:

Cleaner	5 Mins	10 Mins	15 Mins	Rinse
1	- streaks of soil visible moving down coupon - soil detached, floating in front of coupon	- opaque blue rim forming at top of water - soil in the middle coupon seems to be removing	- coupon looks cleaner - some soil still visible on coupon	- blue tint in water
2	-little to no soil change - water getting cloudy - opaque blue rim floating at top of water	- seems to be removing only the thin layers of soil, not thicker layer	- coupon looks cleaner - some soil still visible on coupon	- slight visible clouds in water - water is blue - effective but little chunks of soil still remain on coupon
3	- soil slowly moving to bottom of coupon - water getting cloudy - opaque blue rim floating at top of water	- blue rim at top of water getting thicker - increased streaks visible along coupon	- coupon looks cleaner - looks like soil is floating in front of coupon	- very thin rim forming at top - slight clouds in water - looks effective - water is blue at top (not bottom)
4	- immediate change in soil color (lighter) - streaks visible on coupon - water getting slightly cloudy	- increased streaks of soil floating along the coupon	- blue rim forming on top of water	- soil still remaining on coupon
5				- some soil still

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	- immediate change in soil color (lighter) - water getting cloudy - streaks visible on coupon	- blue rim forming at top of the water - increased streaks of soil floating in water	- water getting cloudy	remaining on coupon
6	- soil breaking into chunks - soil chunks are floating	- blue rim forming at the top of water	- water got cloudy - chunks of soil floating in water	- thin layer of soil still on coupon

Summary:

Substrates:	Copper				
Contaminants:	Oil				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Brulin Corporation	Aquavantage 1400	5%	91.08	☑	
Hubbard Hall Inc	Emerald HD2	15%	96.50	☑	
International Products Corporation	Micro 90 Conc.	2%	96.22	☑	
Alconox Inc	Alconox	1%	91.65	☑	
Alconox Inc	Liquinox	1%	91.95	☑	
Buckeye International	Immersion Cleaner	20%	88.89	☑	

Conclusion: All six cleaners were effective at removing Rustlick 50/50 and Mystery Oil from copper coupons.