CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2019
DateRun:	07/18/2019
Experimenters:	Nicole Kebler, Julie Nguyen
ClientType:	Electroplating Company
ProjectNumber:	Project #1
Substrates:	Copper
PartType:	Coupon
Contaminants:	Lubricating/Lapping Oils, Oil
Cleaning Methods:	Immersion/Soak
Analytical Methods:	Gravimetric, Visual
Purpose:	To evaluate six cleaning products for Mystery Oil (Soluble Oil #35) and Rustlick 50/50 removal from copper coupons.
Experimental Procedure:	Six pre-weighed copper coupons, three for each contaminant, was used for each cleaner. The coupons were soiled halfway on one side using a hand-held swab before dirty weights were recorded. Dilutions and temperature for each cleaner was based on vendor recommendations. Coupons of the same contaminant were immersed completely for 15 minutes, and visual observations were recorded every five minutes. Cleaned coupons were rinsed in heated (95° F) tap water for five minutes, air dried for five minutes with a heat gun, and then final weights were recorded.

Results:

Cleaner	Soil	Initial wt. of cont.	Final wt. cont.	% Cont. Removed	Average	Overall Average
1	Mystery Oil	0.1195	0.0008	99.33	98.24	92.34
		0.1480	0.0057	96.15		
		0.1476	0.0011	99.25		
	Rustlick 50/50	0.1407	0.0199	85.86	86.43	
		0.2062	0.0253	87.73		
		0.1359	0.0194	85.72		
2	Mystery Oil	0.1403	0.0073	94780	95.50	88.43
		0.1501	0.0065	95.67		
		0.1558	0.0062	96.02		
	Rustlick 50/50	0.2060	0.0290	85.92	81.37	
		0.1576	0.0323	79.50		
		0.1665	0.0355	78.68		
3	Mystery Oil	0.1395	0.0072	94.84	96.22	90.19
		0.1227	0.0040	96.74		
		0.0992	0.0029	97.08		
	Rustlick 50/50	0.1946	0.0322	83.45	84.16	
		0.2079	0.0363	82.54		
		0.1865	0.0252	86.49		
4	Mystery Oil	0.1094	0.0015	98.63	96.26	90.54
		0.1263	0.0019	98.50		
		0.1581	0.0132	91.65		
	Rustlick 50/50	0.2087	0.0315	84.91	84.81	
		0.1429	0.0250	82.50		
		0.1711	0.0222	87.02		
5	Mystery Oil	0.1375	0.0017	98.76	99.33	89.52
		0.2621	0.0007	99.73		
		0.1214	0.0006	99.50		
	Rustlick 50/50	0.2060	0.0520	74.76	79.71	
		0.2771	0.0574	79.29		
		0.1959	0.0292	85.09		
6	Mystery Oil	0.0899	0.0071	92.10	94.03	91.01

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		0.0988	0.0043	95.65		
		0.0656	0.0037	94.36		
	Rustlick 50/50	0.3382	0.0307	90.92	87.97	
		0.2095	0.0310	85.20		
		0.2229	0.0272	87.80		

Visual Observations

Contaminant: Mystery Oil

Cleaner	5 Mins	10 Mins	15 Mins	Rinse
1	- soil immediately turned pale white - thin white rim at top of water - water turned opaque white	- cloudy dilution - rim at top getting thicker	- cloudy dilution - thick white rim at top of water	- thin white rim - coupon looks clean
2	- soil immediately turned pale white - thin white rim at top of water	- white streaks visible in dilution	- clear solution - think white rim	- visible white streaks in dilution - coupon looks clean
3	- soil immediately turned pale white - thin white rim at top of water - water turned cloudy	- cloudy white rim - soil floating in water	- thick white rim at top of water	- very faint white streaks on coupon - coupon looks clean
4	- soil immediately turned pale white - white rim forming at top of water - water turned cloudy	- cloudy white rim - soil floating in water	- thick white rim at top of water	- very faint white film on coupon - coupon looks clean
5	- soil immediately turned pale white - white rim forming at top of water - water turned cloudy	- cloudy white rim - soil floating in water	- thick white rim at top of water	- very thin white rim - coupon looks clean
6	- soil immediately	- white rim at	- faint white	- very faint

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	turned pale white - soil moving to top of water	top of water - thin white film on coupon	streaks in water	white film visible in water - coupon looks clean

Contaminant: Rustlick 50/50

Cleaner	5 Mins	10 Mins	15 Mins	Rinse
1	- cloudy white dilution - thin blue rim at top of water - no odor	- less cloudy - soil coming off coupon - layer of soil at top of water	- thick rim at top of water - no longer cloudy - clear with soil removed	- soil residue remaining - blue streaks
2	- immediate thin white swirls on surface - clear liquid - soil moving (white swirls)	- soil still moving - soil is coming off coupon	- water is opaque - no longer moving - soil looks to be removed	- soil still on coupon - blue residue remaining
3	- immediate change in soil color (bright blue to pale blue) - blue streaks in visible	- blue rim forming at top of water	- soil still visible on coupon	- small blue chunks visible - blue streaks - some soil remaining
4	- immediate change in soil color (bright blue to pale blue) - very thin blue rim at top of water	- dilution getting cloudy - blue rim getting thicker	- blue streaks - cloudy dilution	- light blue streaks - soil still visible on coupon
5	- immediate change in soil color (bright blue to pale blue) - very thin blue rim at top of water	- lots of blue streaks visible along coupon - blue rim getting thicker	- increased blue streaks	- blue streaks still visible - soil still remaining on coupon

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6	- small speckles came off coupon - change in soil color (bright blue to pale blue) - blue streaks	- line of soil on surfaces of water - blue streaks	- soil clumping on coupon - increased blue streaks - blue rim at top of water	- water turned light blue - tiny chunks visible floating - light blue streaks

Summary:

Substrates:	Copper
Contaminants:	Lubricating/Lapping Oils, Oil

Company Name:	Product Name:	Conc.:	Efficiency:	Effective:	Observations:
Brulin Corporation	Aquavantage 1400	5%	92.34	☑	
Hubbard Hall Inc	Emerald HD2	15%	88.43	☑	
International Products Corporation	Micro 90 Conc.	2%	90.19	☑	
Alconox Inc	Alconox	1%	90.54	☑	
Alconox Inc	Liquinox	1%	89.52	☑	
Buckeye International	Immersion Cleaner	20%	91.01	☑	

Conclusion:

All six cleaners were effective at removing the Mystery Oil from copper coupons. Next step would be to add agitation to the heated immersion using a stir bar to evaluate if it improves removal of Rustlick 50/50 from copper coupons.