CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2017
DateRun:	03/21/2019
Experimenters:	Alicia McCarthy, Sabrina Apel, Phillip Demers, Ted Kearney
ClientType:	
ProjectNumber:	Project #1
Substrates:	Copper
PartType:	Part
Contaminants:	Oil
Cleaning Methods:	Ultrasonics
Analytical Methods:	Visual
Purpose:	To identify potential alternatives for isopropanol (IPA) to remove oil from copper eyelets.
Experimental Procedure:	Eight pre-contaminated lot bags filled with 50,000 copper eyelet parts, one bag per cleaner, were sent to the lab. In an ultrasonic tank, 50,000 parts were cleaned for 30 minutes. Based on vendor recommendations, cleaners were either cleaned at room temperature (68F) or at 130 F. Cleaners were diluted to the lower percentage range of vendor recommendations or were ready to use. After parts were cleaned, aqueous cleaners were rinsed with tap water and dried for two minutes using a heat blower. After drying, the parts were placed in a clean lot bag; this process was repeated for all eight bags. The parts were sent to the plater for visual observations, and a cleanliness matrix was provided to rate the level of cleanliness and cleaner residue.

Cleanliness Rating Scores

Score	Description
1	Completely clean and contaminant not visible
2	Mostly clean, but a tiny bit of contaminant visible
3	Somewhat clean, but a decent amount of contaminant still visible
4	Not very clean, and a lot of contaminant still visible
5	Completely dirty, and covered in visible contaminant

Cleaner Residue Scores

Score	Description
1	No residue from the cleaner
2	Barely any residue from the cleaner
3	Some amount of visible cleaner residue
4	A lot of cleaner residue left on the part
5	Completely covered in cleaner residue that is visible

Products

Chemical #	Manufacturer	Product Name	Temperature	Dilution
1	United Labs, Inc.	United 605 Smart Solv	130 F	Ready to Use
2	Hubbard Hall	Aquaease PL72A32	130 F	10%
3	Polychem	A2000	130 F	10%
4	QualiChem	METKleen 113	130 F	6%
5	International Products Corporation	Surface Cleanse 930	130 F	5%
6				

CLEANING LABORATORY EVALUATION SUMMARY

	Solvent Kleene	D-Greeze 500 Lo	68 F (Room Temp)	Ready to Use
7	Biochem Systems	Solsafe 245	68 F (Room Temp)	Ready to Use
8	Polychem	A2000B	130 F	10%

Soils: Stamping lubricant 985140-2 (64742-45-9, 5131-66-8, 63231-80-7, 80402-47-5, 68424-40-8)

Hamidraw 1945-700 (64742-52-5, 63449-39-8)

Results:

After testing and sitting in a closed bag for three days, Cleaner 3 lot was completely corroded and removed from evaluation. No corrosion was visible right after testing.

Cleanliness Rating Matrix								
Cleaner #	1	2	3	4	5	6	7	8
Cleanliness Rating	2.2	2.4	-	3.2	1.6	1.8	2.6	4
Cleaner Residue Rating	5	3.6	-	3.2	5	2.8	1.4	2
Average	3.6	3	-	3.2	3.3	2.3	2	3
Effective (Y/N)	N	N	-	N	N	Y	Y	N
AEP Post Plate Peeling Evaluation (Out of 20)	0	2	-	1	4	0	2	0
TE Post Plate Evaluation	5	0	-	144	2000	0	0	0

Cleaners #6 (D Greeze 500 Lo) and #7 (SolSafe 425) were the most effective at removing the contaminant from the copper eyelets and had barely any chemical residue on the parts. These two cleaners were considered effective by the platers, and there was limited to no plate peeling. Cleaner #5 (Surface Cleanse 930) could be considered a potential alternative if a rinsing method was developed to remove the chemical residue, however, further testing would need to be conducted.

The two most effective cleaners, D Greeze 500 Lo and SolSafe 245, were evaluated using TURI's Pollution Prevention Options Analysis System (P2OASys) to compare the current solvent (IPA) with the possible substitutes for environmental health and safety.

Categories	D Greeze 500 Lo	Solsafe 245	Isopropanol
Acute Human Effects	7	8	7
Chronic Human Effects	4	2	4
Ecological Hazards	4	6	2
Environmental Fate & Transport	5	5	5
Atmospheric Hazard	2	2	2
Physical Properties	8	9	10
Process Factors	5	5	4
Life Cycle Factors	6	6	6
Product Score	5.1	5.4	5

D Greeze 500 has moderately high respiratory irritation and inhalation toxicity. Solsafe 245 is extremely toxic when orally exposed, and it has a moderately high acute aquatic toxicity. The VOC levels are what drive the high hazard for the two alternatives, however, they are much lower than IPA (*See Appendix A for the highlighted hazards of concern for each alternative).*

VOC/ Vapor Pressure Levels

Solvent	VOC Level (g/l)	Vapor Pressure (mmHg @ 20C)	Classification
Isopropanol	790	43	Alcohol
D Greeze 500 LO	450	0.5	Organic Solvent
Solsafe 245	300	<1	

CLEANING LABORATORY EVALUATION SUMMARY

			Petroleum Distillate

Summary:

Substrates:	Copper
Contaminants:	Oil

Company Name:	Product Name:	Conc.:	Efficiency:	Effective:	Observations:
United Laboratories International	Smart Solve 605	100	0.00	☐	
Hubbard Hall Inc	Aquaease PL 732	10	0.00	☐	
US Polychem Corporation	Polychem A 2000	10	0.00	☐	
QualiChem	METKleen 113	6	0.00	☐	
International Products Corporation	Surface Cleanse Concentrated Neutral 930	5	0.00	☐	
Transene Company, Inc.	D Greeze 500 LO	100	0.00	☑	
Bio Chem Systems	Solsafe 245	100	0.00	☑	
US Polychem Corporation	Polychem A 2000 B	10	0.00	☐	

Conclusion:

D Greeze 500 Lo and SolSafe 245 are effective alternatives for isopropanol. Surface Cleanse 930 could be another potential alternative if an effective rinsing method was established.