CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	1995
DateRun:	06/07/1995
Experimenters:	Donald Garlotta, Jay Jankauskas
ClientType:	Plating Job Shop
ProjectNumber:	Project #1
Substrates:	Aluminum, Brass, Copper, Steel
PartType:	Coupon
Contaminants:	Waxes
Cleaning Methods:	Mechanical Agitation
Analytical Methods:	Gravimetric
Purpose:	Testing of four cleaners for Plating Job Shop

Experimental Procedure:

The purpose of this trial is to find a cleaner that would be suitable for the needs of Plating Job Shop. A lift test was performed first. Melted Wax was poured in an Aluminum weighing dish. A heat gun was aimed at the Aluminum dish so that the wax would not solidify. Four different cleaners were tested against the Grace Daraclean 294xx (the best performing cleaner tested to date). These cleaners were Oakite Inproclean #3800, Oakite Inproclean #4000T, International Products Corp. Micro and Chem-Tech International Inc. CT-1 multipurpose cleaner. One drop of concentrated solution of each cleaner was placed in the dish of melted wax and the wax dispersion was noted. All of the cleaners except the International Products Corp. Micro compared well to the Grace Daraclean 294xx. Thus the Micro was not further evaluated.
The three cleaners that performed well in the lift test were then used in a cleaning trial similar to previous for Plating Job Shop. Four coupons were cleaned in each cleaner (one of each substrate). For each cleaner the coupons were cleaned in two separate beakers. Beaker #1 contained the Aluminum and Copper coupons while Beaker #2 contained the Brass and Steel coupons.
The coupons were weighed before and after contamination. The cleaning was performed in an air sparged beaker for 20 minutes at 150 F. The coupons were then rinsed for 5 minutes at 150 F in a tap water bath aggitated with air sparging. Drying was performed by running the coupons through air knives for two minutes and then placing the coupons in a convection ovenfor 90 minutes at 120 F. The coupons were cooled down overnight and weighed the next morning.

Results:

The Oakite Inproclean 4000T did an exceptional job of cleaning each substrate. There was no signs of etching, in fact the Inproclean 4000T removed all of the oxide that was previously on the copper coupon. The Aluminum coupon showed a large amount of wax spotted on one side but the other side of the coupon was very clean. This spotting is most likely the result of dragout. The most negative aspect of the Daraclean 294xx is after the trial, when the solution cooled down, the cleaner started to partially solidify. This would propose a great problem with bath life and reusability of the cleaner.

The Oakite Inproclean #3800 performed excellent on all substrates except for the copper. A thin film of wax was left on the copper coupon. This could be resolved with either a higher temperature or higher agitation. There was no etching on any substrate. The wax readily separated from the cleaning solution making it very easy to remove upon cooling. The one problem that was encountered was the foaming of the Inproclean #3800.

Although performing well in removing the wax, the Aluminum coupons were etched pretty bad by the CT-1. There was also the problem of a large amount of foam generated by the air sparging. A reduction in the cleaner concentration would probably solve both problems but the vendor claims 20% is the greatest efficiency for the cleaner.

EXPERIMENTAL DATA LOG

GRAVIMENTRIC ANALYSIS

sample # and substrate	clean mass (g)	mass with contamination (g)	mass after cleaning (g)	contaminant removed (g)	Percent Removal
#21 Al	20.9934	22.7973	20.9977	1.7996	99.76%
#1758 Cu	35.1760	36.2230	35.1751	1.0479	100.09%
#1803 Br	34.1807	35.2509	34.1826	1.0683	99.82%
#46 Steel	162.9043	164.5036	162.8918	1.6118	100.78%
#11 Al	20.9846	22.1741	20.9840	1.1901	100.05%
#4407 Cu	35.4422	36.5618	35.4547	1.1071	98.88%
#4801 Br	34.4818	35.5275	34.4810	1.0465	100.08%
#55 Steel	156.7471	158.2888	156.7472	1.5416	99.99%
#23 Al	20.9820	23.0850	20.9811	2.1039	100.04%
#2744 Cu	35.2751	36.4564	35.2770	1.1794	99.84%
#3130 Br	34.3138	35.2844	34.3128	0.9716	100.10%

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#49 Steel	151.3639	152.9239	151.3685	1.5554	99.71%

Summary:

Substrates:	Aluminum, Brass, Copper, Steel
Contaminants:	Waxes

Company Name:	Product Name:	Conc.:	Efficiency:	Effective:	Observations:
Oakite Products	Inproclean 3800	10	100.00	☑	
Oakite Products	Inproclean 4000 T	10	99.00	☐	
Chemkleen International Inc.	CT 1 Multipurpose Cleaner	20	98.00	☐	
International Products Corporation	Micro (no longer available)	10	0.00	☐	

Conclusion:

From the three trials performed, it appears that the Oakite Inproclean #3800 is the most effective cleaner for Plating Job Shop's needs. The only concerns are the large amounts of foam that is created by the air sparging and the ineffective cleaning on the copper coupon. Reduction in concentration should be considered as well as chemical defoamers to reduce the foam level.