

CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 1996
 DateRun: 01/18/1996
 Experimenters: Jay Jankauskas
 ClientType: Electronics Manufacturer
 ProjectNumber: Project #1
 Substrates: Electronics
 PartType: Part
 Contaminants: Coatings, Fluxes
 Cleaning Methods: Immersion/Soak
 Analytical Methods: Black light, Visual
 Purpose: To evaluate possible alternatives for humiseal and flux removal

Experimental Procedure: Twelve various circuit boards obtained from a receiver were cut down to a smaller size (approximately 3"x3") and precleaned. The Flux and Humiseal was applied on all boards with a swab. Both contaminants were allowed to set on the parts for six days in a convection oven set at 110 F. Six different chemistries were tested for removal of both the flux and the Humiseal. All chemistries were used at their maximum recommended concentration, and at recommended temperatures. A cleaning time of 15 minutes was used for each cleaner. Rinsing was performed in a tap water rinse tank of 130 F for one minute. The parts were run under air knives for 1 minute and then placed in a convection oven at 140 F for 20 minutes to dry. After drying, the parts were inspected for cleanliness. Black light was used to detect the Humiseal coating, and the flux was detected by simple visual examination.

Results: The six cleaners were rated in 3 categories (flux removal, humiseal removal, environmental health & safety). Ratings were done on a scale of one to six with one being the best tested.

GRAVIMETRIC RESULTS

Cleaning Solution: Tech Spray Inc. Aqueous Defluxer

| sample # | clean mass (g) | mass with contamination (g) | mass after cleaning (g) | contaminant removed (g) | Percent Removal |
|----------|----------------|-----------------------------|-------------------------|-------------------------|-----------------|
| 1 | 34.0402 | 34.4275 | 34.4950 | -0.0675 | -17.43% |
| 2 | 22.5303 | 22.9010 | 22.8220 | 0.079 | 21.31% |
| | | | | Average | 1.94% |

Cleaning Solution: Chemtronics Super Bio-Wash

| sample # | clean mass (g) | mass with contamination (g) | mass after cleaning (g) | contaminant removed (g) | Percent Removal |
|----------|----------------|-----------------------------|-------------------------|-------------------------|-----------------|
| 3 | 18.5089 | 18.9178 | 18.9144 | 0.0034 | 0.83% |
| 4 | 16.7197 | 17.1085 | 17.1187 | -0.0102 | -2.62% |
| | | | | Average | -0.90% |

Cleaning Solution: Valtech Corp. Valtron SP2201

| sample # | clean mass (g) | mass with contamination (g) | mass after cleaning (g) | contaminant removed (g) | Percent Removal |
|----------|----------------|-----------------------------|-------------------------|-------------------------|-----------------|
| 5 | 16.1899 | 16.4580 | 16.4592 | -0.0012 | -0.45% |
| 6 | 25.0008 | 25.2955 | 25.2718 | 0.0237 | 8.04% |
| | | | | Average | 3.80% |

Cleaning Solution: Innovative Organics SC11

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| sample # | clean mass (g) | mass with contamination (g) | mass after cleaning (g) | contaminant removed (g) | Percent Removal |
|----------|----------------|-----------------------------|-------------------------|-------------------------|-----------------|
| 7 | 24.8917 | 25.2485 | 25.1977 | 0.0508 | 14.24% |
| 8 | 21.9369 | 22.0782 | 22.0415 | 0.0367 | 25.97% |
| | | | | Average | 20.11% |

Cleaning Solution: Church & Dwight Armakleene E-2001

| sample # | clean mass (g) | mass with contamination (g) | mass after cleaning (g) | contaminant removed (g) | Percent Removal |
|----------|----------------|-----------------------------|-------------------------|-------------------------|-----------------|
| 9 | 19.7927 | 20.1263 | 20.1480 | 0.0217 | 6.50% |
| 10 | 14.9243 | 15.2423 | 15.2331 | -0.0092 | -2.89% |
| | | | | Average | 1.81% |

Cleaning Solution: WR Grace Daraclean 211

| sample # | clean mass (g) | mass with contamination (g) | mass after cleaning (g) | contaminant removed (g) | Percent Removal |
|----------|----------------|-----------------------------|-------------------------|-------------------------|-----------------|
| 11 | 23.1156 | 23.3780 | 23.3075 | 0.0705 | 26.87% |
| 12 | 14.9087 | 15.0416 | 15.0259 | 0.0157 | 11.81% |
| | | | | Average | 19.34% |

Tech Spray Defluxer-Removed all but a small portion of flux, showed some removal of the Humiseal. Not the friendliest chemical, contains 35-40% Diethylene Glycol Monomethyl ether. Super Bio-Wash-Performed poor in all three categories. Valtech Valtron 2200-Wasn't too effective in removing the flux, didn't even touch the Humiseal. Innovative Organics-A majority of the flux was removed, didn't even touch the Humiseal. Armakleen E-2001-Removed all flux and softened up the Humiseal quite a bit. Very worker friendly chemical. Daraclean 282-Removed all flux and started to lift up the Humiseal. Contains up to 3% Glycol Ethers.

Summary:

| Substrates: | | Electronics | | | |
|-------------------------|-------------------------------|------------------|-------------|-------------------------------------|---------------|
| Contaminants: | | Coatings, Fluxes | | | |
| Company Name: | Product Name: | Conc.: | Efficiency: | Effective: | Observations: |
| Tech Spray Inc | Concentrated Aqueous Defluxer | 6 | | <input type="checkbox"/> | |
| Chemtronics Inc | Super Bio Wash | 20 | | <input type="checkbox"/> | |
| Valtech Corporation | Valtron SP 2200 | 4 | | <input type="checkbox"/> | |
| Innovative Organics Inc | Amberclean SC 11 | 5 | | <input type="checkbox"/> | |
| Church & Dwight Co Inc. | Armakleen E 2001 | 10 | | <input checked="" type="checkbox"/> | |
| Magnaflux | Daraclean 282 | 15 | | <input checked="" type="checkbox"/> | |

Conclusion:

The Ersin RMA flux should not be a problem to remove with most aqueous defluxers. Out of the chemistries tested, the Armakleen E-2001 and the Daraclean 282 performed the best and should be considered by Radar Technology, Inc.
The Humiseal coating will be very tough to remove. We are currently ordering chemicals that will hopefully remove the Humiseal. Products are expected from Terpene Technologies, Finger Lakes Chemical and Ecolink in a few weeks.