

# CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 1996  
 DateRun: 01/02/1996  
 Experimenters: Jay Jankauskas  
 ClientType: Electronics Manufacturer  
 ProjectNumber: Project #1  
 Substrates: Plastic, Electronics  
 PartType: Coupon  
 Contaminants: Coatings, Fluxes  
 Cleaning Methods: Immersion/Soak  
 Analytical Methods: Black light, Gravimetric, Visual  
 Purpose: Identify cleaners to remove flux and Humiseal

Experimental Procedure: Twelve various circuit boards obtained from a receiver were cut down to a smaller size (approximately 3"x 3") and precleaned. Each part was weighed after precleaning and then contaminated with Humiseal 1B31 and Ersin 5381 RMA Flux. Both contaminants were allowed to set on the parts for six days in a convection oven set at 110 F. The parts were then weighed before cleaning. 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.  
 SUBSTRATE MATERIAL: Circuit Boards  
 CONTAMINANTS: Humiseal 1B31& Ersin 5381 RMA Flux  
 CONTAMINATING PROCESS USED: Flux and coating applied on with a brush and allowed to set for 6 days. 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 weighed again to get a percent removal of contaminants and inspected under a black light to see how much residual contaminant was present.

Results: Gravimetric results were all screwed up so the results will not be judged on them. Two chemistries seemed to show potential. Tech Spray Defluxer and WR Grace Daraclean 282. The Daraclean 282 removed all flux. The humiseal was not removed, but started to peel off after 15 minutes. After drying the humiseal was quite tacky on both of the circuit boards. The Tech Spray has a dissolving action on the Humiseal which I feel will end up in better cleaning than a lifting action. A slight bit of flux remained on the Tech Spray boards. The Chemtronics, Valtron, Armakleen 2001 and Innovative Organics cleaners were all ineffective in removing both contaminants and will not be tested further.

## 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%          |

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|   |         |         |         |         |       |
|---|---------|---------|---------|---------|-------|
| 6 | 25.0008 | 25.2955 | 25.2718 | 0.0237  | 8.04% |
|   |         |         |         | Average | 3.80% |

Cleaning Solution: Innovative Organics SC11

| 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%          |

Summary:

| <b>Substrates:</b>      | Plastic, Electronics          |        |             |                          |               |
|-------------------------|-------------------------------|--------|-------------|--------------------------|---------------|
| <b>Contaminants:</b>    | 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 2201               | 4      |             | <input type="checkbox"/> |               |
| Innovative Organics Inc | Amberclean SC 11              | 5      |             | <input type="checkbox"/> |               |
| Church & Dwight Co Inc. | Armakleen E 2002              | 10     |             | <input type="checkbox"/> |               |
| Magnaflux               | Daraclean 282 GF              | 15     |             | <input type="checkbox"/> |               |

Conclusion:

Cleaning time will have to be increased. Temperature should be kept as high as possible without damaging parts (maximum temp of 150-160 F). If longer cleaning times are not effective, new chemistries will have to be scoped out. Possible chemicals to be ordered:  
 Finger Lakes Company-Semi-Aqueous Electrical Cleaner  
 ADF Systems Ltd-Nutraclean 9 aqueous cleaner  
 Chem-Tech International-CT-24 Flux Remover  
 EnviroSense Inc.-Envirogold Aqueous Cleaner  
 Rochester Midland Corp.-Alpha Excel  
 Terpene Tech.-Tarksol Semi Aqueous Terpene  
 Today & Beyond- Beyond 2003  
 London Chemical Co.-Longoterge