

# CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2004  
 DateRun: 03/08/2004  
 Experimenters: Jason Marshall  
 ClientType: Manufacturer of Ceramic Capacitors  
 ProjectNumber: Project #1  
 Substrates: Ceramics  
 PartType: Coupon  
 Contaminants: Inks  
 Cleaning Methods: Immersion/Soak  
 Analytical Methods: Gravimetric

Purpose: To evaluate past cleaners on next supplied contaminant

Experimental Procedure: Seven cleaners were selected from the laboratories database of past testing based on supplied data from client. Four aqueous based cleaners were diluted to 10% using DI water in 250 ml beakers. Three semi-aqueous products were used at full strength also in 250 ml beakers. An eighth product was added as the client's current cleaner and diluted to 10%. All eight products were heated to 130 F on a hot plate. Twenty-four preweighed ceramic coupons were coated with client supplied dye, Sherwin Incorporated Dabl-Ckek Penetrant DB-51 (68131-40-8). The dye was applied directly to the coupon surface using a swab and then weighed a second time. Three coupons were cleaned in each solution for 5 minutes using stir-bar agitation. Coupons were rinsed in tap water for 15 seconds at 120 F, followed by air blow off at room temperature for 30 seconds. Once dry, coupons were weighed a final time and efficiencies for each cleaner were calculated.

Results: All eight products removed over 80% of the red dye from the ceramic coupons within five minutes of immersion cleaning. Half of the products still little to no visible amounts of the dye. Of these four products, DBE 6 performed the best, followed by Ink Zapper, SC Aircraft & Metal cleaner and Metabolix E3HB. The table lists the amount of dye initially added, the amount remaining after cleaning and the efficiency for each coupon cleaned.

| Cleaner         | Initial wt | Final wt | % Removed |
|-----------------|------------|----------|-----------|
| Liquinox        | 0.0265     | 0.0052   | 80.38     |
|                 | 0.0160     | 0.0040   | 75.00     |
|                 | 0.0293     | 0.0032   | 89.08     |
| SC Aircraft     | 0.0117     | 0.0013   | 88.89     |
|                 | 0.0254     | 0.0023   | 90.94     |
|                 | 0.0283     | 0.0013   | 95.41     |
| Micro 90        | 0.0254     | 0.0031   | 87.80     |
|                 | 0.0182     | 0.0032   | 82.42     |
|                 | 0.0174     | 0.0025   | 85.63     |
| Metalnox 6314   | 0.0315     | 0.0041   | 86.98     |
|                 | 0.0204     | 0.0027   | 86.76     |
|                 | 0.0215     | 0.0063   | 70.70     |
| E3HB            | 0.0373     | 0.0010   | 97.32     |
|                 | 0.0140     | 0.0014   | 90.00     |
|                 | 0.0114     | 0.0020   | 82.46     |
| Inproclean 3800 | 0.0212     | 0.0030   | 85.85     |
|                 | 0.0277     | 0.0048   | 82.67     |
|                 | 0.0256     | 0.0043   | 83.20     |
| Ink Zapper      | 0.0164     | 0.0019   | 88.41     |
|                 | 0.0106     | 0.0002   | 98.11     |
|                 | 0.0224     | 0.0014   | 93.75     |
| DBE 6           | 0.0171     | 0.0007   | 95.91     |
|                 | 0.0361     | 0.0002   | 99.45     |
|                 | 0.0126     | 0.0005   | 96.03     |

Summary:

|                      |                      |               |                    |                   |                      |  |
|----------------------|----------------------|---------------|--------------------|-------------------|----------------------|--|
| <b>Substrates:</b>   | Ceramics             |               |                    |                   |                      |  |
| <b>Contaminants:</b> | Inks                 |               |                    |                   |                      |  |
| <b>Company Name:</b> | <b>Product Name:</b> | <b>Conc.:</b> | <b>Efficiency:</b> | <b>Effective:</b> | <b>Observations:</b> |  |

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|                                       |  |     |       |                                     |  |
|---------------------------------------|--|-----|-------|-------------------------------------|--|
| Alconox Inc                           | Liquinox   | 10  | 81.49 | <input type="checkbox"/>            |  |
| Gemtek Products                       | SC Aircraft & Metal Cleaner<br>Super Concentrate | 10  | 91.75 | <input checked="" type="checkbox"/> |  |
| International Products<br>Corporation | Micro 90 Conc.                                   | 10  | 85.28 | <input checked="" type="checkbox"/> |  |
| Kyzen Corporation                     | Metalnox M6314 (For<br>Comparison Only)          | 10  | 81.48 | <input type="checkbox"/>            |  |
| Metabolix Inc                         | Metabolix E3HB                                   | 100 | 89.93 | <input checked="" type="checkbox"/> |  |
| Oakite Products                       | Inproclean 3800                                  | 10  | 83.91 | <input type="checkbox"/>            |  |
| Vertec BioSolvents                    | Ink Zapper                                       | 100 | 93.43 | <input checked="" type="checkbox"/> |  |
| Invista S.a.r.l                       | Flexisolv DBE 6 ester                            | 100 | 97.13 | <input checked="" type="checkbox"/> |  |

Conclusion: The five successful products will be retested using ultrasonic energy.