

CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2004
 DateRun: 02/23/2004
 Experimenters: Jason Marshall
 ClientType: Manufacturer of Ceramic Capacitors
 ProjectNumber: Project #1
 Substrates: Ceramics
 PartType: Coupon
 Contaminants: Paints
 Cleaning Methods: Ultrasonics
 Analytical Methods: Gravimetric

Purpose: To evaluate partially successful products with ultrasonic cleaning

Experimental Procedure: The two products from the previous trial were heated to 110 F on a hot plate. Six preweighed ceramic coupons were coated with client supplied lacquer, Microshield Stop Off (78-93-3, 108-88-3, 109-99-9, 75-56-9, 842-07-9). The contaminant was applied directly to the coupon surface using a swab. The coupons were allowed to dry at room temperature before weighing a second time. Three coupons were cleaned in each solution for 10 minute intervals, up to 30 minutes, using a Branson 3510 ultrasonic tank. Beakers were suspended in the tank filled with water and degassed for 5 minutes. Coupons were rinsed in tap water for 15 seconds at 120 F, followed by air blow off at room temperature. Once dry, coupons were weighed a final time and efficiencies for each cleaner were calculated.

Results: Both products were successful in removing over 94% of the Stop Off within 10 minutes. The Ink Zapper had a small amount of residue remaining after rinsing. The Metabolix product had no residue after rinsing. The table lists the amount of Stop Off that was added, how much remained after cleaning and the efficiency for each coupon.

| Cleaner | Initial wt | Final wt | % Removed |
|------------------------|------------|----------|-----------|
| E3HB Ultrasonics | 0.0435 | 0.0006 | 98.62 |
| | 0.0483 | 0.0000 | 100.00 |
| | 0.0932 | -0.0002 | 100.21 |
| Ink Zapper Ultrasonics | 0.0647 | 0.0033 | 94.90 |
| | 0.0536 | 0.0036 | 93.28 |
| | 0.0917 | 0.0042 | 95.42 |

Summary:

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|----------------------|----------------------|---------------|--------------------|-------------------------------------|----------------------|
| Substrates: | Ceramics | | | | |
| Contaminants: | Paints | | | | |
| Company Name: | Product Name: | Conc.: | Efficiency: | Effective: | Observations: |
| Metabolix Inc | Metabolix E3HB | 100 | 99.61 | <input checked="" type="checkbox"/> | |
| Vertec BioSolvents | Ink Zapper | 100 | 94.53 | <input checked="" type="checkbox"/> | |

Conclusion: Both products were successful with the addition of ultrasonic energy.