

CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2008

DateRun: 10/09/2008

Experimenters: Jason Marshall, Junhee Cho

ClientType: Electronics Manufacturer

ProjectNumber: Project #1

Substrates: Aluminum

PartType: Coupon

Contaminants: Oil

Cleaning Methods: Immersion/Soak

Analytical Methods: Gravimetric

Purpose: To evaluate top six products on third supplied contaminant using immersion cleaning.

Experimental Procedure: The top six products based on past testing results were again diluted to 5% using DI water in 400 ml beakers. All six products were heated to 130 F on a hot plate. Peweighed aluminum coupons were coated with the Hagsterfer's Crystal Brite EDM oil using a handheld swab. The contaminant was allowed to dry for about 10 minutes. Once dry, the coupons were weighed a second time to determine the amount of oil applied.

Three coupons were immersed into each solution and cleaned for 5 minutes using stir-bar agitation. Rinsing was performed for 15 seconds using tap water heated to 120 F and followed by 30 seconds of air blow off with dry compressed air at room temperature. Final weights were recorded, and efficiencies were calculated for each coupon cleaned.

Results: All six products were effective at removing the EDM oil from the aluminum coupons within 5 minutes of immersion cleaning. Five of the six removed over 99% of the EDM fluid. The sixth removed over 97%. The table lists the amount of soil added, the amount remaining and the efficiency for each coupon cleaned.

| Cleaner | Initial wt | Final wt | % Removed |
|-----------------------------|------------|----------|-----------|
| Green Soak | 0.1438 | -0.0032 | 102.23 |
| | 0.1488 | -0.0015 | 101.01 |
| | 0.1299 | -0.0017 | 101.31 |
| Shopmaster LpH | 0.1456 | -0.0002 | 100.14 |
| | 0.1616 | -0.0001 | 100.06 |
| | 0.1559 | 0.0004 | 99.74 |
| FPC 100 | 0.1695 | 0.0003 | 99.82 |
| | 0.1720 | 0.0002 | 99.88 |
| | 0.1808 | 0.0001 | 99.94 |
| SC Aircraft & Metal Cleaner | 0.1720 | 0.0062 | 96.40 |
| | 0.1774 | -0.0009 | 100.51 |
| | 0.1890 | -0.0002 | 100.11 |
| Amberclean L12 | 0.1733 | 0.0000 | 100.00 |
| | 0.1606 | 0.0017 | 98.94 |
| | 0.1917 | 0.0003 | 99.84 |
| Ozzy Juice SW-3 | 0.1952 | 0.0042 | 97.85 |
| | 0.1989 | 0.0048 | 97.59 |
| | 0.1579 | 0.0043 | 97.28 |

Summary:

| Substrates: | Aluminum | | | | |
|-------------------------------------|---|--------|-------------|-------------------------------------|---------------|
| Contaminants: | Oil | | | | |
| Company Name: | Product Name: | Conc.: | Efficiency: | Effective: | Observations: |
| BCS Company | Green Spray 400 | 5 | 101.51 | <input checked="" type="checkbox"/> | |
| Buckeye International | Shopmaster LPH | 5 | 99.98 | <input checked="" type="checkbox"/> | |
| Environmental Solution Products Inc | FPC 100 | 5 | 99.88 | <input checked="" type="checkbox"/> | |
| Gemtek Products | SC Aircraft & Metal Cleaner Super Concentrate | 5 | 99.00 | <input checked="" type="checkbox"/> | |

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|-------------------------|-------------------------------------|---|-------|-------------------------------------|--|
| Innovative Organics Inc | Amberclean L 12 | 5 | 99.59 | <input checked="" type="checkbox"/> | |
| Chem Free Corporation | SW-3 Ozzy Juice (Improved Low Odor) | 5 | 97.57 | <input checked="" type="checkbox"/> | |

Conclusion:

The top products will be evaluated on the fourth supplied contaminant under the same cleaning conditions.