

CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2004
 DateRun: 05/28/2004
 Experimenters: Jason Marshall
 ClientType: Lab
 ProjectNumber: Project #1
 Substrates: Aluminum
 PartType: Coupon
 Contaminants: Oil
 Cleaning Methods: Vapor Degreasing
 Analytical Methods: Gravimetric

Purpose: Laboratory evaluations of alternative cleaning products

Experimental Procedure: Basic cleaning performance testing was conducted using ASTM G122 as the bases for cleaning. Two hundred fifty milliliters of each product were used at full strength in a 4000 ml beaker and heated to its boiling point on a hot plate. Preweighed aluminum coupons were coated with the Soltex Polybutene 32 (9003-29-6) using a handheld swab. Coupons were weighed a second time to determine the amount of soil added to each coupon. Three coupons were cleaned in each solution for 5 minutes using vapor degreasing. After cooling to room temperature, the coupons were weighed a final time and efficiencies were calculated.

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|----------|-----------|------------|----------|-----------|
| Results: | Cleaner | Initial wt | Final wt | % Removed |
| | AK 225 | 0.6015 | 0.0455 | 92.44 |
| | | 0.4551 | 0.0183 | 95.98 |
| | | 0.3043 | 0.0135 | 95.56 |
| | CCA | 0.6504 | 0.0345 | 94.70 |
| | | 0.3536 | 0.0182 | 94.85 |
| | | 0.4704 | 0.0330 | 92.98 |
| | MCA | 0.4626 | 0.0298 | 93.56 |
| | | 0.6492 | 0.0359 | 94.47 |
| | | 0.2118 | 0.0128 | 93.96 |
| | HD DC | 0.3554 | 0.0315 | 91.14 |
| | | 0.3873 | 0.0304 | 92.15 |
| | | 0.5912 | 0.0563 | 90.48 |
| | FR C | 0.8269 | 0.1593 | 80.74 |
| | | 0.5288 | 0.0595 | 88.75 |
| | | 0.2053 | 0.0172 | 91.62 |
| | HFE 7100 | 0.3715 | 0.2366 | 36.31 |
| | | 1.0457 | 0.2498 | 76.11 |
| | | 0.4852 | 0.1828 | 62.32 |
| | HFE 7200 | 0.8601 | 0.1825 | 78.78 |
| | | 0.7228 | 0.1392 | 80.74 |
| | | 0.5693 | 0.1561 | 72.58 |
| | Ensolv A | 0.7580 | 0.0003 | 99.96 |
| | | 0.6845 | -0.0003 | 100.04 |
| | | 0.5019 | 0.0000 | 100.00 |
| | Metalnox | 0.9434 | 0.0009 | 99.90 |
| | | 0.4670 | -0.0021 | 100.45 |
| | | 0.6442 | 0.0039 | 99.39 |
| | Solvon PB | 1.0079 | 0.0040 | 99.60 |
| | | 0.3972 | 0.0005 | 99.87 |
| | | 0.5900 | 0.0017 | 99.71 |

| | | | | | | | |
|----------|----------------------|----------------------|---------------|--------------------|-------------------|----------------------|--|
| Summary: | Substrates: | Aluminum | | | | | |
| | Contaminants: | Oil | | | | | |
| | Company Name: | Product Name: | Conc.: | Efficiency: | Effective: | Observations: | |

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|-------------------------------|------------------------|-----|--------|-------------------------------------|--|
| AGA Chemical | AK 225 | 100 | 94.66 | <input checked="" type="checkbox"/> | |
| DuPont | Vertrel CCA | 100 | 94.18 | <input checked="" type="checkbox"/> | |
| DuPont | Vertrel MCA | 100 | 93.99 | <input checked="" type="checkbox"/> | |
| Micro Care | Heavy Duty Degreaser C | 100 | 91.25 | <input checked="" type="checkbox"/> | |
| Micro Care | Flux Remover C | 100 | 87.04 | <input checked="" type="checkbox"/> | |
| 3M | HFE 7100 | 100 | 58.25 | <input type="checkbox"/> | |
| 3M | HFE 7200 | 100 | 77.37 | <input type="checkbox"/> | |
| Enviro Tech International Inc | Ensolv A | 100 | 100.00 | <input checked="" type="checkbox"/> | |
| Kyzen Corporation | Metalnox M6960 | 100 | 99.20 | <input checked="" type="checkbox"/> | |
| Poly Systems USA Inc | Solvon Kreussler PB | 100 | 99.73 | <input checked="" type="checkbox"/> | |
| Poly Systems USA Inc | Solvon Kreussler IP | 100 | 98.89 | <input checked="" type="checkbox"/> | |
| Dow Chemical Company | OS 10 | 100 | 99.95 | <input checked="" type="checkbox"/> | |
| Dow Chemical Company | OS 20 | 100 | 89.86 | <input checked="" type="checkbox"/> | |
| Dow Chemical Company | OS 30 | 100 | 51.72 | <input type="checkbox"/> | |

Conclusion: Eleven of the fourteen products removed over 85%