

CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2004
 DateRun: 04/13/2004
 Experimenters: Jason Marshall, Parvathy Vijayan Babu
 ClientType: Capacitor Manufacturer
 ProjectNumber: Project #1
 Substrates: Aluminum
 PartType: Coupon
 Contaminants: Oil
 Cleaning Methods: Immersion/Soak
 Analytical Methods: Gravimetric
 Purpose: To evaluate selected vapor degreasing solvents on first oil.

Experimental Procedure: Six products were selected based on client request for vapor degreasing solvents. Each product was used at full strength in a 250 ml beaker and heated to 96 F on a hot plate. Eighteen preweighed aluminum coupons were coated with the Soltex Polybutene 32 (9003-29-6) using a hand held 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 stir-bar agitation. After cleaning parts were weighed a final time and efficiencies were calculated.

Results: Four of the products, 71DE, AK 225, CCA and MCA, removed over 94% of the soil in the five minutes of immersion cleaning. The other two products removed less than 20%. Even after increasing cleaning time to ten minutes, these two products had only marginal success, removing less than 40%. The table below lists the amount of soil added, remaining and efficiencies for each coupon cleaned.

| Cleaner | Initial wt | Final wt | % Removed |
|-------------------|------------|----------|-----------|
| HFE 7100 | 0.6255 | 0.4415 | 29.42 |
| | 0.3452 | 0.3569 | -3.39 |
| | 0.5307 | 0.5216 | 1.71 |
| HFE 7200 | 0.2486 | 0.2254 | 9.33 |
| | 0.4331 | 0.38 | 12.26 |
| | 0.4522 | 0.2914 | 35.56 |
| HFE 71DE | 0.4494 | 0.0091 | 97.98 |
| | 0.3842 | 0.0171 | 95.55 |
| | 0.4593 | 0.0062 | 98.65 |
| AK 225 | 0.3207 | 0.0157 | 95.10 |
| | 0.5828 | 0.0309 | 94.70 |
| | 0.5086 | 0.0393 | 92.27 |
| HFE 7100 (10 min) | 0.6255 | 0.4209 | 32.71 |
| | 0.3452 | 0.3468 | -0.46 |
| | 0.5307 | 0.4635 | 12.66 |
| HFE 7200 (10 min) | 0.2486 | 0.2059 | 17.18 |
| | 0.4331 | 0.2221 | 48.72 |
| | 0.4522 | 0.2140 | 52.68 |
| CCA | 0.8681 | 0.0234 | 97.30 |
| | 0.5975 | 0.0041 | 99.31 |
| | 1.0897 | 0.0532 | 95.12 |
| MCA | 0.4396 | 0.0211 | 95.20 |
| | 1.0074 | 0.0182 | 98.19 |
| | 0.6466 | 0.0126 | 98.05 |

Summary:

| | | | | | | |
|----------------------|----------------------|---------------|--------------------|--------------------------|----------------------|--|
| Substrates: | | Aluminum | | | | |
| Contaminants: | | Oil | | | | |
| Company Name: | Product Name: | Conc.: | Efficiency: | Effective: | Observations: | |
| 3M | HFE 7100 | 100 | 9.25 | <input type="checkbox"/> | at 10 min = 14.97% | |

CLEANING LABORATORY EVALUATION SUMMARY

| | | | | | |
|--------------|-------------|-----|-------|-------------------------------------|--------------------|
| 3M | HFE 7200 | 100 | 19.05 | <input type="checkbox"/> | at 10 min = 39.52% |
| 3M | HFE 71DE | 100 | 97.39 | <input checked="" type="checkbox"/> | |
| AGA Chemical | AK 225 | 100 | 94.03 | <input checked="" type="checkbox"/> | |
| DuPont | Vertrel CCA | 100 | 97.25 | <input checked="" type="checkbox"/> | |
| DuPont | Vertrel MCA | 100 | 97.15 | <input checked="" type="checkbox"/> | |

Conclusion:

Longer cleaning time (30 minutes) may help to improve the effectiveness of 7100 and 7200. Increasing the temperature of all the products could also improve the removal of this soil. All six products will be tested on the second supplied soil.