

CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2002

DateRun: 06/26/2002

Experimenters: Jason Marshall

ClientType: Chemical Company

ProjectNumber: Project #1

Substrates: Aluminum

PartType: Coupon

Contaminants: Adhesive, Resins/Rosins

Cleaning Methods: Immersion/Soak

Analytical Methods: Gravimetric

Purpose: To identify alternatives to MEK for adhesive/resin removal

Experimental Procedure: Nine products were selected from the lab's databases of alternative cleaning products based on client information. Five semi-aqueous products and four aqueous based products were selected. The semi-aqueous products were used at full strength where as the aqueous based products were diluted to 10% using DI water in 600 ml beakers. All nine products were heated to 130 F on a hot plate. Twenty-seven preweighed coupons were coated with Emerson & Cuming Stycast 2651-1 Black, self-curing epoxy resin (1675-54-3, 330-54-1) using a hand held swab. Coupons were allowed to sit overnight and reweighed to determine the amount of resin applied. Three coupons were immersed into each solution at 130 F for 5 minutes using stir-bar agitation. Following cleaning, coupons were rinsed in a tap water bath for 15 seconds at 120 F and dried using a Master Appliance Heat Gun at 500 F for 30 seconds. Once coupons were at room temperature, final clean weights were recorded and cleaning efficiencies were calculated for each product.

Results: The four aqueous products were unsuccessful in removing the resin based adhesive. Four semi aqueous products were successful in removing over 90% of the adhesive. Although Safe-Strip from Ecolink removed over 99% contaminant, its main cleaning component in n-methyl-2-pyrrolidone. Both products from Bio Chem Systems removed 90-95%. The dibasic ester from DuPont was as successful as Safe Strip, removing over 99%. The only semi-aqueous product to not perform well was National Diagnostic's Opti Clear, cleaning less than half of the adhesive. The table below lists the amount of adhesive added to each coupon as well as the calculated efficiencies

Table 1. Adhesive Removal

| Cleaner | Initial wt of cont. | Final wt of cont. | %Cont Removed |
|-----------------|---------------------|-------------------|---------------|
| Bio T Max | 0.6745 | 0.0480 | 92.88 |
| | 0.2713 | 0.0115 | 95.76 |
| | 0.4727 | 0.0149 | 96.85 |
| Solsafe | 0.6520 | 0.0319 | 95.11 |
| | 0.6777 | 0.0668 | 90.14 |
| | 0.8771 | 0.1254 | 85.70 |
| Safe-Strip | 0.4848 | 0.0043 | 99.11 |
| | 0.4103 | 0.0023 | 99.44 |
| | 0.8209 | 0.0071 | 99.14 |
| DBE | 0.4491 | 0.0012 | 99.73 |
| | 0.5896 | 0.0013 | 99.78 |
| | 0.5540 | 0.0007 | 99.87 |
| Opti Clear | 0.6141 | 0.3041 | 50.48 |
| | 1.3972 | 0.9438 | 32.45 |
| | 0.5157 | 0.2919 | 43.40 |
| Surface Cleanse | 0.6083 | 0.4766 | 21.65 |
| | 0.9587 | 0.4855 | 49.36 |
| | 0.6682 | 0.5100 | 23.68 |
| Daraclean | 0.5201 | 0.4399 | 15.42 |
| | 0.3935 | 0.3800 | 3.43 |
| | 0.3777 | 0.3903 | -3.34 |
| Inproclean | 0.7316 | 0.5088 | 30.45 |
| | 0.4382 | 0.4182 | 4.56 |

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|--------|--------|--------|-------|
| | 0.4761 | 0.4409 | 7.39 |
| Beyond | 0.4324 | 0.4362 | -0.88 |
| | 0.8671 | 0.5498 | 36.59 |
| | 0.3838 | 0.3911 | -1.90 |

Summary:

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|------------------------------------|--|---------------|--------------------|-------------------------------------|----------------------|
| Substrates: | Aluminum | | | | |
| Contaminants: | Adhesive, Resins/Rosins | | | | |
| Company Name: | Product Name: | Conc.: | Efficiency: | Effective: | Observations: |
| Bio Chem Systems | Bio T Max | 100 | 95.16 | <input checked="" type="checkbox"/> | |
| Bio Chem Systems | Solsafe 245 | 100 | 90.32 | <input checked="" type="checkbox"/> | |
| EcoLink | Safe Strip | 100 | 99.23 | <input checked="" type="checkbox"/> | contains NMP |
| Invista S.a.r.l | Flexisolv DBE Ester | 100 | 99.80 | <input checked="" type="checkbox"/> | |
| National Diagnostic | Opti Clear | 100 | 42.11 | <input type="checkbox"/> | |
| International Products Corporation | Surface Cleanse Concentrated Neutral 930 | 10 | 31.56 | <input type="checkbox"/> | |
| Magnaflux | Daraclean 212 | 10 | 5.17 | <input type="checkbox"/> | |
| Oakite Products | Inproclean 3800 | 10 | 14.14 | <input type="checkbox"/> | |
| Today & Beyond | Beyond 2002 | 10 | 11.27 | <input type="checkbox"/> | |

Conclusion:

The three successful cleaners, Bio T Max, Solsafe 245 and DBE will be used in the next trial using ultrasonic energy.