

# CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2007  
 DateRun: 02/08/2007  
 Experimenters: Jason Marshall  
 ClientType: Consultant  
 ProjectNumber: Project #1  
 Substrates: Aluminum  
 PartType: Coupon  
 Contaminants: Oil  
 Cleaning Methods: Immersion/Soak  
 Analytical Methods: Gravimetric

Purpose: To evaluate four binary azeotropes for removing oil from aluminum coupons using immersion cleaning.

Experimental Procedure: The four supplied solvents were mixed with DI water in 600 ml beakers to obtain binary azeotropes. Methyl Acetate (MeOAc) was mixed with water (95% water) and heated to 56.1 C on a hot plate. T-Butyl Acetate (t-BAc) was mixed with water (16.5% water) and heated to boiling at 87.4 C. Propylene Glycol Methyl Ether (PGME) was mixed with water (51% water) and heated to 97.5 C. The final blend consisted of Heptane mixed with water (12.9% water) and heated to 79.2 C.

Twelve preweighed aluminum coupons were coated with CP Hall Co Plasthall Eso oil (8013-07-8) with a handheld swab. Coupons were weighed again to determine the amount of oil applied. Three coupons were cleaned in each azeotrope for five minutes at the boiling point, rinsed for 15 seconds in 120 F tap water and dried for 30 seconds using compressed air at room temperature. Coupons were weighed a third time to determine the amount of oil remaining. Efficiencies were calculated and recorded.

Results: Two of the four azeotropes removed over 98% of the canola oil. The table lists the amount of soil added, the amount remaining, and the efficiency of each coupon cleaned.

| Azeotrope | Initial wt | Final wt | % Removed |
|-----------|------------|----------|-----------|
| MeOAc     | 0.2587     | 0.1138   | 56.01     |
|           | 0.7266     | 0.1149   | 84.19     |
|           | 0.6344     | 0.1902   | 70.02     |
| t-BAc     | 0.6208     | 0.0022   | 99.65     |
|           | 0.6846     | 0.0014   | 99.80     |
|           | 0.4129     | 0.0037   | 99.10     |
| PGME      | 0.3868     | 0.0669   | 82.70     |
|           | 0.5283     | 0.0745   | 85.90     |
|           | 0.5412     | 0.0913   | 83.13     |
| Heptane   | 0.4839     | 0.0084   | 98.26     |
|           | 0.4815     | 0.0052   | 98.92     |
|           | 0.5208     | 0.0068   | 98.69     |

Summary:

|                      |                                     |               |                    |                                     |                      |
|----------------------|-------------------------------------|---------------|--------------------|-------------------------------------|----------------------|
| <b>Substrates:</b>   | Aluminum                            |               |                    |                                     |                      |
| <b>Contaminants:</b> | Oil                                 |               |                    |                                     |                      |
| <b>Company Name:</b> | <b>Product Name:</b>                | <b>Conc.:</b> | <b>Efficiency:</b> | <b>Effective:</b>                   | <b>Observations:</b> |
| No Specific Vendor   | Methyl Acetate-water                | 5             | 70.07              | <input type="checkbox"/>            |                      |
| No Specific Vendor   | t-Butyl Acetate-water               | 83.5          | 99.52              | <input checked="" type="checkbox"/> |                      |
| No Specific Vendor   | Propylene Glycol Methyl Ether-water | 49            | 83.91              | <input type="checkbox"/>            |                      |
| J.T. Baker           | Heptane Low water                   | 87.1          | 98.63              | <input checked="" type="checkbox"/> |                      |

Conclusion: The heptane-water azeotrope removed 98.6% of the canola oil, the t-Bac-water removed 99.5%, PGME-water removed 83.9% and the MeOAc removed 70.1%.