CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2007

DateRun: 02/06/2007

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 quench 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 Castrol Quench G oil (64742-55-8, 64742-65-0, 8052-42-4) 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: During cleaning the MeOAc did not boil at the specified temperature (56.1 C). Cleaning was performed at this point. Following cleaning, the solution was heated to determine the boiling point. The measured boiling point was 83-84 C. The three other azeotropes boiled at the expected temperatures. Three of the four products removed over 85% of the quench oil. The only ineffective product was the MeOAc. 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	0.1305	0.0738	43.45
	0.2221	0.0920	58.58
	0.3559	0.1039	70.81
t-BAc	0.3062	0.0379	87.62
	0.3093	0.0104	96.64
	0.3078	0.0022	99.29
PGME	0.1967	0.0317	83.88
	0.2744	0.0228	91.69
	0.2452	0.0182	92.58
Heptane	0.3093	0.0005	99.84
	0.2387	-0.0005	100.21
	0.3204	0.0001	99.97

Summary:

Substrates:	Aluminum				
Contaminants:	Oil				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
No Specific Vendor	Methyl Acetate-water	5	57.61	☐	
No Specific Vendor	t-Butyl Acetate-water	83.5	94.52	☑	
No Specific Vendor	Propylene Glycol Methl Ether-water	49	89.38	☑	
J.T. Baker	Heptane Low water	87.1	100.01	☑	

Conclusion: The heptane-water azeotrope removed 100% of the quench oil, the t-Bac-water removed 94%, PGME-water removed 89% and the MeOAc removed under 60%.