CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2001
DateRun:	08/27/2001
Experimenters:	Jason Marshall
ClientType:	Electronics Manufacturer
ProjectNumber:	Project #1
Substrates:	Ceramics
PartType:	Coupon
Contaminants:	Adhesive
Cleaning Methods:	Immersion/Soak
Analytical Methods:	Gravimetric
Purpose:	Evaluating additional cleaners for removal of reed wax.
Experimental Procedure:	Four cleaners were selected based on the results from the successful previous trial. A fifth cleaner was added based on client request. All five solutions were used at full strength. Four products were heated to 140 F on a hot plate and the fifth, Uni-Clear, was heated to 100F in a heated water bath (due to its low flash point of 140 F). Fifteen preweighed coupons were coated with the supplied Reed wax. The wax was heated with a hot air gun and a moderate layer was added to the coupon. These coupons were then allowed to cool to room temperature and weighed again. Three coupons were immersed in each of the cleaners. Observations were made at 5, 10, 15, 20, 30 and 45 minutes. After the final observation, the coupons were rinsed in DI water and dried using air blow off. Coupons were then weighed a final time and percent efficiencies were calculated for each cleaner.
Results:	Of the five products evaluated, only two removed over 85% of the wax from the coupons. The Buckeye Shopmaster RC removed 88% and the Universal Photonics Uni-Clear removed 99.97%. The other three removed less than 5% of the wax. Table 1 lists the efficiencies for each cleaner and coupon.

Table 1. Cleaning Efficiencies

	Shopmaster	Safe Strip	DBE-4	590 S	Uni-Clear
Coupon 1	94.71	2.18	1.08	1.36	100.00
Coupon 2	91.48	1.38	-2.30	2.62	100.02
Coupon 3	77.49	2.08	0.12	5.70	99.89
Ave	87.89	1.88	-0.37	3.23	99.97
Std Dev	9.15	0.44	1.74	2.23	0.07

Despite the low efficiency, DuPont's DBE-4 showed signs of altering the wax during the 45 minute cleaning. The cleaning chemistry softened the wax during the first 5 minutes of cleaning. By 30 minutes, the wax was sliding down the coupons and gathering at the bottom. Table 2 lists the observations made during the 45 minutes of cleaning.

Table 2. Observations

Times	Shopmaster	Safe Strip	DBE-4	590 S	Uni-Clear
5	very soft-dissolving	Slightly soft	very soft-dissolving	no change	good dissolving
10	good dissolving 50% gone	some dissolving	good softening	little softening	almost all clean
15	coming off in clumps	no change	some dissolving	no change	1 all clean
20	80% gone	no change	sliding down	no change	little remaining
30	very soft, most gone	okay	softer	darker color	all gone after 25 min
45	clumps floating at top	no change	no change	no change	n/a

Summary:

Substrates:	Ceramics

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Contaminants:	Adhesive				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Buckeye International	Shopmaster RC	100	87.89	☑	
EcoLink	Safe Strip	100	1.88	☐	
Invista S.a.r.l	Flexisolv DBE 4 ester	100	-0.37	☐	
Aremco Products Inc	Crystalbond 590 S		3.23	☐	
Universal Photonics	Uni Clear	100	99.97	☑	

Conclusion: Shopmaster RC and Uni-Clear were very successful in removing the wax. Uni-Clear will be further evaluated for cleaning the Crystalbond 590.