CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2001

DateRun: 10/08/2001

Experimenters: Jason Marshall

ClientType: Electronics Manufacturer

ProjectNumber: Project #1

Substrates: Ceramics

PartType: Coupon

Contaminants: Abrasive, Coatings, Waxes

Cleaning Methods:

Analytical Methods:

Purpose: Summary of Findings

Experimental Procedure:

Results:

Phase 1 Laboratory Testing
The focus of the first project was to identify a replacement cleaner for toluene to remove wax. A total of sixteen products were evaluated using immersion cleaning. Through visual and gravimetric analysis, four cleaning products were found to be successful in removing the wax from the ceramic and glass substrates and are listed below in Table 1.

Table 1. Successful Wax Cleaning

Company	Product	Classification	Efficiency
Envirosolutions Inc	Bio T Max	Natural Terpene	99.36
Solvent Kleene	D Greeze 500 LO	Hydrocarbon Solvent	76.16
Buckeye International	Shopmaster RC	Ester blend	87.89
Universal Photonics	Uni Clear I	D-limonene Terpene	100.01

Phase 2 Laboratory Testing
Having found a replacement for toluene in wax removal, the next step was to find alternative cleaners for the other contaminants used at the facility. The use of the first of the contaminants was as an adhesive to be used in place of the current wax. The last two contaminants were both polishing slurries used during the initial stages of manufacturing of the ceramic base materials.

Cyrstalbond 509
In an attempt to limit the amount of cleaning products, the successful wax cleaners were selected for evaluated for cleaning during this phase of testing. Only one of the cleaners was successful in removing the Crystalbond 509 adhesive. Shopmaster RC removed 94.83%. Additional products were also investigated for the removal of the Crystalbond 509. A total of twelve products were evaluated. Table 2 lists the successful cleaners for the 509 adhesive.

Company	Product	Classification	Efficiency
Buckeye International	Shopmaster RC	Ester blend	94.83
DuPont	DBE-4	Ester blend	99.61
Ecolink Inc.	Safe Strip	N-methyl pyrrolidone	98.97
Alconox Inc.	Luminox	Neutral Aqueous	97.49*

*Required 20 minutes additional cleaning time

Nalco Chemical Co Nalco 2350 Polishing Slurry
Again, an attempt was made to evaluate the successful cleaners from the previous trials for the next contaminant. None of the previous products were capable of removing a majority of the polishing slurry from the ceramic coupons. Several alkaline aqueous products were found to very effective in removing nearly all of the slurry with fifteen minutes of soaking at 120 F. Table 3 lists the effective products.
Table 3. Nalco Chemical Co Nalco 2350 Polishing Slurry Cleaning

Company	Product	Classification	Efficiency
Innovative Organics	Amberclean LC	Alkaline Aqueous	99.72

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International Products	Micro 90	Alkaline Aqueous	99.38
LPS Industries	LPS Precision	Alkaline Aqueous	99.50
MacDermid	ND 17	Alkaline Aqueous	99.62
Oakite Products	Inproclean 3800	Alkaline Aqueous	99.36
US Polychemical	Polyspray Jet790 xs	Alkaline Aqueous	99.42
Amax	Safety First	Semi-aqueous Terpene	99.88

Saint Gobain Industrial Ceramics Water Based Alumina
The same seven cleaners were also effective in cleaning the second polishing slurry, removing over 94% of the alumina from the ceramic coupons in five minutes of cleaning. ND 17 and LPS were the most effective removing just over 97%. The results are listed in Table 4.
Table 4. Saint Gobain Industrial Ceramics Water Based Alumina Cleaning

Company	Product	Classification	Efficiency
Innovative Organics	Amberclean LC	Alkaline Aqueous	94.50
International Products	Micro 90	Alkaline Aqueous	94.11
LPS Industries	LPS Precision	Alkaline Aqueous	97.30
MacDermid	ND 17	Alkaline Aqueous	97.31
Oakite Products	Inproclean 3800	Alkaline Aqueous	94.24
US Polychemical	Polyspray Jet790 xs	Alkaline Aqueous	95.84
Amax	Safety First	Semi-aqueous Terpene	95.09

Phase 3 FTIR Analysis of Rejected Parts
The final project conducted at the lab was to determine the source of the contamination on rejected parts. The lab used Fourier Transform Infrared Spectrometry in an attempt to identify the possible contaminants on the ceramic and gold pieces. Fourier Transform Infrared spectroscopy correlates vibrational energy to a compound's molecular signature. Similar to other high-tech methods such as GC (gas chromatography), the curves generated in this analytical technique are both quantitative for species identification (the placement of the curve on the electromagnetic spectrum) and qualitative for amounts (the area under the curve). Interpretation of graphs can be difficult due to the presence of interfering peaks.
It appears that several of the supplied contaminated parts did have some of the wax remaining on them after the toluene cleaning. In addition most of the parts had toluene residue as well. The FT-IR readings made by SCL should not be considered as a final determination as to the identification of the source of contamination. Comparisons are listed in Table 5.

Table 5. FTIR Analysis

Sample	Source	Observations-Comparison
1	A	Toluene
2	A	Toluene
3	B	Toluene & IPA & maybe Wax
4	B	Wax & Toluene
5	C	Wax & IPA
6	C	Wax & IPA
7	D	Wax & Toluene
8	A	Wax & Toluene

Vendor Contact Information
Company names, contact numbers and addresses are listed in Table 6.
Table 6. Contact Information for Successful Cleaning Chemistries

COMPANY	CONTACT Number	ADDRESS	LOCATION	STATE	ZIP
Alconox Inc	1-212-532-4040 x60	9 East 40th Street	New York	NY	10016
	1-800-662-0023		Louisville	KT	40203

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Amax Corporation		960 S. Third Street			
Buckeye International Inc	1-314-291-1900	2700 Wagner Place	Maryland Heights	MO	63043
DuPont Nylon	1-800-231-0998		Wilmington	DE	19898
Ecolink Inc	1-800-886-8240	1481 Rock Mountain Blvd.	Stone Mountain	GA	30083
EnviroSolutions Inc	1-203-452-7225	232 Main Street	Monroe	CT	06468
Innovative Organics	1-714-701-3900	4790 East Wesley Drive	Anaheim	CA	92807
International Products Corp	1-609-386-8770	P.O. Box 70	Burlington	NJ	08016
LPS Laboratories Inc	1-800-241-8334	101 Stagecoach Dr.	Lancaster	MA	01523
MacDermid Inc	1-203-575-5726	245 Freight Street	Waterbury	CT	06702
Oakite Products Inc	1-908-508-2107	50 Valley Road	Berkeley Heights	NJ	07922
Solvent Kleene Inc	1-978-531-2279	131 1/2 Lynnfield Street	Peabody	MA	01960
Universal Photonics	1-516-935-4000	495 West John Street	Hicksville	NY	11801
US Polychemical Corp	1-800-356-5530	584 Chestnut Ridge Road	Chestnut Ridge	NY	10977

Summary:

Conclusion: