CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	1996
DateRun:	11/19/1996
Experimenters:	Jay Jankauskas
ClientType:	Electronics Manufacturer
ProjectNumber:	Project #1
Substrates:	Plastic, Electronics
PartType:	Coupon
Contaminants:	Fluxes
Cleaning Methods:	
Analytical Methods:	
Purpose:	Information identical to cleaning situation.
Experimental Procedure:	

Results:

It was a pleasure to meet you on Friday November 15th. I found some pretty interesting information in my files that is virtually identical to your cleaning situation. The enclosed report has test results for alternatives to TCA in removing various fluxes (including Alpha 615) from printed circuit boards. They found that the most effective alternatives were either a mixture of IPA/cyclohexane or Axarel 2200 followed by a rinse in IPA. In order to safely use each of these solvent systems, you would need to retrofit your vapor degreaser with the proper fire suppression system, but it might be worth considering.
I also enclosed EPA's SNAP list on acceptable alternatives to CFCs in electronics cleaning applications. Two of the chemistries that I mentioned to you that would be possible drop-in replacements are Parachlorobenzotrifluoride and HCFC-225ca/cb. The HCFC is not flammable (unlike the PCBTF), but it also faces a phaseout date of 2010 which may be accelerated (see enclosed fact sheet on HCFC's). I also enclosed some info on these two alternatives.
As for a testing plan in the lab, I would first like you to take a look at the enclosed information before we set anything up. Until then, I will still look around for other possible alternatives, and I'll get in touch with you in a few days.

Attached is a brief summary of the testing plan to find a solvent blend that will be a successful replacement to 1,1,1 TCA at your facility. As I mentioned, this plan is not set in stone, so feel free to make any suggestions if you see appropriate. I also included a copy of EPA's SNAP list which lists chemicals which can and cannot be used for various cleaning applications. Up to date info on SNAP listed solvents can be accessed through EPA's web site at www.epa.gov or through the SNAP hotline (1-800-296-1996).

1,1,1 TCA Drop-in Vapor Degreasing Substitute Trial
Criteria for choosing a successful replacement:

1) Must successfully remove Alpha 615 RMA flux from boards in accordance with Mil Std. 2000.

2) Replacement should be able to be used in a Baron Blakeslee Vapor Degreaser with as minimal reconfiguration as possible.

3) No flashpoint. Although a solvent with a flash point may be suitable, one has already been found that will definitely be cost effective and work well (a blend of 33% IPA and 66% cyclohexane).

4) Low-cost solvent. One of the problems that we are finding with possible replacements (AK- 225, HFEs, Vertrel, etc) is that solvent costs are quite expensive. We would like to keep the solvent cost down while still conforming with other requirements.

5) Replacement should have minimal environmental and worker impact as possible. Any chemical replacement(s) must be SNAP approved. Probably the biggest concern would be with worker exposure limits and any noxious odors.

Possible solvents to test out in blends*:		
Product-Company	Flash Point (F)	Boiling Point (F)
AK-225-AGA	None	129.2
HFE-7100-3M	None	140
Perchloroethylene	None	250
Triechloroethylene	None	188
Perfluorocarbons-3M	None	-34 to 214
Vertrel-DuPont		
OXSOL 100-Oxychem	109	282

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OXSOL 2000-Oxychem	54	216
IPA	53	180
Cyclohexane	-0.4	177
Borothene-Advanced Chemical Des.	None	162

*These solvents are just a preliminary pick, solvents may be added or dropped from the choice list.
Tests to be performed:
1) Identification of binary and tertiary azeotropes. Near azeotropic behavior would be necessary to successfully operate in a vapor phase. Azeotropes can be determined by distilling binary and tertiary mixtures and plotting temperature and/or composition verses fraction distilled. Regions of constant temperature and composition indicate near-azeotropes.

2) Cleaning Trials: A simple immersion test for a few minutes comparing the azeotropes with a control mixture of 33% IPA and 66% cyclohexane. Cleanliness will be rated in two categories; 1) Percent flux removed, 2) Qualitative measurement of white flux residue.

3) Testing for Flash Point and Auto-ignition Temperature.

Summary:

Conclusion: