CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	1997
DateRun:	10/20/1997
Experimenters:	Jason Marshall, Prashant Trivedi
ClientType:	Manufacturers of Harmonic Drive
ProjectNumber:	Project #1
Substrates:	Stainless Steel
PartType:	Coupon
Contaminants:	Greases
Cleaning Methods:	Ultrasonics
Analytical Methods:	Gravimetric
Purpose:	Evaluate ultrasonic cleaning of grease

Experimental Procedure:

The purpose of the experiment was to determine if ultrasonic cleaning would be effective in removing the contaminant.
Coupons were contaminated as in the previous two trials. Five percent solutions of the cleaning chemistries were made in beakers and heated to 150 F on hot plates. The coupons were cleaned in a 40 KHz ultrasonic for five minutes. The rinsing and drying procedures were the same as in the previous trials.

SUBSTRATE MATERIAL: 17-4 Stainless steel
CONTAMINANTS: Braycote 601-perfluoropolyether grease

Results:

Ultrasonic cleaning increased the cleaning efficiency of the selected cleaners only slightly. For cleaners # 1 and 3, the remaining grease started to clump up on the coupon. Occasionally, these clumps would break off and float in the cleaning solution. It was interesting to note that the coupons cleaned using just the heated water were cleaned better than cleaner #2 and #4. The grease on these coupons also showed the same tendency to clump.

A side experiment was conducted using one coupon that was cleaned in the hot water. This coupon was cleaned for an additional 20 minutes. The cleaning percentage was found to be almost 43%. Figure 1 shows the average percent removal for each of the cleaners as well as the extended water trial.
Table 1 Percent Removal per Cleaner

Cleaner	HTF-321	CT-1	DEOX-007	InproClean	Water
Cleaner #	1	2	3	4	5
	6.22	1.76	9.77	4.84	3.58
	13.8	4.74	15.6	7.34	10.5
	dropped	7.79	3.35	2.55	2.15
Ave	9.99	4.76	9.56	4.91	5.41
Std Dev	5.32	3.02	6.11	2.39	4.46
Water @ 25 min					42.80%

Summary:

Substrates:	Stainless Steel				
Contaminants:	Greases				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Chemkleen International Inc.	CT 1 Multipurpose Cleaner	5	4.76	☐	
US Polychem Corporation	Polychem DEOX 007	5	9.56	☐	
Tarksol Inc	Tarksol HTF 321	5	9.99	☐	
Water	Water	100	5.41	☐	
Water	Water	100	42.80	☐	at 25 minutes

Conclusion:

Through the use of an ultrasonic cleaning tank, the efficiency of the cleaning can be increased to some extent. The enhancement was only very slight in this case. During a side experiment, it was determined that time might have more of an effect on the removal of the contaminant.

To further increase the elimination of the grease, several options exist: changing the ultrasonic frequency, changing the typeof mechanical energy, increasing the time of the cleaning, and increasing the concentration of the cleaners. The next test will use power spray cabinet as the source of the mechanical energy.