

# 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:**

<b>Substrates:</b>	Stainless Steel				
<b>Contaminants:</b>	Greases				
<b>Company Name:</b>	<b>Product Name:</b>	<b>Conc.:</b>	<b>Efficiency:</b>	<b>Effective:</b>	<b>Observations:</b>
Chemkleen International Inc.	CT 1 Multipurpose Cleaner	5	4.76	<input type="checkbox"/>	
US Polychem Corporation	Polychem DEOX 007	5	9.56	<input type="checkbox"/>	
Tarksol Inc	Tarksol HTF 321	5	9.99	<input type="checkbox"/>	
Water	Water	100	5.41	<input type="checkbox"/>	
Water	Water	100	42.80	<input type="checkbox"/>	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 type of 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.