CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	1997
DateRun:	10/01/1997
Experimenters:	Jason Marshall, Prashant Trivedi
ClientType:	Manufacturer of Computer Parts
ProjectNumber:	Project #1
Substrates:	Stainless Steel
PartType:	Part
Contaminants:	Cutting/Tapping Fluids, Lubricating/Lapping Oils, Oil
Cleaning Methods:	Ultrasonics
Analytical Methods:	Visual
Purpose:	Determine optimum conditions for cleaning parts

Experimental Procedure:

The purpose of the experiment was to determine the optimum conditions for cleaning the parts.

The experimental conditions of the first two trials were kept constant except for the cleaning time, the cleaner concentration and the mechanical energy used in the cleaning phase. Two concentrations were used; five percent and ten percent. The parts were observed after 2, 4, 6, 10, 15, and 20 minutes of cleaning. Ultrasonic frequencies tested were at 40 and 25KHz. One part was cleaned for each concentration and frequency. Table 1 shows what variables were used for each part cleaned.

Table 1 Experimental Variables

	Ultrasonic	Cleaning Time	Concentration
TEST #	Frequency (KHz)	(min)	(%vol)
1	40	10	5
2	40	15	5
3	40	20	5
4	25	2	5
5	25	4	5
6	25	6	5
7	40	2	10
8	40	4	10
9	40	6	10
10	25	2	10
11	25	4	10
12	25	6	10

The five percent solution in the 40KHz ultrasonic was observed at the longer cleaning intervals for two reasons. First, the the lower time periods were previously tested. The second reason was that the lower times did not result in satisfactory cleaning.

SUBSTRATE MATERIAL: Stainless steel
CONTAMINANTS: Client supplied oil

Results:

Table 2 lists the results of the cleaning trials. The test numbers correspond to the conditions specified in Table 1. It is apparent that the lower concentration cleaner performed poorly in the 40KHz ultrasonic. The cleaner took up to fifteen minutes to clean a majority of the oil from the part. At the lower frequency, this concentration only needed six minutes for nearly complete removal of the oil. As expected, the higher concentration cleaned better than the lower concentration at both ultrasonic frequencies. In both cases, the ten percent solution needed only four minutes to reach near complete removal of the oil.

See attached sheets for scanned images of the parts at each time interval. Also included with this report are the parts after the final cleaning stage. A small section of each part was not cleaned so that the initial conditions could be compared to the final conditions.

Table 2 Cleaning Results

TEST #	Comments
1	~80% clean
2	Back ~100%--Front was spotty
3	~100% clean
4	~80% clean
5	~90% clean

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6	~100% clean
7	~95% clean
8	~98% clean--some smudges
9	~100% clean
10	~98% clean--some smudges
11	~100% clean
12	~100% clean-excellent cleaning

From this trial several possible conditions can be used to obtain completely cleaned parts. The best cleaning situations involved a ten percent cleaning solution and an ultrasonic frequency of 25KHz. Next was the ten percent solution at 40KHz. The five percent solution at 25KHz performed far better than at the 40KHz frequency.

Summary:

Substrates:	Stainless Steel				
Contaminants:	Cutting/Tapping Fluids, Lubricating/Lapping Oils, Oil				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Magnaflux	Daraclean 282 GF	5	0.00	☑	
Magnaflux	Daraclean 282 GF	10	0.00	☑	

Conclusion:

The concentration of Daraclean 282 GF has a large influence on the removal rate of the oil. When using the higher concentration, changing the ultrasonic frequency did little to effect the rate at which the oil was removed from the parts. For the lower cleaning concentration, however, the ultrasonic frequency plays a large role in reducing the time for cleaning. At the 25KHz frequency, the five percent solution needed only six minutes to remove the oil. Cleaning with the five percent solution at the 40KHz frequency required twenty minutes.

These experiments were performed to test the effectiveness of the chemistry in removing the oil. Now that it is known that the cleaner can remove the oil, the next step will be to determine what type of cleaning to implement.