CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2000
DateRun:	08/13/2000
Experimenters:	Jason Marshall
ClientType:	General
ProjectNumber:	Project #1
Substrates:	Plastic
PartType:	Part
Contaminants:	Cutting/Tapping Fluids, Lubricating/Lapping Oils, Dirt, Oil
Cleaning Methods:	Immersion/Soak
Analytical Methods:	Gravimetric
Purpose:	To determine weight and maximum particle size of contaminant.

Experimental Procedure:

General Summary:
Parts were washed with a clean solvent using an immersion soak for one minute while swirling the solvent, followed by three to four sprays of solvent using a spray bottle. The collected solvent was filtered and the filter paper was dried in an oven. Contaminant weights were then calculated based on the area of the parts soaked.
Equipment Used:
1. Solvent: Isopropanol
2. Filter membranes of 0.8 and 5.0 µm.
3. Filtration equipment: Filter funnel, holding fixture for filter membrane, rubbers stopper, vacuum, vacuum flask (Figure 1)
4. Collecting pan: glass 500ml glass beaker
5. Vacuum pump: Laboratory faucet, generating vacuum of 12.5-18 psi (86-112kPa).
6. Analytical balance: Denver Instrument Co Analytical Balance model A-250
7. Drying oven at temperature of 80±2 C
8. Desiccator
Procedure Used:
1. Pre-filter solvent through 0.8 µm filter membrane
2. Wash all equipment that is used with the pre-filtered solvent
3. Wash benchtop with pre-filtered solvent
4. Clean drying oven
5. Dry all filter membranes in oven at 80±2 C for 15 minutes, then place filter membranes in desiccator and allow to cool to room temperature
6. Weigh pre-dried filter membranes. Record mass to ± 0.1mg
7. Install filter membrane in gravimetric filtration apparatus (Figure 1)
8. Thoroughly wash all surfaces to be checked for cleanliness using solvent immersion in beaker. Any grinding chips, heat treat scale, or other particles which can be loosened from the part must be added to the collected solvent.
9. Turn on vacuum. Pass all of the collected solvent through the pre-dried 5.0 µm filter membrane.
10. Thoroughly flush the collecting pan (beaker) allowing the flushing solvent to pass through the filter membrane
11. With the vacuum still on, remove funnel assembly and gently rinse any residue contamination from the funnel onto the filter disk using a squeeze bottle and pre-filtered solvent. Allow the pump to run for approximately 10 additional seconds
12. Carefully remove the filter membrane and place it in the drying oven for 15 minutes
13. Place filter membrane in desiccator and allow to cool to room temperature
14. Re-weigh the filter membrane and record mass to ± 0.1mg
15. Place filter membrane in a protective cover

SUBSTRATE MATERIAL: Polyimide (plastic)
CONTAMINANTS: oil, dirt
CONTAMINATING PROCESS USED: Parts received contaminated

Results:

Table 1 lists the weights of the filter membrane before and after solvent filtration.
Table 1. Filter Weights

	X	Y	Y-X in grams	Y-X in mg	
	Dried	Dirty	Wt Cont	Blank correction	mg
Group 1	0.0937	0.0942	0.0005	0.0009	0.9
Group 2	0.0911	0.0915	0.0004	0.0008	0.8

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Group 3	0.0823	0.0825	0.0002	0.0006	0.6
Blank	0.0848	0.0844	-0.0004	0	0

The second table contains the surface area calculations for the supplied part shown in Figure 2.

Table 2. Surface Area

Top & Bottom	1) 610.7	mm2 x2
Outside	2) 638.4	mm2 x1
Inside	3) 568.0	mm2 x1
Total	2427.8	mm2/piece
10 pieces	24278	Total area

Using the data from Table 1 and the total surface area for the ten parts cleaned, the contaminant weight of the parts were found by using the following equation: C = (Y - X)/ A

where:

Y = Mass of loaded membrane (mg)

X = Mas of clean membrane (mg)

A = Wash surface area (m 2).

After finding the mass per area, the cleanliness class was then found using the JDS-G169 Gravimetric Cleanliness Classes table supplied by the client. The mass per area and cleanliness class for each of the three groups are listed in Table 3.

Table 3. Contaminant Cleanliness

Class	mg/m2	Cleanliness Class
Group 1	37.1	5.6
Group 2	33	5.6
Group 3	24.7	5.4
Blank	0	5

Summary:

Substrates:	Plastic				
Contaminants:	Cutting/Tapping Fluids, Lubricating/Lapping Oils, Dirt, Oil				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Fisher Scientific	Isopropanol a459-4 70% VV (CAS: 67-63-0)	100	0.00	☑	

Conclusion:

The supplied parts were determined to be relatively free of contamination as determined by the cleanliness class system supplied by the client. Two of the three groups were three steps from the cleanest level and one group was only two steps away.