CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	1999
DateRun:	03/22/1999
Experimenters:	Jason Marshall
ClientType:	Electron & Ion Technology Co
ProjectNumber:	Project #1
Substrates:	Alloys, Stainless Steel, Titanium
PartType:	Coupon
Contaminants:	Cutting/Tapping Fluids, Lubricating/Lapping Oils, Dirt, Oil
Cleaning Methods:	Ultrasonics
Analytical Methods:	OSEE
Purpose:	Request to determine method for evaluating cleaned parts. Want to compare two cleaning methods.
Experimental Procedure:	Ten parts cleaned using the Branson method and ten parts cleaned using the Crest method were analyzed using OSEE.

Optically Stimulated Electron Emission or PEE, Photo Electron Emission is based on the principle that metals and certain surfaces emit electrons upon illumination with ultraviolet (UV) light. These electrons can be collected, measured as current, converted to a voltage and digitally displayed. A surface contaminant will either enhance or attenuate this signal, depending on its own photo emissive nature. While OSEE will not identify a contaminant, it is a good comparative tool to determine the degree of contamination. This method is best suited for thin films (oils, etc.) and not particulate matter (dust, for example).

Readings were taken from multiple sites on each part to ensure characteristic measurements. Average values were determined and recorded. After each part was analyzed, five parts from each method were contaminated with the machining fluid and OSEE readings were taken again. This was to reveal the effect the fluid has on the electron emissions. Once the relationship was found, the two cleaning methods can be compared to each other.

SUBSTRATE MATERIAL: Ion Gun Parts - Molybdenum, Alumina, 304 Stainless Steel with Alumina, Macor,Ti6AL 4V
CONTAMINANTS: Metal working fluid (Hangsterfer's S-500CF_US) and Dirt

Results: The following tables list the OSEE readings taken for two parts for each method.

Table 3. Part 3 OSSE Values

1	Branson			Crest	
Top	Bottom	Edge	Top	Bottom	Edge
119	201	219	148	183	137
114	217	282	145	171	178
116	208	151	154	184	222
124	199	178	112	224	153
135	212	180	132	218	147
110	209	203	106	210	182
119.67	207.67	202.17	132.83	198.33	169.83
8.87	6.74	45.50	19.90	21.77	31.04
2	Branson			Crest	
Top	Bottom	Edge	Top	Bottom	Edge
119	183	245	171	220	201
140	180	150	171	208	199
133	181	161	132	221	234
105	185	168	126	209	112
116	181	160	135	211	88
103	196	165	121	196	174
119.33	184.33	174.83	142.67	210.83	168.00
14.81	5.99	34.91	22.47	9.15	56.53

Table 4. Part 4 OSEE Values				
SS	Branson	1	SS	Crest
Top	Bottom		Top	Bottom

TURI
TOXICS USE REDUCTION INSTITUTE
UMASS LOWELL

CLEANING LABORATORY EVALUATION SUMMARY

232	240		205	263
222	235		243	255
233	281		218	261
233	287		218	238
223	251		214	256
207	213		221	230
210	229		208	219
221			193	217
289			222	
234			168	
230	248	Average	211	277
23	27	Std Dev	20	17
Alumina		Branson		1
Top	Bottom	Side	Inside	
243	50	66	78	
43	41	43	96	
22	33	128	87	
63	24	39	68	
25	46	43	72	
60	44	30	78	
76	40	58	80	Average
84	10	36	10	Std Dev
Alumina		Crest		
Top	Bottom	Side	Inside	
81	320	121	325	
101	60	34	523	
61	63	30	364	
45	70	34	152	
63	324	42	236	
98	25	52	366	
75	144	52	328	
22	139	35	127	
Branson		2	Crest	
SS			SS	
Top	Bottom		Top	Bottom
180	265		218	248
233	227		216	258
244	199		214	267
216	191		262	250
213	183		265	248
197	193		245	231
164	242		263	210
211	204		213	
234			244	
236			280	
213	214	Average	242	245
26	31	Std Dev	25	19
Alumina				
Top	Bottom	Side	Inside	2
69	52	43	90	
78	28	76	63	
61	28	71	51	
59	25	81	66	
66	18	66	42	

CLEANING LABORATORY EVALUATION SUMMARY

47	18	41	55	
63	28	63	61	Average
10	13	17	17	Std Dev
Alumina				
Top	Bottom	Side	Inside	
66	50	61	659	
94	15	74	853	
45	22	38	880	
62	21	67	916	
35	14	70	352	
38	11	29	610	
57	22	57	932	
22	14	19	216	

Table 5. Part 5 OSEE Values

1-Branson	Crest
Top	Top
253	142
183	122
333	171
323	123
278	90
290	168
277	136
54	31
2	
Top	Top
329	169
342	160
355	203
349	189
358	189
254	129
331	173
39	27

Table 6. Comparison of Cleaning Methods

Results: 5/6 substrates cleaner using Branson method

OSEE	Branson		Crest	
up	Part 1	cleaner	Part 1	dirtier
up	Part 2	cleaner	Part 2	dirtier
up	Part 3	cleaner	Part 3	dirtier
down	Part 4s	dirtier	Part 4s	cleaner
up	Part 4a	cleaner	Part 4a	dirtier
down	Part 5	cleaner	Part 5	dirtier

The readings for both methods were relatively close and taking the standard deviations calculated, most readings were statistically the same.

Summary:

Substrates:	Alloys, Stainless Steel, Titanium				
Contaminants:	Cutting/Tapping Fluids, Lubricating/Lapping Oils, Dirt, Oil				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Branson Ultrasonics	GP	10	0.00	☑	
Valtech Corporation	Valtron SP 2200	2	0.00	☑	

Conclusion:

Using OSEE analysis, two cleaning methods were compared. Five of six substrates were cleaned better using the Branson method. The stainless-steel surface was the only material to be cleaned better using the Crest system.
Even though the Branson method yielded cleaner parts, the two methods could be considered comparable

when standard deviations are incorporated into the OSEE readings. Most of the readings for both methods could be considered equal and therefore parts would be at the same level of cleanliness.