CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2014

DateRun: 11/30/2014

Experimenters: Jason Marshall

ClientType: Electronics Manufacturer

ProjectNumber: Project #2

Substrates: Liquid, Marble, Molybdenum

PartType: Coupon

Contaminants:

Cleaning Methods: Immersion/Soak

Analytical Methods: ORP - Oxidation-reduction potential readings

Purpose: To evaluate supplied ozone generation unit for ozone levels via ORP readings.

Experimental Procedure: The wall mounted unit was turned on and allowed to reach a charge. The ozonated water was collected in a 1000 milliliter beaker. Approximately 250 sample was collected. Samples were collected after one gallon and after four gallons of water passed through the unit. Each solution was measured for oxidation reduction potential using a Hanna Instruments ORP meter model HI 98201. The measurement unit was placed in the solution and remained in the ozonated water throughout the analysis time period. The mV readings were recorded at various time intervals to determine the level of ORP. Time intervals were at T = 0, 5, 10, 15, 20, 25, 30, 45, 60, 75, 90, 105 and 120 minutes. Values were recorded and plotted. Temperature of the solution was recorded at the initial collection point. In addition to the ozonated water, tap water was measured with the ORP meter.

Results: All samples collected were found to have a temperature of 24 C except one that had a temperature of 29 C. The two tap water samples stayed nearly constant over the two-hour assessment time frame. The initial readings were 369 and 343. Ending levels were 365 (at 60 minutes) and 324. The samples that were collected at the one-gallon mark had lower ORP readings than those collected after four gallons. The ORP levels were 720 and 680 mV. The levels began dropping off by the five-minute mark. Final readings were 453 (60 minutes) and 423. For the four-gallon collections, initial readings continued to rise during the first 10 minutes after generation, then reaching a plateau and then dropping off around the 45-minute mark. Most of the samples collected were significantly lower at the 60-minute mark and then bottomed out at the 120-minute mark. The levels of ORP for the four-gallon collection were higher than at the one-gallon collection, peaking around the 1000 mV. All levels ended near the 425-450 mV range.

Time (min)	Tap water	Tap water run 2	Ozone (1 gallon)	Ozone Run 2 (1 gallon)	Ozone (4 gallon)	Ozone Run 2 (4 gallon)	Ozone Run 3 (4 gallon)	Ozone Run 4 (4 gallon)
0	369	343	720	680	755	940	973	942
5	369	340	681	658	805	973	996	980
10	368	340	653	608	838	973	996	980
15	368	341	605	568	843	982	999	953
20	367	340	568	541	840	965	982	941
25	367	340	520	524	830	969	984	955
30	366	339	490	506	811	961	981	917
45	366	338	460	474	654	898	970	766
60	365	337	453	447	520	624	891	555
75		334		434	463	504	712	479
90		331		430	449	460	556	452
105		328		426	443	445	481	439
120		326		423	440	437	453	431
Date	12/1/2014	12/2/2014	12/1/2014	12/3/2014	12/1/2014	12/2/2014	12/2/2014	12/3/2014
Temp C	24	24	24	29.1	24	24	24	24.5

Summary:

Conclusion: ORP levels for each ozonated water sample were found to decrease over a two-hour window. The longer the unit is run prior to collection resulted in an increase of the initial ORP levels but all ended at nearly the same end point. Tap water levels remained relatively constant over two hours.