CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2016
DateRun:	11/15/2016
Experimenters:	Vanessa Harripersaud
ClientType:	Chemical Company
ProjectNumber:	Project #1
Substrates:	Glass/Quartz, Chrome
PartType:	Coupon
Contaminants:	Films, Soaps
Cleaning Methods:	Manual Wipe
Analytical Methods:	Gravimetric, Visual
Purpose:	To evaluate CleanCore Aqueous Ozone solution (ozonated water) (at time = 0, 2 & 4 hrs) and a comparative cleaner on removal efficiency from glass and chrome substrates
Experimental Procedure:	hree pre-weighed coupons per cleaner were coated with 1 g of Glass soil, at 68°F(room temperature), using a hand held swab. The contaminated coupons were air dried for 24 hours at 68°F (room temperature) and weighed again to determine the amount of soil added after the 24 hour period. The CleanCore Aqueous Ozone kiosk machine was turned on and run to generate ozonated water. Ozonated water was collected into the CleanCore Spray Bottle. Properties of tap water and the ozonated water (directly from the spray hose and the CleanCore Spray Bottle) were measured and recorded throughout the procedure, as necessary, including temperature, ORP values (mV), dissolved ozone levels (ppm), and pH. Instrumentation used for measurements: on-machine: dissolved ozone meter - ATi Q45H (ozone in ppm and temp in °F); ORP meter - Black Stone BL982411 ORP Controller (ORP in mV) handheld instruments: Hanna HI 98121 meter (ORP & temp in °C); Chemetrics Meter with vacu-vials (dissolved ozone in ppm) At the appropriate time interval, based on the age of the ozonated solution in the CleanCore Spray Bottle (t= 0 hr, t=2 hr, t=4 hr), three coupons of each substrate were placed in the SLW unit and a KC Wypal reinforced paper towel was attached to the cleaning sled and treated with one spray of cleaning solution from the CleanCore Spray Bottle. Each coupon was sprayed once with the same cleaning solution. The cleaning unit was run for 20 cycles (equivalent of 30 seconds of cleaning). Coupons were dried overnight and final weights were recorded. Efficiencies were calculated and recorded. Three coupons of each substrate were also cleaned with a comparative cleaner (Windex) instead of the ozonated solution, following the same process on the SLW machine and for drying and final weights.

Results:

Ozonated H2O	t=0 hrs	t=2 hrs	t=4 hrs
Temperature	21.2 °C	21.7 °C	21.8 °C
Ozone Levels (in ppm & ORP mV)			
handheld meter (from spray bottle)	ORP 402 mV	248 mV	274 mV
meter on machine (during filling)	ORP 930 mV		
meter on machine	1.141 - 1.236 ppm		
vacu-vials (soln from hose)	0.89ppm		
vacu-vials (soln from spray bottle)	0.23 ppm	0.10 ppm	0.0 ppm
temp of water when made	68.1 °F		
pH of water when made	6.5		
tap water - ORP (handheld meter)	214 mV	242 mV	242 mV
tap water - temp (handheld meter)	20.0 °C	21.54 °C	21.5 °C
	0.02 ppm		

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ozone in tap water (vacu-vials)			

Removal

Cleaner	Initial wt	Final wt	% Removed
Clean Core Ozone soln, t- 0 hr	0.0651	0.0018	97.24
Glass	0.0571	0.0030	94.75
	0.0767	0.0081	89.44
Clean Core Ozone soln, t- 2 hr	0.0624	0.0048	92.31
Glass	0.0625	0.0068	89.12
	0.0596	0.0024	95.97
Clean Core Ozone soln, t- 4 hr	0.0649	0.0103	84.13
Glass	0.0535	0.0166	68.97
	0.0514	0.0050	90.27
Windex	0.1629	0.0102	93.74
Glass	0.1629	0.0082	94.97
	0.1225	0.0062	94.94
Clean Core Ozone soln, t- 0 hr	0.0607	0.0057	90.61
Chrome	0.0620	0.0023	96.29
	0.0561	0.0050	91.09
Clean Core Ozone soln, t- 2 hr	0.0558	0.0065	88.35
Chrome	0.0485	0.0009	98.14
	0.0513	0.0012	97.66
Clean Core Ozone soln, t- 4 hr	0.0531	0.0019	96.42
Chrome	0.0548	0.0008	98.54
	0.0556	0.0012	97.84
Windex	0.1056	0.0207	80.40
Chrome	0.1064	0.0149	86.00
	0.1063	0.0234	77.99

Glass Substrate

CompanyName:	Product Name	Conc.	% Efficiency	Effective
CleanCore	Aqueous Ozone	100%	T= 0 hrs: 93.81	
			T= 2 hrs: 92.47	
			T = 4 hrs: 81.12	Yes
Formula 409	Multi-Surface	100%	94.55	Yes

Observations (if any):

CleanCore Visual: more streaking/filminess noted on coupons cleaned with CleanCore Aqueous Ozone as compared to coupons cleaned with Windex

Windex Visual: more bright clean (sparkling) areas noted on coupons cleaned with Windex as compared to the coupons cleaned with CleanCore Aqueous Ozone

Chrome Substrate

CompanyName:	Product Name	Conc.	% Efficiency	Effective
CleanCore	Aqueous Ozone	100%	T= 0 hrs: 92.66	
			T= 2 hrs: 94.72	
			T = 4 hrs: 97.6	Yes

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Formula 409	Multi-Surface	100%	81.46	No

Observations (if any):

CleanCore visual: more filming and streaking noted on coupons cleaned with CleanCore Aqueous Ozone

Windex Visual: less streaking and filming noted on coupons cleaned with Windex as compared to coupons cleaned with CleanCore Aqueous Ozone

Summary:

Substrates:	Glass/Quartz, Chrome				
Contaminants:	Films, Soaps				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
CleanCore	CleanCore queous Ozone Solution	100	93.23	☑	T = 0
CleanCore	CleanCore queous Ozone Solution	100	93.59	☑	T = 2
CleanCore	CleanCore queous Ozone Solution	100	89.36	☑	T = 4
SC Johnson & Son Inc	Windex Glass & More Cleaner (Spray)	100	88.00	☑	

Conclusion:

For glass substrate with glass soil, the CleanCore Aqueous Ozone Solution had a removal efficiency of 93.81% at T=0, as compared to the 94.55% for the Windex Cleaner. Visually, more bright clean (sparkling) areas were noted on coupons cleaned with Windex as compared to the coupons cleaned with CleanCore Aqueous Ozone.

For chrome substrate with glass soil, the CleanCore Aqueous Ozone Solution had a removal efficiency of 92.66% at T=0, as compared to the 81.46% for the Windex Cleaner. Visually, less streaking and filming was noted on coupons cleaned with Windex as compared to coupons cleaned with CleanCore Aqueous Ozone.