CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2016
DateRun:	11/16/2016
Experimenters:	Vanessa Harripersaud
ClientType:	Chemical Company
ProjectNumber:	Project #1
Substrates:	Ceramics, Chrome
PartType:	Coupon
Contaminants:	Hucker's Soil
Cleaning Methods:	Manual Wipe
Analytical Methods:	Gravimetric
Purpose:	To evaluate CleanCore Aqueous Ozone solution (ozonated water) (at time = 0, 2 & 4 hrs) and a comparative cleaner on removal efficiency from ceramic and chrome substrates

Experimental Procedure:

Three pre-weighed coupons per cleaner were coated with 0.5 g of Huckers soil, at 68°F(room temperature), using a hand held swab. The contaminated coupons were air dried for 2 hours at 68°F (room temperature) and weighed again to determine the amount of soil added after the 2 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 (Formula 409 Multi-Surface Cleaner) 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	24.1 °C	24.0 °C	23.8 °C
Ozone Levels (in ppm & ORP mV)			
handheld meter (from spray bottle)	ORP 4098mV	244 mV	223 mV
meter on machine (during filling)	ORP 930 mV		
meter on machine	1.010 - 1.200 ppm		
vacu-vials (soln from hose)	1.06 ppm		
vacu-vials (soln from spray bottle)	0.46 ppm	0.04 ppm	0.01 ppm
temp of water when made	74.3 °F		
pH of water when made	6.5		
tap water - ORP (handheld meter)	287 mV	236 mV	212 mV
tap water - temp (handheld meter)	23.2 °C	23.0 °C	23.0 °C

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ozone in tap water (vacu-vials)	0.04 ppm		

Removal

Cleaner	Initial wt	Final wt	% Removed
Clean Core Ozone soln, t- 0 hr	0.2261	0.0659	70.85
Ceramic	0.2293	0.0609	73.44
	0.2586	0.0605	76.60
Clean Core Ozone soln, t- 2 hr	0.2339	0.1069	54.30
Ceramic	0.2509	0.1205	51.97
	0.2370	0.0825	65.19
Clean Core Ozone soln, t- 4 hr	0.2478	0.0488	80.31
Ceramic	0.2339	0.1494	36.13
	0.2398	0.0882	63.22
Formula 409 Multi-Surface Cleaner	0.2317	0.0204	91.20
Ceramic	0.2480	0.0122	95.08
	0.2474	0.0169	93.17
Clean Core Ozone soln, t- 0 hr	0.2376	0.0667	71.93
Chrome	0.2212	0.0631	71.47
	0.2355	0.0457	80.59
Clean Core Ozone soln, t- 2 hr	0.2680	0.0282	89.48
Chrome	0.2441	0.0297	87.83
	0.2289	0.0475	79.25
Clean Core Ozone soln, t- 4 hr	0.2302	0.0434	81.15
Chrome	0.2283	0.0395	82.70
	0.2322	0.0264	88.63
Formula 409 Multi-Surface Cleaner	0.2321	0.0091	96.08
Chrome	0.2293	0.0108	95.29
	0.2387	0.0148	93.80

Ceramic Substrate

CompanyName:	Product Name	Conc.	% Efficiency	Effective
CleanCore	Aqueous Ozone	100%	T= 0 hrs: 73.63	
			T= 2 hrs: 57.15	
			T = 4 hrs: 59.88	No
Formula 409	Multi-Surface	100%	93.15	Yes

Observations (if any):

CleanCore Visual thick residual portions of soil left after cleaning with CleanCore Aqueous Ozone as compared to Formula 409 Cleaner

Formula 409 visual: appreciably greater quantity of soil removed with Formula 409 Cleaner than with CleanCore Aqueous Ozone

Chrome Substrate

CompanyName:	Product Name	Conc.	% Efficiency	Effective

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CleanCore	Aqueous Ozone	100%	T= 0 hrs: 74.67	
			T= 2 hrs: 85.52	
			T = 4 hrs: 84.16	No at T = 0
Formula 409	Multi-Surface	100%	95.06	Yes

Observations (if any):

CleanCore Visual more residual soil left covering most of coupon surface for coupons cleaned with CleanCore Aqueous Ozone as compared to coupons cleaned with Formula 409 Multi-Surface Cleaner

Formula 409 visual: appreciably greater quantity of soil removed with Formula 409 Cleaner than with CleanCore Aqueous Ozone

Summary:

Substrates:	Ceramics, Chrome				
Contaminants:	Hucker's Soil				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
CleanCore	CleanCore queous Ozone Solution	100	74.15	☐	T = 0
CleanCore	CleanCore queous Ozone Solution	100	71.34	☐	T = 2
CleanCore	CleanCore queous Ozone Solution	100	72.02	☐	T = 4
Clorox Company	Formula 409 All Purpose Cleaner	100	94.10	☑	

Conclusion:

For ceramic substrate with Huckers soil, the CleanCore Aqueous Ozone Solution had a removal efficiency of 73.63 % at T=0, as compared to the 93.15 % for the Formula 409 Multi-Surface Cleaner. Visually, thick residual portions of soil were left after cleaning with CleanCore Aqueous Ozone as compared to Formula 409 Multi-Surface Cleaner. The CleanCore Aqueous Ozone solution was not effective at removing Huckers soil from ceramic coupons.

For chrome substrate with Huckers soil, the CleanCore Aqueous Ozone Solution had a removal efficiency of 74.67% at T=0, as compared to the 95.06 % for the Formula 409 Multi-Surface Cleaner. Visually, more residual soil was left covering most of coupon surface for coupons cleaned with CleanCore Aqueous Ozone as compared to coupons cleaned with Formula 409 Multi-Surface Cleaner. The CleanCore Aqueous Ozone solution was not effective at removing Huckers soil from chrome coupons (at T=0).