CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2016
DateRun:	11/17/2016
Experimenters:	Vanessa Harripersaud
ClientType:	Chemical Company
ProjectNumber:	Project #1
Substrates:	Ceramics, Stainless Steel, White Board
PartType:	Part
Contaminants:	Greases, Oil, Food
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, stainless steel, and painted steel substrates

Experimental Procedure:

Three pre-weighed coupons per cleaner were coated with 0.5 g of DCC 17 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 (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:

Operating Conditions:			
Ozonated H2O	t=0 hrs	t=2 hrs	t=4 hrs
Temperature	21.2 °C	22.6 °C	22.8 °C
Ozone Levels (in ppm & ORP mV)			
handheld meter (from spray bottle)	ORP 365 mV	242 mV	233 mV
meter on machine (during filling)	ORP 930 mV		
meter on machine	1.103 - 1.149 ppm		
vacu-vials (soln from hose)	0.76 ppm		
vacu-vials (soln from spray bottle)	0.19 ppm	0.03 ppm	0.02 ppm
temp of water when made	70.2 °F		
pH of water when made	6.5		
tap water - ORP (handheld meter)	262 mV	238 mV	242 mV

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tap water - temp (handheld meter)	21.3 °C	22.4 °C	22.5 °C
ozone in tap water (vacu-vials)	0.04 ppm		

Removal

Cleaner	Initial wt	Final wt	% Removed
Clean Core Ozone soln, t- 0 hr	0.4972	0.0235	95.27
Ceramic	0.5021	0.0169	96.63
	0.5118	0.0122	97.62
Clean Core Ozone soln, t- 2 hr	0.5116	0.0837	83.64
Ceramic	0.5058	0.0647	87.21
	0.5162	0.0422	91.82
Clean Core Ozone soln, t- 4 hr	0.5151	0.0542	89.48
Ceramic	0.4694	0.0555	88.18
	0.4901	0.0837	82.92
Formula 409 Multi-Surface Cleaner	0.4927	0.0204	95.86
Ceramic	0.4742	0.0316	93.34
	0.5046	0.0182	96.39
Clean Core Ozone soln, t- 0 hr	0.4192	0.0271	93.54
Stainless Steel	0.4435	0.023	94.81
	0.5346	0.0391	92.69
Clean Core Ozone soln, t- 2 hr	0.4749	0.0183	96.15
Stainless Steel	0.5285	0.0164	96.90
	0.4346	0.0198	95.44
Clean Core Ozone soln, t- 4 hr	0.4643	0.0173	96.27
Stainless Steel	0.4440	0.0096	97.84
	0.5699	0.0167	97.07
Formula 409 Multi-Surface Cleaner	0.4418	0.0085	98.08
Stainless Steel	0.4796	0.0064	98.67
	0.5851	0.0079	98.65
Clean Core Ozone soln, t- 0 hr	0.4855	0.0314	93.53
Painted Steel	0.4243	0.0140	96.70
	0.4811	0.0253	94.74
Clean Core Ozone soln, t- 2 hr	0.4497	0.0032	99.29
Painted Steel	0.5371	-0.0037	100.69
	0.4537	0.0097	97.86
Clean Core Ozone soln, t- 4 hr	0.5573	0.0366	93.43
Painted Steel	0.4715	0.0138	97.07
	0.4719	0.0332	92.96
Formula 409 Multi-Surface Cleaner	0.4912	0.0194	96.05
Painted Steel	0.4819	0.0303	93.71
	0.4476	0.0194	95.67

Ceramic Substrate

CompanyName:	Product Name	Conc.	% Efficiency	Effective (% Efficiency ≥ 80%)
CleanCore		100%		

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	Aqueous Ozone		T= 0 hrs: 96.51 %	
			T= 2 hrs: 87.56 %	
			T = 4 hrs: 86.86%	Yes
Formula 409	Multi-Surface	100%	95.20%	Yes

Observations (if any):

CleanCore Visual at T=0: appreciable quantity of soil removed

Stainless Steel Substrate

Formula 409 Visual: appreciable quantity of soil removed

Company Name:	Product Name	Conc.	% Efficiency	Effective
CleanCore	Aqueous Ozone	100%	T= 0 hrs: 93.68	
			T= 2 hrs: 96.16	
			T = 4 hrs: 97.06	Yes
Formula 409	Multi-Surface	100%	98.46	Yes

Observations (if any):

CleanCore Visual at T=0: more residual filming and streaking noted with coupons cleaned with CleanCore Aqueous Ozone as compared to those cleaned with Formula 409 Multi-Surface Cleaner

Formula 409 Visual: larger bright clean (shiny) surface area noted on coupons cleaned with Formula 409 Multi-Purpose Cleaner as compared to CleanCore Aqueous Ozone

Painted Steel Substrate

CompanyName:	Product Name	Conc.	% Efficiency	Effective
CleanCore	Aqueous Ozone	100%	T= 0 hrs: 94.99	
			T= 2 hrs: 99.28	
			T = 4 hrs: 94.49	Yes
Formula 409	Multi-Surface	100%	995.14	Yes

Observations (if any): CleanCore Visual at T=0: m residual filming and streaking were comparable between coupons cleaned by the two cleaners

Summary:

Substrates:	Ceramics, Stainless Steel, White Board				
Contaminants:	Greases, Oil, Food				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
CleanCore	CleanCore queous Ozone Solution	100	95.06	☑	T = 0
CleanCore	CleanCore queous Ozone Solution	100	94.33	☑	T = 2
CleanCore	CleanCore queous Ozone Solution	100	92.80	☑	T = 4
Clorox Company	Formula 409 All Purpose Cleaner	100	96.27	☑	

Conclusion:

For ceramic substrate with DCC 17 soil, the CleanCore Aqueous Ozone Solution had a removal efficiency of 96.51 % at T=0, as compared to the 95.20 % for the Formula 409 Multi-Surface Cleaner.

For stainless steel substrate with DCC 17 soil, the CleanCore Aqueous Ozone Solution had a removal efficiency of 93.68% at T=0, as compared to the 98.46 % for the Formula 409 Multi-Surface Cleaner. Visually, at T=0, more residual filming and streaking were noted with coupons cleaned with CleanCore Aqueous Ozone as compared to those cleaned with Formula 409 Multi-Surface Cleaner.

For painted steel substrate with DCC 17 soil, the CleanCore Aqueous Ozone Solution had a removal efficiency of 94.99% at T=0, as compared to the 95.14% for the Formula 409 Multi-Surface Cleaner. Visually, at T=0, residual filming and streaking were comparable between coupons cleaned by the two cleaners.