

CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2016

DateRun: 11/22/2016

Experimenters: Vanessa Harripersaud

ClientType: Chemical Company

ProjectNumber: Project #1

Substrates: Ceramics, Chrome

PartType: Coupon

Contaminants: Films, Soaps

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 1 g of Bathroom 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 (Lysol Power Bathroom 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 | 23.7 °C | 22.8 °C | 19.8 °C |
| | Ozone Levels (in ppm & ORP mV) | | | |
| | handheld meter (ozonated soln from spray bottle) (ORP) | 254 mV | 224 mV | 223 mV |
| | meter on machine (during filling of spray bottle) | ORP - 930 mV | | |
| | meter on machine | 1.044 - 1.230 ppm | | |
| | vacu-vials (ozonated soln from fill hose) | 0.85 ppm | | |
| | vacu-vials (ozonated soln from spray bottle) | 0.21 ppm | 0.05 ppm | 0.01ppm |
| | temp of water when made | 73.8 °F - 74.0 °F | | |
| | pH of water when made | 6.5 | | |
| | tap water - ORP (handheld meter) | 205 mV | 211 mV | 205 mV |

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| tap water - temp (handheld meter) | 24.0 °C | 22.5 °C | 21.0 °C |
| ozone in tap water (vacu-vials) | 0.04 ppm | | |

Removal

| Cleaner | Substrate | Coupon | Clean Wt | Dirty Wt | Final Wt | % Removed | % Average |
|----------------------|-----------|--------|----------|----------|----------|-----------|-----------|
| Ozone t=0 hrs | Ceramic | 13 | 81.2077 | 81.4510 | 81.2424 | 85.74 | 81.78 |
| | | 24 | 82.7321 | 82.9770 | 82.7833 | 79.09 | |
| | | 7 | 78.9031 | 79.1538 | 78.9520 | 80.49 | |
| Ozone t = 2hrs | | 3 | 80.4009 | 80.6167 | 80.4408 | 81.51 | 73.16 |
| | | 24 | 84.5556 | 84.8128 | 84.6362 | 68.66 | |
| | | 4 | 85.9874 | 86.3007 | 86.0836 | 69.29 | |
| Ozone t=4 hrs | | 12 | 81.2480 | 81.4485 | 81.3438 | 52.22 | 53.86 |
| | | 20 | 81.6970 | 81.8790 | 81.7626 | 63.96 | |
| | | 21 | 75.9327 | 76.1664 | 76.0603 | 45.40 | |
| Lysol Power | | 16 | 76.3611 | 76.5441 | 76.4258 | 64.64 | 62.03 |
| | | 88 | 78.4470 | 78.6981 | 78.5462 | 60.49 | |
| | | 44 | 77.9398 | 78.1924 | 78.0384 | 60.97 | |
| Ozone t=0 hrs | Chrome | 23 | 21.6569 | 21.8973 | 21.7319 | 68.80 | 75.64 |
| | | 24 | 21.7427 | 21.9867 | 21.7921 | 79.75 | |
| | | 9 | 21.6567 | 21.9027 | 21.7099 | 78.37 | |
| Ozone t = 2hrs | | 16 | 21.6806 | 22.0338 | 21.9261 | 30.49 | 44.58 |
| | | 9 | 21.6328 | 22.0473 | 21.8225 | 54.23 | |
| | | 13 | 21.7088 | 22.0446 | 21.8800 | 49.02 | |
| Ozone t=4 hrs | | 19 | 21.6759 | 22.0332 | 21.9186 | 32.07 | 30.39 |
| | | 22 | 27.2304 | 27.5551 | 27.4588 | 29.66 | |
| | | 18 | 21.6080 | 21.8622 | 21.7874 | 29.43 | |
| Lysol Power | | 6 | 21.6412 | 21.9569 | 21.8367 | 38.07 | 44.47 |
| | | 3 | 21.4829 | 21.8186 | 21.6200 | 59.16 | |
| | | 14 | 21.7242 | 22.0357 | 21.9230 | 36.18 | |

Ceramic Substrate

| CompanyName | Product Name | Conc. | % Efficiency | Effective |
|-------------|----------------|-------|----------------------|-------------------|
| | | | (% Efficiency ≥ 80%) | |
| CleanCore | Aqueous Ozone | 100% | T = 0 hrs: 81.78% | Yes, at T = 0 hrs |
| | | | T = 2 hrs: 73.16 % | |
| | | | T = 4 hrs: 53.86% | |
| Lysol | Power Bathroom | 100% | 62.03% | No |

Observations (if any): Visual at T=0: ceramic coupons looked appreciably cleaner compared to those cleaned with Lysol Power Bathroom Cleaner

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| Chrome Substrate | | | | |
| CompanyName: | Product Name | Conc. | % Efficiency | Effective |
| | | | (% Efficiency ≥ 80%) | |
| CleanCore | Aqueous Ozone | 100% | T = 0 hrs: 75.64 | No |
| | | | T = 2 hrs: 44.58 | |
| | | | T = 4 hrs: 30.39 | |
| Lysol | Power Bathroom | 100% | 62.03% | No |

Observations (if any: Visual at T=0: ceramic coupons looked appreciably cleaner compared to those cleaned with Lysol Power Bathroom Cleaner

Summary:

| | | | | | |
|----------------------|----------------------------------|---------------|--------------------|-------------------------------------|----------------------|
| Substrates: | Ceramics, Chrome | | | | |
| Contaminants: | Films, Soaps | | | | |
| Company Name: | Product Name: | Conc.: | Efficiency: | Effective: | Observations: |
| CleanCore | CleanCore aqueous Ozone Solution | 100 | 78.71 | <input checked="" type="checkbox"/> | T = 0 |
| Reckitt Benckiser | Lysol Bathroom Cleaner | 100 | 53.25 | <input type="checkbox"/> | |
| CleanCore | CleanCore aqueous Ozone Solution | 100 | 58.87 | <input type="checkbox"/> | T = 2 |
| CleanCore | CleanCore aqueous Ozone Solution | 100 | 42.12 | <input type="checkbox"/> | T = 4 |

Conclusion:

For ceramic substrate with bathroom soil, the CleanCore Aqueous Ozone Solution had a removal efficiency of 81.78% at T=0, as compared to the 62.03% for the Lysol Power Bathroom Cleaner. For chrome substrate with bathroom soil, the CleanCore Aqueous Ozone Solution had a removal efficiency of 75.64% at T=0, as compared to the 44.7% for the Lysol Power Bathroom Cleaner. Neither cleaner achieved the 80% benchmark.