

CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2015

DateRun: 06/01/2015

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ClientType: Cleaner Manufacturer

ProjectNumber: Project #1

Substrates: Stainless Steel

PartType: Coupon

Contaminants: Oil

Cleaning Methods: Immersion/Soak

Analytical Methods: Gravimetric

Purpose: To evaluate the efficiency one cleaner on GS 34 Soil-1 from stainless steel coupons using immersion technique.

Experimental Procedure: Eleven sets of stainless-steel coupons were weighed; each set consist of three coupons. The sets of coupons were soiled with GS 34 Soil-1. Both soils were applied at the loading of ~100mg. The soiled coupons were oven dried for 30 minutes at 40 °C for GS 34 Soil-1. Dirty weights were recorded for all of coupons after 15 minutes of cooling. Cooled coupons were then immersed into 500 mL of each cleaning agent for 30 minutes standing up and soiled side facing away from one another inside the beaker. After immersion, coupons were left to bake for an additional 30 minutes at 40 oC. It was left out to cool for another additional 15 minutes then weighed for final weights. After sitting out overnight, the cleaned coupons were applied with a pressured towel manually onto each set of three coupons then weighted again for a second final weight.

Soil 1: Maintenance soil = 10 grams of carbon black, 10 grams iron oxide, 100 ml WD-40, 100 ml hydraulic oil, and 100 ml gear oil.

Chemistries evaluated: BioCircle_L; BioCircle_Ultra; BioCircle_Aero; BioCircle_CB 100; BioCircle_CB 100_ALU; BioCircle_UNO SF; Simple Green; Chem Free SW4; Aquantene 330; LPS T91; Keteca

Results:

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| Cleaners | Initial | Final#1 | Final#2 | Final#3 | %Removed#1 | %Removed#2 | %Removed#3 | %Ave#1 | %Ave#2 | %Ave#3 |
|-----------------|----------|---------|---------|---------|------------|------------|------------|---------|---------|--------|
| BioCircle_L | | | | | | | | | | |
| | 0.1017 | 0.1180 | 0.1155 | 0.0505 | -16.03 | -13.57 | 50.34 | | | |
| | 0.1039 | 0.1184 | 0.1153 | 0.0513 | -13.96 | -10.97 | 50.63 | | | |
| | 0.0991 | 0.1452 | 0.1226 | 0.0486 | -46.52 | -23.71 | 50.96 | -25.5 | -16.08 | 50.64 |
| BioCircle_Ultra | | | | | | | | | | |
| | 0.1022 | 0.2827 | 0.186 | 0.0616 | -176.61 | -82 | 39.73 | | | |
| | 0.107 | 0.2044 | 0.1624 | 0.0515 | -91.03 | -51.78 | 51.87 | | | |
| | 0.1024 | 0.2412 | 0.1704 | 0.0609 | -135.55 | -66.41 | 40.53 | -134.4 | -66.73 | 44.04 |
| BioCircle_Aero | | | | | | | | | | |
| | 0.0989 | 0.1277 | 0.1148 | 0.0519 | -29.12 | -16.08 | 47.52 | | | |
| | 0.1039 | 0.1638 | 0.114 | 0.0463 | -57.65 | -9.72 | 55.44 | | | |
| | 0.1049 | 0.1177 | 0.111 | 0.0314 | -12.2 | -5.82 | 70.07 | -32.99 | -10.54 | 57.68 |
| BioCircle_CB | 100 | | | | | | | | | |
| | 0.1139 | 0.1959 | 0.1694 | 0.061 | -71.99 | -48.73 | 46.44 | | | |
| | 0.105 | 0.2232 | 0.1524 | 0.0593 | -112.57 | -45.14 | 43.52 | | | |
| | 0.1109 | 0.2309 | 0.1714 | 0.0523 | -108.21 | -54.55 | 52.84 | -97.59 | -49.47 | 47.6 |
| BioCircle_CB | 100_ALU | | | | | | | | | |
| | 0.1032 | 0.1911 | 0.1352 | 0.0419 | -85.17 | -31.01 | 59.4 | | | |
| | 0.0974 | 0.173 | 0.1189 | 0.0322 | -77.62 | -22.07 | 66.94 | | | |
| | 0.1164 | 0.2336 | 0.1505 | 0.0239 | -100.69 | -29.3 | 79.47 | -87.83 | -27.46 | 68.6 |
| BioCircle_UNO | SF | | | | | | | | | |
| | 0.1150 | 0.3531 | 0.2586 | 0.0838 | -207.04 | -124.87 | 27.13 | | | |
| | 0.1077 | 0.3339 | 0.2233 | 0.0834 | -210.03 | -107.34 | 22.56 | | | |
| | 0.0841 | 0.2697 | 0.2053 | 0.073 | -220.69 | -144.11 | 13.2 | -212.59 | -125.44 | 20.96 |
| Simple | Green | | | | | | | | | |
| | 0.0934 | 0.1268 | 0.1102 | 0.0404 | -35.76 | -17.99 | 56.75 | | | |
| | 0.0943 | 0.1441 | 0.108 | 0.0342 | -52.81 | -14.53 | 63.73 | | | |
| | 0.0980 | 0.1278 | 0.1131 | 0.0396 | -30.41 | -15.41 | 59.59 | -39.66 | -15.97 | 60.02 |
| Chem | Free SW4 | | | | | | | | | |
| | 0.0924 | 0.1201 | 0.1103 | 0.0328 | -29.98 | -19.37 | 64.5 | | | |
| | 0.1026 | 0.1445 | 0.1293 | 0.0368 | -40.84 | -26.02 | 64.13 | | | |
| | 0.1037 | 0.1401 | 0.1246 | 0.0276 | -35.1 | -20.15 | 73.38 | -35.31 | -21.85 | 67.34 |
| Aquantene | 330 | | | | | | | | | |
| | 0.0930 | 0.8305 | 0.1975 | 0.1722 | -793.01 | -793.01 | -112.37 | | | |
| | 0.0951 | 0.071 | 0.1815 | 0.1439 | 25.34 | 25.34 | -90.85 | | | |
| | 0.1031 | 0.2709 | 0.181 | 0.145 | -162.75 | -162.75 | -75.56 | -310.14 | -310.14 | -92.93 |
| LPS | T91 | | | | | | | | | |
| | 0.0900 | 0.0081 | 0.007 | 0.0063 | 91 | 92.22 | 93 | | | |
| | 0.0921 | 0.0219 | 0.006 | 0.0063 | 76.22 | 93.49 | 93.16 | | | |
| | 0.0926 | 0.019 | 0.0165 | 0.0158 | 79.48 | 82.18 | 82.94 | 82.23 | 89.3 | 89.7 |
| Kreussler | | | | | | | | | | |
| | 0.1009 | 0.2485 | 0.1654 | 0.0691 | -146.28 | -63.92 | 31.52 | | | |
| | 0.0901 | 0.2775 | 0.1646 | 0.0625 | -207.99 | -82.69 | 30.63 | | | |
| | 0.0947 | 0.1483 | 0.1285 | 0.0429 | -56.6 | -35.69 | 54.7 | -136.96 | -60.77 | 38.95 |

Summary:

| | | | | | |
|----------------------|-----------------------|---------------|--------------------|--------------------------|----------------------|
| Substrates: | Stainless Steel | | | | |
| Contaminants: | Oil | | | | |
| Company Name: | Product Name: | Conc.: | Efficiency: | Effective: | Observations: |
| Fisher Scientific | Absolute Ethanol | 0 | 0.00 | <input type="checkbox"/> | |
| J Walter Inc. | Bio Circle Ultra | 100 | | <input type="checkbox"/> | |
| J Walter Inc. | Bio Circle L | 100 | | <input type="checkbox"/> | |
| J Walter Inc. | Bio Circle Aero | 100 | | <input type="checkbox"/> | |
| J Walter Inc. | Bio Circle CB 100 | 100 | | <input type="checkbox"/> | |
| Fisher Scientific | Absolute Ethanol | 0 | 0.00 | <input type="checkbox"/> | |
| J Walter Inc. | Bio Circle CB 100 ALU | 100 | | <input type="checkbox"/> | |

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|----------------------------|-------------------------------------|-----|------|-------------------------------------|--|
| J Walter Inc. | Bio Circle UNO SF | 100 | | <input type="checkbox"/> | |
| Fisher Scientific | Absolute Ethanol | 0 | 0.00 | <input type="checkbox"/> | |
| Chem Free Corporation | SW-4 Ozzy Juice Degreasing Solution | 100 | | <input type="checkbox"/> | |
| Environmental Intelligence | Simple Green Cleaner & Degreaser | 100 | | <input type="checkbox"/> | |
| Gray Mills | Aquatene 360 | 100 | | <input type="checkbox"/> | |
| LPS Laboratories | T-91, Non Solvent degreaser | 100 | | <input checked="" type="checkbox"/> | |
| Kreussler | Kreussler K 4 | 100 | | <input type="checkbox"/> | |

Conclusion:

The cleaner that worked the best at removing GS-34 Soil 1 is T-91 with an efficiency of 89.70%. In comparison between all the Bio Circle products, the one that worked the best was Bio Circle CB 100 ALU with an efficiency of 68.60%. In addition to that the least effective Bio Circle cleaner is Bio Circle UNO SF with an efficiency of 20.96%. However, the cleaner Aquatene 330 was not effective at removing any of the soil with an efficiency of -92.93%. Nearly all the soil had remained after immersion. But in addition to that it had also left a green residue after the substrates have been dried and resulted in additional excess weight on the substrates resulting to a negative efficiency. Overall, the three best cleaners would be as follows: T-91, Bio Circle CB 100 ALU and Chem Free SW4.