# CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2019

DateRun: 06/10/2019

Experimenters: Julia Doyle

ClientType: Machinery Manufacturer

ProjectNumber: Project #1

Substrates: Stainless Steel

PartType: Coupon

Contaminants: Oil

Cleaning Methods: Ultrasonics

Analytical Methods: Gravimetric, Visual

Purpose: To evaluate the effectiveness of aqueous cleaners at the removal of gundrill oil/coolant from stainless steel alloy using heated ultrasonics at vendor recommended temperatures.

Experimental Procedure: Initial weights were obtained for 15 stainless steel coupons, three for each cleaner, before soiling with gundrill oil/coolant mixture on half of the coupon on one side. Coupons were immediately weighed to obtain the dirty weight. Three coupons were immersed in each cleaner for 25 minutes in their recommended temperature by the vendor while making observations every five minutes. Coupons were removed from cleaners, immersed in deionized (DI) water and allowed to air dry for one hour at room temperature (68 F) before taking final weights.

Chemistries Evaluated:

1. Buckeye Immersion Cleaner
2. Liquinox Critical Cleaning Detergent
3. Alconox Powdered Precision Cleaner

| Company Name | Product Name | Concentration | Temperature |
|---|---|---|---|
| Buckeye International | Buckeye Immersion Cleaner | 2:10 | 125 F |
| Alconox Inc. | Liquinox Critical Cleaning Detergent | 1:100 | 80 F |
| Alconox Inc. | Liquinox Critical Cleaning Detergent | 1:100 | 100 F |
| Alconox Inc. | Alconox Powdered Precision Cleaner | 1:100 | 80 F |
| Alconox Inc. | Alconox Powdered Precision Cleaner | 1:100 | 100 F |

Results: After air drying at room temperature (68F), it appeared there was some cleaner residue on the coupons, so coupons were patted dry once. Liquinox for both 80F and 100F temperatures were effective at removing oil/coolant and were at 91.81% and 94.85% respectively. Alconox was effective at the higher temperature of 100F at 96.40% effectiveness but not at 80F which was 85.01% effectiveness. Buckeye immersion cleaner was 94.56% effective at 125F with a higher concentration of 2:10 (1:5) when compared to the last test.

| Chemical Name | Initial Weight of Cont | Final Weight of Cont | % Removed | Average |
|---|---|---|---|---|
| Buckeye Immersion Cleaner | 0.0053 | 0.0001 | 98.11 | 94.56 |
| | 0.0052 | 0.0001 | 98.07 | |
| | 0.0104 | 0.0013 | 87.50 | |
| Liquinox (80F) | 0.0070 | 0.0005 | 92.85 | 91.81 |
| | 0.0081 | 0.0005 | 93.82 | |
| | 0.0080 | 0.0009 | 88.75 | |

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|---|---|---|---|---|
| Alconox (80F) | 0.0050 | 0.0008 | 84.00 | 85.01 |
| | 0.0072 | 0.0013 | 81.94 | |
| | 0.0055 | 0.0006 | 89.09 | |
| Liquinox (100F) | 0.0069 | 0.0002 | 97.10 | 94.85 |
| | 0.0108 | 0.0007 | 93.51 | |
| | 0.0099 | 0.0006 | 93.94 | |
| Alconox (100F) | 0.0088 | 0.0002 | 97.72 | 96.40 |
| | 0.0073 | 0.0001 | 98.63 | |
| | 0.0070 | 0.0005 | 92.86 | |

Summary:

| **Substrates:** | Stainless Steel |
|---|---|
| **Contaminants:** | Oil |

| Company Name: | Product Name: | Conc.: | Efficiency: | Effective: | Observations: |
|---|---|---|---|---|---|
| Buckeye International | Immersion Cleaner | 1:5 | 94.56 | ☑ | Buckeye Immersion Cleaner was effective for removing oil/coolant from stainless steel coupons. |
| Alconox Inc | Liquinox | 1:100 | 91.81 | ☑ | Liquinox was effective for removing oil/ coolant from stainless steel coupons. |
| Alconox Inc | Liquinox | 1:100 | 94.85 | ☑ | Liquinox was effective for removing oil/ coolant from stainless steel coupons. |
| Alconox Inc | Alconox | 1:100 | 85.01 | ☐ | Alconox was not effective for removing oil/ coolant from stainless steel coupons. |
| Alconox Inc | Alconox | 1:100 | 96.40 | ☑ | Alconox was effective for removing oil/ coolant from stainless steel coupons. |

Conclusion:

Coupons appeared clean once they were patted dry, which removed some apparent chemical residue. Coupons may benefit from a spray rinse instead of dipping coupon into DI water. Increasing the heat with the Alconox and Liquinox cleaners appeared to increase the percent removal of contaminant. Of note, when using the ultrasonic cleaner, it appeared that one coupon in each set had more oil droplets on it during the cleaning than the other two; not clear whether this is related to how much soil was added to the coupon or the placement in the ultrasonic cleaner.