

CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2018

DateRun: 02/20/2018

Experimenters: Hayley Byra

ClientType: General

ProjectNumber: Project #2

Substrates: Copper

PartType: Coupon

Contaminants: Lubricating/Lapping Oils

Cleaning Methods: Immersion/Soak

Analytical Methods: Gravimetric, Visual

Purpose: To evaluate the effectiveness of four TCE aqueous alternatives at removing lubricating oils from copper alloys.

Experimental Procedure: Nine copper coupons were tested for each cleaner. Initial weights were recorded, and three coupons were soiled for each contaminant using a handheld swab to cover the bottom third of the substrate. The coupons were then immersed, three at a time, in a beaker with 250ml of the chosen diluted cleaner at room temperature (68°F) for ten minutes. Visual observations were taken during this time, and final weights were recorded after cleaning. This process was repeated for each cleaner on all three contaminants.

| Results: | Cleaner | Soil | Initial wt | Final wt | %Removed | Avg %Removed | Overall %Removed |
|----------|------------------|----------------|------------|----------|----------|--------------|------------------|
| | Shopmaster | Oak 15A | 0.0333 | 0.03323 | 0.30 | 1.56 | 8.19 |
| | | | -0.0262 | -0.0269 | 2.67 | | |
| | | | 0.0142 | 0.0132 | 7.04 | | |
| | | Oak 941A | 0.0731 | 0.0505 | 30.92 | 15.43 | |
| | | | 0.0478 | 0.0412 | 13.81 | | |
| | | | 0.0254 | 0.0250 | 1.57 | | |
| | | M4 | 0.0790 | 0.0750 | 5.06 | 7.58 | |
| | | | 0.1323 | 0.1107 | 16.33 | | |
| | | | 0.0660 | 0.0651 | 1.36 | | |
| | Solution 2000 | Oak 15A | 0.0689 | 0.0698 | -1.31 | -11.03 | -2.50 |
| | | | 0.0359 | 0.0414 | -15.32 | | |
| | | | 0.0255 | 0.0297 | -16.47 | | |
| | | Oak 941A | -0.4644 | -0.4668 | -0.52 | 3.19 | |
| | | | 0.0295 | 0.0270 | 8.47 | | |
| | | | 0.0310 | 0.0305 | 1.61 | | |
| | | M4 | 0.2118 | 0.2134 | -0.76 | 0.33 | |
| | | | 0.1250 | 0.1025 | 0.00 | | |
| | | | 0.1258 | 0.1236 | 1.75 | | |
| | SC Aircraft | Oak 15A | 0.0539 | 0.0495 | 8.16 | 4.02 | 2.69 |
| | | | 0.0365 | 0.0340 | 6.85 | | |
| | | | 0.0374 | 0.0385 | -2.94 | | |
| | | Oak Draw 941-A | 0.0395 | 0.0334 | 15.44 | 9.09 | |
| | | | 0.0474 | 0.0467 | 1.48 | | |
| | | | 0.0416 | 0.0373 | 10.34 | | |
| | | M4 | 0.0406 | 0.0470 | 15.76 | -5.04 | |
| | | | 0.1497 | 0.1503 | -0.40 | | |
| | | | 0.0860 | 0.0851 | 1.05 | | |
| | Amberclean 527 L | Oak 15A | 0.0261 | 0.0261 | 0.00 | -2.15 | 2.95 |

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|--|-------|--------|--------|-------|-------|--|
| | | 0.0448 | 0.0434 | 3.13 | | |
| | | 0.0292 | 0.0320 | -9.59 | | |
| | Oak | 0.0682 | 0.6630 | 2.79 | 10.52 | |
| | Draw | 0.0568 | 0.0521 | 8.27 | | |
| | 941-A | 0.0654 | 0.0520 | 20.49 | | |
| | M4 | 0.1237 | 0.1251 | 1.13 | 0.48 | |
| | | 0.0780 | 0.0779 | 0.13 | | |
| | | 0.0489 | 0.0477 | 2.45 | | |

Summary:

| | | | | | |
|-------------------------|---|---------------|--------------------|--------------------------|----------------------|
| Substrates: | Copper | | | | |
| Contaminants: | Lubricating/Lapping Oils | | | | |
| Company Name: | Product Name: | Conc.: | Efficiency: | Effective: | Observations: |
| Buckeye International | Shopmaster | | 8.19 | <input type="checkbox"/> | |
| EnviroSan Products Ltd | Solution 2000 | | -2.50 | <input type="checkbox"/> | |
| Gemtek Products | SC Aircraft & Metal Cleaner Super Concentrate | | 2.69 | <input type="checkbox"/> | |
| Innovative Organics Inc | Amberclean 527 L | | 2.95 | <input type="checkbox"/> | |

Conclusion: