# CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2021

DateRun: 02/02/2021

Experimenters: Zoe Lawson, Justin Kiander

ClientType: Precision Instrument Manufacturer

ProjectNumber: Project #1

Substrates: Aluminum

PartType: Coupon

Contaminants: Greases

Cleaning Methods: Ultrasonics

Analytical Methods: Gravimetric, Visual

Purpose: The purpose of this experiment was to determine the effectiveness of cleaners via unheated ultrasonic cleaning.

Experimental Procedure: Cleaners were prepared to the following concentrations: Metalnox 6386 100%, Dimethyl Glutarate 100%, Water Works Heavy Duty Degreaser 7:1, SC Aircraft & Metal Cleaner 20%, Crystal Simple Green Industrial Cleaner 30 parts water. Three aluminum coupons were obtained and weighed for each of the cleaners being tested. Coupons were soiled with aviation grease and a dirty weight was recorded. Cleaners were placed into an ultrasonic bath at room temperature. Coupons were submerged into their respective cleaners and unheated ultrasonics was conducted for 15 minutes. After 15 minutes, coupons cleaned with SC Aircraft were rinsed in a deionized water bath at room temperature for 30 seconds. All coupons were then partially dried with a heat gun to remove excess solution and finished drying in air for 24 hours. Following the drying step, coupons were weighed again and a clean weight was recorded. Effectiveness of the cleaners was determined.

Results:

| Cleaner | Initial wt of cont | Final wt of cont | %Cont Removed | %AVG |
|---|---|---|---|---|
| Metalnox 6386 | 0.099 | 0.0059 | 94.04 | 92.33% |
| | 0.117 | 0.0191 | 83.68 | |
| | 0.1115 | 0.0008 | 99.28 | |
| Dimethyl Glutarate | 0.1609 | 0.1212 | 24.67 | 25.14% |
| | 0.0975 | 0.0722 | 25.95 | |
| | 0.125 | 0.094 | 24.8 | |
| Water Works | 0.1155 | 0.0091 | 92.12 | 94.84% |
| | 0.1578 | 0.0059 | 96.26 | |
| | 0.1761 | 0.0068 | 96.14 | |
| SC Aircraft & Metal | 0.1543 | 0.0127 | 91.77 | 93.22% |
| | 0.1124 | 0.0097 | 91.37 | |
| | 0.1153 | 0.004 | 96.53 | |
| Crystal Simple Green | 0.1378 | 0.1111 | 19.38 | 26.42% |
| | 0.1405 | 0.0828 | 41.07 | |
| | 0.1488 | 0.1208 | 18.82 | |

Water Works Heavy Duty Degreaser was determined to be the most effective cleaner with an average removal of 94.84%, followed closely by SC Aircraft 93.22% and Metalnox 92.33%. Significant improvement was achieved via unheated ultrasonics for many of the cleaners. All cleaners have now developed a pink color indicating the removal of the grease. Dimethyl glutarate slightly decreased in performance, but adding heat could help to improve both this cleaner and Crystal Simple Green. Next steps would be to conduct heated ultrasonics at 100°F.

Summary:

| **Substrates:** | Aluminum | | | | |
|---|---|---|---|---|---|
| **Contaminants:** | Greases | | | | |
| **Company Name:** | **Product Name:** | **Conc.:** | **Efficiency:** | **Effective:** | **Observations:** |
| Kyzen Corporation | Metalnox M6386 | 100% | 92.33 | ☑ | |
| Fisher Scientific | Dimethyl glutarate (CAS:1119-40-0) | 100% | 25.14 | ☐ | |
| Keteca USA | Water Works Heavy Duty Degreaser | 7:1 | 94.84 | ☑ | |
| | | 20% | 93.22 | | |

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|---|---|---|---|---|---|
| Gemtek Products | SC Aircraft & Metal Cleaner Super Concentrate | | | ☑ | |
| Simple Green | Crystal Simple Green Industrial Cleaner & Degreaser | 30 parts water | 26.42 | ☐ | |

Conclusion: Upon completion of testing, it was determined that unheated ultrasonics provided significant improvement for almost all cleaners. Water Works Heavy Duty Degreaser was the most effective with an average removal of 94.84%. There is, however, still some room for improvement, and next steps will be to conduct heated ultrasonics at 100°F for all cleaners.