

# CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2021

DateRun: 02/18/2021

Experimenters: Zoe Lawson, Justin Kiander

ClientType: Precision Instrument Manufacturer

ProjectNumber: Project #1

Substrates: Steel

PartType: Part

Contaminants: Oil

Cleaning Methods: Ultrasonics

Analytical Methods: Gravimetric, Visual

Purpose: The purpose of this experiment was to determine the effectiveness of cleaners on steel parts provided by the company.

Experimental Procedure: Cleaners were prepared to the following concentrations: Metalnox 6386 100%, Water Works Heavy Duty Degreaser 7:1, SC Aircraft & Metal 20%. All solutions and an ultrasonic bath were heated to 100°F. Three steel cut out parts were obtained and weighed for each of the cleaners being tested. Parts had been presoiled with packaging oil by the company. Once solutions reached the proper temperature, parts were submerged into their respective cleaners for 15 minutes under ultrasonic cleaning. After 15 minutes, parts cleaned with SC Aircraft were submerged into a deionized water bath at 100°F for 30 seconds. All parts were then dried with an air gun at ambient temperature to remove excess solution and prevent damage to the substrate. Parts were allowed to finish drying in air for 24 hours. Following the drying step, parts were weighed and a clean weight was recorded. Effectiveness of the cleaners was determined.

Results:

| Cleaner             | Initial wt of part | Final wt of part | Effective |
|---------------------|--------------------|------------------|-----------|
| Metalnox 6386       | 17.7424            | 17.7376          | Yes       |
|                     | 17.1949            | 17.1950          | No        |
|                     | 17.4549            | 17.4514          | Yes       |
| Water Works         | 16.9595            | 16.9630          | No        |
|                     | 16.8067            | 16.7986          | Yes       |
|                     | 18.0233            | 18.0185          | Yes       |
| SC Aircraft & Metal | 17.4061            | 17.4055          | Yes       |
|                     | 17.3505            | 17.3426          | Yes       |
|                     | 17.1702            | 17.1640          | Yes       |

Because parts arrived presoiled, initial weights were not able to be obtained. An attempt was made to keep cleaning parts after the first cycle to achieve a stable "initial" weight, but weights fluctuated too much between trials to produce accurate results. The weights presented in the chart above represent the first cycle of cleaning. Contact angle testing would be ideal to determine cleanliness, however, at the time of testing the contact angle machine is not operational.

Overall, cleaners were successful in removing the packaging oil from the steel parts. Spots of rusting were observed on the back of parts cleaned with Water Works after the first full cleaning and drying cycle. To avoid rusting a full air gun dry of the front and back of the part to remove all excess solution is necessary. Next steps would be to continue testing on the steel parts with aviation grease added.

Summary:

| <b>Substrates:</b>   |   | Steel  |             |                                     |   |
|----------------------|---|--------|-------------|-------------------------------------|---|
| <b>Contaminants:</b> |   | Oil    |             |                                     |   |
| Company Name:        | Product Name:                                 | Conc.: | Efficiency: | Effective:                          | Observations:   |
| Kyzen Corporation    | Metalnox M6386                                | 100%   |             | <input checked="" type="checkbox"/> |   |
| Keteca USA           | Water Works Heavy Duty Degreaser              | 7:1    |             | <input checked="" type="checkbox"/> | Potential to rust, a full air gun dry after cleaning is necessary to prevent rusting. |
| Gemtek Products      | SC Aircraft & Metal Cleaner Super Concentrate | 20%    |             | <input checked="" type="checkbox"/> |   |

Conclusion: Upon completion of testing it was determined that all cleaners were effective at removing the packaging oils from steel parts. Next steps would be to progress testing to include the aviation grease soil on steel substrates.