

CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2019
 DateRun: 01/01/1970
 Experimenters: Sabrina Apel, Othon Pagounes
 ClientType: Medical Instrument Mfr
 ProjectNumber: Project #1
 Substrates: Titanium
 PartType: Part
 Contaminants: Oil
 Cleaning Methods: Ultrasonics
 Analytical Methods: Visual

Purpose: Five sets of 26-28 titanium parts were provided pre-contaminated with J2. Cleaners were heated to vendor recommended temperatures before immersing the parts into an ultrasonic tank for 15 minutes. Visual observations were recorded overall with notes and a set of three parts per cleaner were evaluated by three lab technicians, labelled A-C in Table 1, for cleaner and contaminant residue according using the rating key below.

Experimental Procedure: Five sets of 26-28 titanium parts were provided pre-contaminated with J2. Cleaners were heated to vendor recommended temperatures before immersing the parts into an ultrasonic tank for 15 minutes. Visual observations were recorded overall with notes and a set of three parts per cleaner were evaluated by three lab technicians, labelled A-C in Table 1, for cleaner and contaminant residue according using the rating key below.

Rating Key:

| Rating Key | |
|------------|----------------------|
| 1 | No Residue |
| 2 | Slight Residue |
| 3 | Noticeable Residue |
| 4 | Considerable Residue |
| 5 | Severe Residue |

Results: Table 1: Visual Rating Results

| Cleaner | Conc. (%) | Temp. (°F) | Before Cleaning Rating | | | After Cleaning Rating | | | Average Score |
|-----------------|-----------|------------|------------------------|---|---|-----------------------|---|-----|---------------|
| | | | A | B | C | A | B | C | |
| Dowanol PnBGE | 100 | 100 | 4 | 5 | 4 | 2 | 2 | 1.5 | 2 |
| Ozzy Juice SW 3 | 100 | 110 | | | | 3 | 4 | 2.5 | 3 |
| Metalnox M6386 | 100 | 130 | | | | 1 | 1 | 1.5 | 1 |
| Sta-Sol ESS 160 | 100 | 106 | | | | 2 | 2 | 1.5 | 2 |
| Liquinox | 1 | 150 | | | | 5 | 5 | 5 | 5 |

Visual Observations:

Dowanol PnBGE - Slight cleaner residue and soil residue that remained on parts after cleaning.

Ozzy Juice SW3 - Slight cleaner residue and soil residue that remained on parts after cleaning.

Metalnox M6386 - No cleaner residue or soil residue on parts after cleaning

Sta-Sol ESS-160 - No cleaner residue or soil residue on parts after cleaning, however, it took a while for the parts to completely dry

Liquinox - Cleaner residue and soil residue remained on parts after cleaning. Cleaner will need a rinse step going forward with testing.

Summary:

| | | | | | | |
|----------------------|----------------------|---------------|--------------------|-------------------|----------------------|--|
| Substrates: | Titanium | | | | | |
| Contaminants: | Oil | | | | | |
| Company Name: | Product Name: | Conc.: | Efficiency: | Effective: | Observations: | |

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|-----------------------|-------------------------------------|------|------|-------------------------------------|---------------|
| Dow Chemical Company | Dowanol PnBGE | 100% | 2.00 | <input checked="" type="checkbox"/> | Visual Rating |
| Chem Free Corporation | SW-3 Ozzy Juice (Improved Low Odor) | 100% | 3.00 | <input type="checkbox"/> | Visual Rating |
| Kyzen Corporation | Metalnox M6386 | 100% | 1.00 | <input checked="" type="checkbox"/> | Visual Rating |
| JR Hess & Co., Inc. | Sta-Sol ESS 160 | 100% | 2.00 | <input checked="" type="checkbox"/> | Visual Rating |
| Alconox Inc | Liquinox | 1% | 5.00 | <input type="checkbox"/> | Visual Rating |

Conclusion:

Dowanol PnBGE, Metalnox 6386, and Sta-Sol ESS 160 were the most effective at removing J2 soil from titanium parts using heated ultrasonics.