

CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2017

DateRun: 05/06/2017

Experimenters: George Liang, Vinh Tran

ClientType: Cleaner Manufacturer

ProjectNumber: Project #1

Substrates: Copper

PartType: Coupon

Contaminants: Cutting/Tapping Fluids, Lubricating/Lapping Oils, Oil

Cleaning Methods: Manual Wipe

Analytical Methods: Gravimetric

Purpose: To evaluate the efficiency of supplied cleaner (Quicksolv DMC) and a comparative solvent (acetone) in the removal of Nisseki SAS-60E and Cut20 oils from copper coupons.

**Experimental
Procedure:**

Soiling Process:

A set of twelve copper coupons were weighed on an analytical balance to determine their initial mass. Once this was completed half of the coupons were evenly soiled with about 0.5 gram of Nisseki SAS-60E oil, and the other half with about 0.5 gram of Cut20 oil using a handheld swab. The coupons were reweighed to determine the mass of the coupons with the contaminant applied.

Cleaning Process:

Three coupons that were soiled with Nisseki SAS-60E oil were placed on a Gardner Straight Line Washability unit. A Kimberly-Clark Wypal reinforced paper towel was attached to the cleaning sled and soaked with one spray of Quicksolv DMC. Each coupon was sprayed once with the same cleaning solution. The cleaning unit was run for 20 cycles (~33 seconds). This same process was run on another set of three copper coupons soiled with Cut20 oil. The remaining six coupons were run through the same process but cleaned with acetone. The coupons were allowed to dry for an hour before being weighed. Final weights were recorded, efficiencies were calculated and recorded.

Chemistries Evaluated: Quicksolv DMC, Acetone

Results:

The sample cleaner Quicksolv DMC was just as effective as the acetone in removing the oils from the copper substrate. Both the Quicksolv DMC and the acetone had very high soil removal rates (97.11 - 98.84%, average 97.98% for Quicksolv DMC; 97.56 - 97.68%, average 97.62% for acetone).

| Cleaner | Soil | Initial wt. of Cont. (g) | Final wt. of Cont. (g) | Cont. Removed (%) | Avg. Cont. Removed (%) | Avg. Removal Efficacy (%) |
|---------------|-----------------|--------------------------|------------------------|-------------------|------------------------|---------------------------|
| Quicksolv DMC | Nisseki SAS-60E | 0.481 | 0.003 | 99.38 | 98.84 | 97.98 |
| | | 0.4868 | 0.0057 | 98.83 | | |
| | | 0.4906 | 0.0082 | 98.33 | | |
| | Cut20 | 0.482 | 0.0124 | 97.43 | 97.11 | |
| | | 0.5114 | 0.0136 | 97.34 | | |
| | | 0.6485 | 0.0223 | 96.56 | | |
| Acetone | Nisseki SAS-60E | 0.3509 | 0.0102 | 97.09 | 97.68 | 97.62 |
| | | 0.4956 | 0.0065 | 98.68 | | |
| | | 0.168 | 0.0046 | 97.26 | | |
| | Cut20 | 0.5017 | 0.0129 | 97.43 | 97.56 | |
| | | 0.5187 | 0.0093 | 98.21 | | |
| | | 0.4983 | 0.0147 | 97.05 | | |

Table Summary:

| Company Name | Product Name | Soil | Conc. (%) | Removal Efficacy (%) | Effective (Yes if >85%) |
|--------------|---------------|-----------------|-----------|----------------------|-------------------------|
| Inventec | Quicksolv DMC | Nisseki SAS-60E | 100 | 98.84 | Yes |
| Inventec | Quicksolv DMC | Cut20 | 100 | 97.11 | Yes |
| J.T. Baker | Acetone | Nisseki SAS-60E | 100 | 97.68 | Yes |

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| J.T. Baker | Acetone | Cut20 | 100 | 97.56 | Yes |
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Summary:

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|--------------------------------|----------------------|---|--------------------|-------------------------------------|------------------------------------|
| Substrates: | | Copper | | | |
| Contaminants: | | Cutting/Tapping Fluids, Lubricating/Lapping Oils, Oil | | | |
| Company Name: | Product Name: | Conc.: | Efficiency: | Effective: | Observations: |
| J.T. Baker | Acetone | 100 | 97.60 | <input checked="" type="checkbox"/> | Nisseki SAS-60E 97.68; Cut20 97.56 |
| Inventec Performance Chemicals | Quicksolv DMC | 100 | 98.45 | <input checked="" type="checkbox"/> | Nisseki SAS-60E 98.84; Cut20 97.11 |

Conclusion:

Both products performed at the same level on the two oils, removing over 97%.