

CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 1995
 DateRun: 05/16/1995
 Experimenters: Donald Garlotta, Jay Jankauskas
 ClientType: Stamping Company
 ProjectNumber: Project #1
 Substrates: Copper
 PartType: Part
 Contaminants: Cutting/Tapping Fluids, Lubricating/Lapping Oils, Oil
 Cleaning Methods: Ultrasonics
 Analytical Methods: Gravimetric, Wipe
 Purpose: Testing how the positions of tubes effect cleaning

Experimental Procedure: Testing the how the positions of the tubes will effect the cleaning inside the tubes. Two cleaners will be used, 10% Skyproducts Cleaner #10 and 4% ManGill #0650. For Each Cleaner, three positions will be used. First the tubes will be filled with cleaner and pointed hole side up. Second, the tubes will be filled with cleaner and lie on their side. Finally, the tubes will be filled with cleaner and pointed hole side down. Samples were cleaned using Crest Ultrasonics in a beaker for 15 minutes at 140 degrees. For all three testing conditions the tubes were filled with cleaner or water before washing and rinsing. The samples were rinsed in a beaker filled with tap water at 140 degrees and agitated with a stirbar. During rinsing the tubes were positioned hole side up so that the oil was allowed to escape. After rinsing the water was drained out of the tubes and they were placed in a convection oven set at 162 degrees for one hour and then placed in a vacuum oven set at for 1 hour. All samples were weighed before cleaning and after drying. The amount of residual oil on the inside of the tubes was checked by inserting a cotton swab in the hole and noticing the oil buildup on it. The amount of oil buildup will be termed: none, slight, moderate, heavy.

Results: GRAVIMENTRIC ANALYSIS

| sample # and tube positioning | amount of oil inside tubes (swab) | weight with contamination(g) | weight after cleaning (g) | weight change (g) |
|-------------------------------------|---|---------------------------------|------------------------------------|-------------------------|
| 49, upward | none | 15.5557 | 15.5474 | 0.0083 |
| 50, upward | slight | 15.5749 | 15.5621 | 0.0128 |
| 51, upward | slight | 15.589 | 15.5616 | 0.0274 |
| 52, upward | none | 15.5391 | 15.5261 | 0.0130 |
| 53, upward | heavy | 15.6068 | 15.5875 | 0.0193 |
| 54, upward | slight | 15.5993 | 15.5917 | 0.0076 |
| 55, upward | slight | 15.5775 | 15.5629 | 0.0146 |
| 56, upward | moderate | 15.5349 | 15.5084 | 0.0265 |
| 57, sideways | light | 15.5567 | 15.5436 | 0.0131 |
| 58, sideways | moderate | 15.637 | 15.6264 | 0.0106 |
| 59, sideways | none | 15.6652 | 15.6527 | 0.0125 |
| 60, sideways | slight | 15.5549 | 15.5319 | 0.0230 |
| 61, sideways | moderate | 15.5600 | 15.5523 | 0.0077 |
| 62, sideways | slight | 15.6249 | 15.6082 | 0.0167 |

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|-----------------|----------|---------|---------|--------|
| 63, sideways | moderate | 15.6576 | 15.6504 | 0.0072 |
| 64, sideways | heavy | 15.6700 | 15.6602 | 0.0098 |
| 65, downward | none | 15.6240 | 15.6129 | 0.0111 |
| 66 downward | moderate | 15.6230 | 15.6204 | 0.0026 |
| 67, downward | none | 15.5223 | 15.5005 | 0.0218 |
| 68, downward | heavy | 15.6682 | 15.6283 | 0.0399 |
| 69, downward | moderate | 15.6268 | 15.6101 | 0.0167 |
| 70, downward | slight | 15.6653 | 15.6494 | 0.0159 |
| 71, downward | heavy | 15.6077 | 15.5739 | 0.0338 |
| 72, downward | none | 15.5691 | 15.5604 | 0.0087 |

Notes and Observations:

Hole side up-Oil was released from the hole of the tube immediately after insertion into the ultrasonic bath. Tubes filled up easily in the cleaner but needed some agitation to fill the tubes totally up with rinse water. Average removal was .0162 grams with a standard deviation of .0075.

Hole side down-No noticable removal of oil during cleaning. But after draining the tubes after cleaning and rinsing, alot of oil was released. Average removal was .0188 grams with a standard deviation of .0126. Sideways-Due to cloudiness of cleaner solution could not see if any oil was being released. Tubes needed to be shaken up in order to allow cleaner solution to fill the tubes. Alot of oil was released from the tubes during draining. Average removal was .0126 grams with a standard deviation of .0052.

Summary:

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|---------------------------|---|---------------|--------------------|-------------------------------------|----------------------|
| Substrates: | Copper | | | | |
| Contaminants: | Cutting/Tapping Fluids, Lubricating/Lapping Oils, Oil | | | | |
| Company Name: | Product Name: | Conc.: | Efficiency: | Effective: | Observations: |
| Sky Products Company Inc | Cleaner #10 | 10 | | <input checked="" type="checkbox"/> | |
| Man Gill Chemical Company | Gillite 0650 Cl | 4 | | <input type="checkbox"/> | |

Conclusion:

Copper tubes looked very clean after drying. Some residual copper buildup was noticed on the bottom of the beaker of Skyproducts cleaner solution after cleaning. This is believed to be copper chips that were on the tubes prior to cleaning. The swab tests show that the Skyproducts #10 cleaner was superior to the Mangil Gillite 0650. The best oil removal was obtained when the tubes were placed upright. Better removal can be obtained with a longer cleaning time and better rinsing (most likely tumbling).