

CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2019

DateRun: 07/29/2019

Experimenters: Nicole Kebler, Julie Nguyen

ClientType: Electroplating Company

ProjectNumber: Project #1

Substrates: Copper

PartType: Coupon

Contaminants: Lubricating/Lapping Oils, Oil

Cleaning Methods: Immersion/Soak

Analytical Methods: Gravimetric, Visual

Purpose: To evaluate six cleaning products for Rustlick 50/50 removal from copper coupons.

Experimental Procedure: Three pre-weighed copper coupons were used for each cleaner. The coupons were soiled halfway on one side using a hand-held swab before dirty weights were recorded. Dilutions and temperature for each cleaner was based on vendor recommendations. Coupons were immersed three at a time for 15 minutes, and visual observations were recorded every five minutes. Cleaned coupons were rinsed in heated (95° F) tap water for five minutes, air dried for five minutes with a heat gun, and then final weights were recorded.

Results:

| Cleaner | Initial wt. of cont. | Final wt. cont. | % Cont. Removed | Average |
|---------|----------------------|-----------------|-----------------|---------|
| 1 | 0.1138 | 0.0025 | 97.80 | 99.03 |
| | 0.0825 | 0.0002 | 99.76 | |
| | 0.0890 | 0.0004 | 99.55 | |
| 2 | 0.0550 | 0.0000 | 100.00 | 99.26 |
| | 0.0825 | 0.0006 | 99.27 | |
| | 0.0946 | 0.0014 | 98.52 | |
| 3 | 0.0506 | 0.0014 | 97.23 | 97.53 |
| | 0.0560 | 0.0010 | 98.21 | |
| | 0.0662 | 0.0019 | 97.13 | |
| 4 | 0.0867 | 0.0030 | 96.54 | 98.24 |
| | 0.1318 | 0.0011 | 99.16 | |
| | 0.0906 | 0.0009 | 99.01 | |
| 5 | 0.0924 | 0.0039 | 95.78 | 94.65 |
| | 0.0827 | 0.0050 | 93.95 | |
| | 0.0779 | 0.0045 | 94.22 | |
| 6 | 0.0773 | 0.0025 | 96.76 | 97.83 |
| | 0.0867 | 0.0007 | 99.19 | |
| | 0.0771 | 0.0019 | 97.54 | |

Visual Observations

| Cleaner | 5 Mins | 10 Mins | 15 Mins | Rinse |
|---------|--|---|--|---|
| 1 | - immediate removal of all thin layer of soil - tiny clear bubbles forming - most soil removed before 5 min mark | - water turned slightly blue - some tiny clear bubbles on coupon | - water is slightly blue + cloudy - coupon looks clean - slight chemical smell | - coupon looks to be clean - dilution is clear |

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| | | | | |
|---|--|---|---|---|
| 2 | <ul style="list-style-type: none"> - too cloudy to see | <ul style="list-style-type: none"> - water clearing up - most soil looks to be removed - very small amount of tiny clear bubbles | <ul style="list-style-type: none"> - coupon looks clean - water is clear | <ul style="list-style-type: none"> - coupon looks to be clean - dilution is clear |
| 3 | <ul style="list-style-type: none"> - soil immediately turned pale blue - removing thin layers of soil before 5 mins - very thick layer of soils not removed | <ul style="list-style-type: none"> - thicker layers of soil slowly being removed - clear tiny bubbles visible on coupon | <ul style="list-style-type: none"> - water turning slightly cloudy + blue - lots of tiny clear bubbles | <ul style="list-style-type: none"> - coupon looks to be clean - dilution is clear |
| 4 | <ul style="list-style-type: none"> - soil immediately coming off - blue swirls (due to agitation) visible - swirls moving to top of water | <ul style="list-style-type: none"> - water slightly turning blue - tiny clear bubbles visible on coupon - thicker layer of soil still remain on coupon | <ul style="list-style-type: none"> - very little soil still on coupon - flakes of soil floating at top - water turning cloudy + blue | <ul style="list-style-type: none"> - coupon looks to be clean - dilution is clear |
| 5 | <ul style="list-style-type: none"> - soil immediately turned pale blue - soil forming swirls (due to agitation) | <ul style="list-style-type: none"> - thick layer of soil still remain - water getting cloudy - some soil still on coupon | <ul style="list-style-type: none"> - coupons look fairly clean before 15 min mark | <ul style="list-style-type: none"> - coupon looks to be clean - dilution is clear |
| 6 | <ul style="list-style-type: none"> - immediate blue swirls (soil coming off) - water getting slightly cloudy | <ul style="list-style-type: none"> - some soil rising to top - very thin blue rim at top of water | <ul style="list-style-type: none"> - water slightly cloudy - coupon looks fairly clean - tiny clear bubbles on coupon | <ul style="list-style-type: none"> - coupon looks to be clean - dilution is clear |

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Summary:

| | | | | | |
|------------------------------------|-------------------------------|---------------|--------------------|-------------------------------------|----------------------|
| Substrates: | Copper | | | | |
| Contaminants: | Lubricating/Lapping Oils, Oil | | | | |
| Company Name: | Product Name: | Conc.: | Efficiency: | Effective: | Observations: |
| Brulin Corporation | Aquavantage 1400 | 5% | 99.03 | <input checked="" type="checkbox"/> | |
| Hubbard Hall Inc | Emerald HD2 | 15% | 99.26 | <input checked="" type="checkbox"/> | |
| Alconox Inc | Alconox | 1% | 97.53 | <input checked="" type="checkbox"/> | |
| International Products Corporation | Micro 90 Conc. | 2% | 98.24 | <input checked="" type="checkbox"/> | |
| Alconox Inc | Liquinox | 1% | 94.65 | <input checked="" type="checkbox"/> | |
| Buckeye International | Immersion Cleaner | 20% | 97.83 | <input checked="" type="checkbox"/> | |

Conclusion:

All six cleaners were effective at removing Rustlick 50/50 from copper coupons. Next step would be to pick the top four best performing cleaners to test on dirty parts provided by Barry Industries.