

# CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 1998  
 DateRun: 10/13/1998  
 Experimenters: Jason Marshall  
 ClientType: Ceramic Decal Printer  
 ProjectNumber: Project #1  
 Substrates: Stainless Steel  
 PartType: Coupon  
 Contaminants: Inks  
 Cleaning Methods: Manual Wipe  
 Analytical Methods: Gravimetric

Purpose: To evaluate new, lower VOC, cleaning solvents for press clean-up.

Experimental Procedure: Prewieghed coupons were contaminated with the client supplied ink using a hand held swab. Ink was allowed to dry for 3 hours and then the coupons were weighed. Seven chemistries were selected based on the lab's Effective Test Conditions Database and vendor information. An eighth cleaner\* was supplied by the client for comparison. Each cleaner was used at room temperature and at 100% concentration. A paper towel was soaked with each cleaner. Coupons were wiped for no more than 1½ minutes. Three coupons were cleaned with each chemistry. Final clean weights were recorded and cleaning efficiencies were calculated.

SUBSTRATE MATERIAL: Stainless Steel (304)

CONTAMINANTS: Ink-Cerdec Magenta (CAS#'s: 119-64-2 Tetrahydronaphthalene; 65997-18-4 Lead Borosilicate Frit; 1345-24-0 Pigment Red 109; 20667-12-3 Silver Oxide)

Results: Almost all of the chemistries tested had complete removal of the ink. Only Oakite and WR Grace had less than 99% efficiency. The remaining six cleaners were above this value. The effectiveness of the cleaners and the amount of time required for cleaning are listed in Table 1.

Table 1. Cleaning Efficiencies and Times.

|                     | 100 Solvent | 4000 T | Bio-T Max | HTF 60 | Soy Gold | EP 921 | 1-1-02 | 294 XX |
|---------------------|-------------|--------|-----------|--------|----------|--------|--------|--------|
| Coupon 1            | 99.83       | 76.66  | 100       | 99.89  | 99.47    | 99.84  | 99.883 | 82.75  |
| Coupon 2            | 99.95       | 88.33  | 99.85     | 99.95  | 99.52    | 99.88  | 99.72  | 65.01  |
| Coupon 3            | 99.94       | 60.15  | 99.85     | 99.93  | 99.34    | 99.62  | 99.93  | 78.51  |
| Ave                 | 99.91       | 75.05  | 99.9      | 99.92  | 99.44    | 99.78  | 99.84  | 75.42  |
| Std Dev             | 0.067       | 14.16  | 0.087     | 0.031  | 0.093    | 0.14   | 0.11   | 9.26   |
| Time Required (min) |             |        |           |        |          |        |        |        |
|                     | <1          | >1.5   | < 1       | 1-1.5  | 1        | <1     | 1      | >1.5   |

The client supplied cleaner had an average cleaning of 99.91% performed in less than one minute. There were a couple other cleaners with similar efficiencies and times. BIO-T Max, HTF 60 and 1-1-2 all cleaned at or above 99.8% and within 30 seconds of the 100 Solvent. Two other cleaners removed between 99.4 and 99.8% of the contaminant in about the same time as the original cleaner.

Summary:

|                               |                 |                      |        |             |                                     |               |
|-------------------------------|-----------------|----------------------|--------|-------------|-------------------------------------|---------------|
| Substrates:                   | Stainless Steel |                      |        |             |                                     |               |
| Contaminants:                 | Inks            |                      |        |             |                                     |               |
| Company Name:                 |                 | Product Name:        | Conc.: | Efficiency: | Effective:                          | Observations: |
| Exxon Mobile Chemical Company |                 | Aromatic 100 Solvent | 100    | 99.91       | <input checked="" type="checkbox"/> |               |
| Oakite Products               |                 | Inproclean 4000 T    | 100    | 75.05       | <input type="checkbox"/>            |               |
| Bio Chem Systems              |                 | Bio T Max            | 100    | 99.90       | <input checked="" type="checkbox"/> |               |
| Tarksol Inc                   |                 | Tarksol HTF 60       | 100    | 99.92       | <input checked="" type="checkbox"/> |               |
| AG Environmental Products     |                 | Soy Gold 1000        | 100    | 99.44       | <input checked="" type="checkbox"/> |               |
| Inland Technologies Inc       |                 | EP 921               | 100    | 99.78       | <input checked="" type="checkbox"/> |               |
| Finger Lakes Chemical         |                 | 1-1-02               | 100    | 99.84       | <input checked="" type="checkbox"/> |               |
| Magnaflux                     |                 | Daraclean 294 xx     | 100    | 75.42       | <input type="checkbox"/>            |               |

Conclusion:

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Of the seven chemistries tested, five had similar cleaning action as the supplied product. The next test will be to determine the effect the cleaners have on the CDF Direct Film Coating.