

CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2008
 DateRun: 03/28/2008
 Experimenters: Jason Marshall, Shweta Bansal
 ClientType: Machining Company
 ProjectNumber: Project #1
 Substrates: Aluminum
 PartType: Coupon
 Contaminants: Inks
 Cleaning Methods: Manual Wipe
 Analytical Methods: Visual, Timing
 Purpose: To evaluate the sixth supplied ink on the top products.

Experimental Procedure: The top ten products from the previous trial were used at full strength and room temperature. Twenty preweighed coupons were coated with the supplied Avery Marks-A-Lot permanent marker (black). Once dry, a second weight was recorded to determine the amount of ink added to the coupon. As in the last trial, two coupons were used per cleaning alternative. A handheld swab was immersed into the cleaning product and then manual wiped across the coupon for up to one minute. Following the cleaning, the coupons were wiped dry for 5 seconds. Observations were made, final coupon weights recorded, and the average efficiencies were calculated.

Results: As was the case for the blue Sharpie marker, due to the limited weight added by the black permanent marker, gravimetric analysis yielded inconclusive results. Therefore, analysis was performed based on visual rankings and length of time needed to clean the coupons. Products were considered successful in they removed the ink in under one minute of cleaning.

Nine of ten products removed all of the ink in under 10 seconds. The 10th product removed almost all of the ink after 60 seconds. The table below lists the time required to clean and the observations made.

| Cleaner | Time | Visual |
|----------------------------------------|------|--------------------|
| Soy Clear 1500 | >60 | Nearly all removed |
| Ink Zapper | 7 | All removed |
| Methyl Ester 1618 | 6 | All removed |
| Citrus Soy Solvent Cleaner & Degreaser | 9 | All removed |
| Graffiti Remover SAC | 5 | All removed |
| BioRenewables Industrial Degreaser | 5 | All removed |
| EP 921 | 6 | All removed |
| BG Solv 717 Ink & Graffiti Cleaner | 3 | All removed |
| Graffiti remover | 4 | All removed |
| Smart Solve 605 | 6 | All removed |

Summary:

| Substrates: | Aluminum | | | | |
|---------------------------|----------------------------------------|--------|-------------|-------------------------------------|---------------|
| Contaminants: | Inks | | | | |
| Company Name: | Product Name: | Conc.: | Efficiency: | Effective: | Observations: |
| AG Environmental Products | Soy Clear 1500 | 100 | | <input type="checkbox"/> | |
| Vertec BioSolvents | Ink Zapper | 100 | | <input checked="" type="checkbox"/> | |
| Twin Rivers Technologies | Methyl Ester 1618 | 100 | | <input type="checkbox"/> | |
| Bi-O-Kleen Industries | Citrus Soy Solvent Cleaner & Degreaser | 100 | | <input checked="" type="checkbox"/> | |
| Spartan Chemical Company | Graffiti Remover SAC | 100 | | <input checked="" type="checkbox"/> | |
| Spartan Chemical Company | BioRenewables - Restroom Cleaner | 100 | | <input checked="" type="checkbox"/> | |
| Inland Technologies Inc | EP 921 | 100 | | <input checked="" type="checkbox"/> | |

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|-----------------------------------|------------------------------------|-----|--|-------------------------------------|--|
| BioGenesis Enterprises Inc | BG Solv 717 Ink & Graffiti Cleaner | 100 | | <input checked="" type="checkbox"/> | |
| Finger Lakes Chemical | Graffiti remover | 100 | | <input checked="" type="checkbox"/> | |
| United Laboratories International | Smart Solve 605 | 100 | | <input checked="" type="checkbox"/> | |

Conclusion:

Following successful laboratory testing of multiple products on the various inks, the next step will be to select products for on-site piloting.