

CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2024
 DateRun: 11/21/2024
 Experimenters: Amelia Wagner
 ClientType: Textile Mfr
 ProjectNumber: Project #1
 Substrates: Stainless Steel
 PartType: Coupon
 Contaminants: Plastic
 Cleaning Methods: Manual Wipe
 Analytical Methods: Gravimetric, Timing

Purpose: To test the efficacy of other solvents to manually remove three types of polymers from stainless steel

Experimental Procedure: Three 304 stainless steel coupons were assigned to each of the soils per solvent resulting in a total of 27 coupons total. Each coupon was weighed with a mass balance and had their initial weights recorded. Each coupon was then soiled with its respective polymer and catalyst mixture. To soil each coupon, a pipette was used to apply a 0.5ml of the correct polymer catalyst mixture in a stripe across the middle of the coupons. The stripe of soil was then spread with a paint scraper to apply a thin coating to the bottom half of the coupon. After drying for 30 seconds, the next layer was applied. Each coupon was soiled with a total of 5 layers. After the soil was applied, the coupons were placed in the oven at 325F for 5 mins to cure the polymers. Each coupon had their dirty weights recorded. Each coupon was then timed while manually wiped with a cotton rag dipped in the respective solvent with circular motions. Manual wiping was ceased when all visible soil was removed from a coupon. If all visible soil was not able to be fully removed at 5 mins (300 seconds), cleaning was ceased. Coupons were then left to air dry for 30 mins before recording their clean weights.

Results:

| Cleaner | Soil | Initial wt of cont. | Final wt of cont. | %Cont Removed | % AVG | % Overall | Time until clean | Secs AVG | Secs Overall |
|--------------------|--------------|---------------------|-------------------|---------------|--------|-----------|------------------|----------|--------------|
| Dimethyl Succinate | 7195 NF Alum | 0.0575 | 0.0061 | 89.39 | 17.96 | 46.13 | 202 | 267 | 187 |
| | | 0.1026 | 0.1346 | -31.19 | | | 300 | | |
| | | 0.0973 | 0.1015 | -4.32 | | | 300 | | |
| | 7229 | 0.0847 | 0.0119 | 85.95 | 26.56 | | 194 | 265 | |
| | | 0.0849 | 0.0865 | -1.88 | | | 300 | | |
| | | 0.0956 | 0.0998 | -4.39 | | | 300 | | |
| | 7223 | 0.1759 | 0.0104 | 94.09 | 93.87 | | 35 | 28 | |
| | | 0.1445 | 0.0099 | 93.15 | | | 22 | | |
| | | 0.1675 | 0.0094 | 94.39 | | | 26 | | |
| Sta Sol | 7195 NF Alum | 0.1285 | 0.0114 | 91.13 | 60.47 | 44.78 | 58 | 165 | 164 |
| | | 0.1013 | 0.0131 | 87.07 | | | 138 | | |
| | | 0.0716 | 0.0693 | 3.21 | | | 300 | | |
| | 7229 | 0.0806 | 0.1005 | -24.69 | -14.99 | | 300 | 300 | |
| | | 0.1262 | 0.1503 | -19.10 | | | 300 | | |
| | | 0.1112 | 0.1125 | -1.17 | | | 300 | | |
| | 7223 | 0.1118 | 0.0130 | 88.37 | 88.85 | | 20 | 26 | |
| | | 0.1252 | 0.0141 | 88.74 | | | 46 | | |
| | | 0.1440 | 0.0152 | 89.44 | | | 13 | | |

The polymers 719f NF Alum and 7229 absorbed the cleaning liquid during the cleaning cycle causing the clean weights to be heavier than the initial weights, resulting in negative percentages of contaminant removed.

Neither Dimethyl Succinate nor Sta Sol evaporated after 30 mins of air drying, so all coupons were dried with a heat gun before taking clean weights.

Summary:

| | | | | | |
|----------------------|------------------------------------|---------------|--------------------|--------------------------|----------------------|
| Substrates: | Stainless Steel | | | | |
| Contaminants: | Plastic | | | | |
| Company Name: | Product Name: | Conc.: | Efficiency: | Effective: | Observations: |
| JR Hess & Co., Inc. | Sta-Sol ESS 160 | 100% | 44.78 | <input type="checkbox"/> | |
| Fisher Scientific | Dimethyl Succinate (CAS: 106-65-0) | 100% | 46.13 | <input type="checkbox"/> | |

Conclusion:

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Neither Dimethyl Succinate nor Sta Sol are effective in removing all three polymer soils from stainless steel. Both were only successful in removing the 7223 soil.