CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	1996
DateRun:	02/04/1996
Experimenters:	Jay Jankauskas, Sutherman Ramesh
ClientType:	Coatings Manufacturer
ProjectNumber:	Project #1
Substrates:	Stainless Steel
PartType:	Coupon
Contaminants:	Adhesive, Coatings
Cleaning Methods:	Ultrasonics
Analytical Methods:	Gravimetric, Scrape Test
Purpose:	Eight chemistries were tested in phase 1

Experimental Procedure:

The purpose of this trial is to complete phase one testing for Coatings Manufacturer. Eight different chemistries were tested at maximum recommended operating conditions. Chemistries that show potential will be used in phase two and phase three testing.
Twenty-four 2"x4" 304 Stainless Steel coupons were precleaned in a 20% solution of ND-Supreme in the Crest Ultrasonic console for 20 minutes at 140 F. The coupons were then rinsed in DI water for 2 minutes at 120 F. The coupons were run under air knives for two minutes and then dried for 30 minutes in a convection oven. The coupons were then allowed to cool down for 30 minutes.
After cooling the coupons were measured for a clean weight and then contaminated with both contaminants. The left side of the coupon was contaminated with Basecoat #51144 while the right side was contaminated with #51072. Curing lasted overnight. After curing, the coupons were weighed for a contaminated weight.
Cleaning was performed for 30 minutes at a Temperature of 160 F (+-5 F) in a 600 ml beaker with stir-bar agitation. The stir-bar setting was maintained constant for each chemistry tested. Cleaning time was for 30 minutes. All water-based chemistries were diluted to 50% while the rest of the chemistries were used at full strength. After cleaning, the coupons were immersed in tap water for 2 minutes at 100 F. (Tap water rinsing is not appropriate for some chemistries, but the rinsing will be more carefully evaluated in Phases II and III.) After rinsing the coupons were dried at 140 F in a convection oven for one hour. The coupons were allowed to cool down overnight, and then weighed the next day.

SUBSTRATE MATERIAL: 304 Stainless Steel Coupons
CONTAMINANTS: Durane Base Coatings #51072 & #51144
CONTAMINATING PROCESS USED: Rubbed on with swab and allowed to cure overnight

Results:

Out of the eight different chemistries tested, four show a lifting mechanism (all four U.S. Polychem chemistries). To evaluate the effectiveness of these chemistries a scrape test was used on the remaining coating after cleaning. The other four chemistries use a dissolving mechanism on the coatings so gravimetric analysis was successful in evaluating the effectiveness of these chemistries.

GRAVIMETRIC RESULTS

U.S. Polychem Polyspray Jet 790P (50% solution)-#51072 coating was totally removed on all 3 coupons. #51144 Coating was scraped and could be pulled off of coupon with little effort.

sample #	clean mass (g)	mass with contamination (g)	mass after cleaning (g)	contaminant removed (g)	Percent Removal
4	60.4205	61.4891	60.9933	0.4958	46.40%
5	59.7666	60.8911	60.4188	0.4723	42.00%
6	60.484	61.4893	61.0261	0.4632	46.08%
				Average	44.82%
				StDev.	2.45%

U.S. Polychem Polyspray Jet 790 XS (50% solution)- Effective on the #51072 (except on coupon #7). Scrape test showed that #51144 Coating could be pulled off with quite a bit of effort.

sample #	clean mass (g)	mass with contamination (g)	mass after cleaning (g)	contaminant removed (g)	Percent Removal
7	59.9058	61.0715	61.0420	0.0295	2.53%
8	60.1100	61.2037	60.7258	0.4779	43.70%
9	60.6564	61.5477	60.9692	0.5785	64.91%
				Average	37.04%

CLEANING LABORATORY EVALUATION SUMMARY

				StDev.	31.71%

U.S. Polychem Polyspray Jet 790C (50% solution)- Not effective on the #51144 Coating at all.

sample #	clean mass (g)	mass with contamination (g)	mass after cleaning (g)	contaminant removed (g)	Percent Removal
10	60.0143	61.0900	60.4747	0.6153	57.20%
11	60.7083	61.8142	61.1438	0.6704	60.62%
12	60.2780	61.3615	61.2888	0.0727	6.71%
				Average	41.51%
				StDev.	30.19%

Frederick Gumm Cleppo 288-D (50% solution)- Effective on the #51144, but a longer cleaning time will be required to remove the #51072.

sample #	clean mass (g)	mass with contamination (g)	mass after cleaning (g)	contaminant removed (g)	Percent Removal
13	60.3352	61.8657	61.2669	0.5988	39.12%
14	60.5393	61.6671	60.6663	1.0008	88.74%
15	60.7022	62.1118	61.8616	0.2502	17.75%
				Average	48.54%
				StDev.	36.42%

Ecolink Safe Strip (non-diluted)-Excellent Removal of the Basecoat #51072, A longer cleaning time will be necessary to remove the #51144

sample #	clean mass (g)	mass with contamination (g)	mass after cleaning (g)	contaminant removed (g)	Percent Removal
16	60.5761	61.6049	60.6560	0.9489	92.23%
17	60.3589	61.4997	60.3737	1.1260	98.70%
18	59.9049	61.1859	59.9882	1.1977	93.50%
				Average	94.81%
				StDev.	3.43%

.S. Polychem 69MC (non-diluted)- Lifts off the #51072 in 10 minutes. Scrape test showed that the remaining #51144 Coating could be removed easily after cleaning.

sample #	clean mass (g)	mass with contamination (g)	mass after cleaning (g)	contaminant removed (g)	Percent Removal
19	60.2195	61.3182	60.8249	0.4933	44.90%
20	60.4775	61.4268	60.9516	0.4752	50.06%
21	60.2207	61.2342	60.6523	0.5819	57.41%
				Average	50.79%
				StDev.	6.29%

Terpene Technologies HTF 85B (non-diluted)-Almost as effective as the Ep-921, lower % removal on coupon 22 was due to a high contaminant load.

sample #	clean mass (g)	mass with contamination (g)	mass after cleaning (g)	contaminant removed (g)	Percent Removal
22	60.0098	62.058	60.0875	1.9705	96.21%
23	60.1060	61.1690	60.1068	1.0622	99.92%
24	60.2287	61.1451	60.2314	0.9137	99.71%
				Average	98.61%
				StDev.	2.09%

Inland Technologies EP 921(non-diluted)- The most effective chemistry tested. Total removal occurred after 20 minutes.

sample #			mass after	contaminant removed (g)	Percent Removal

CLEANING LABORATORY EVALUATION SUMMARY

	clean mass (g)	mass with contamination (g)	cleaning (g)		
25	60.5203	61.7187	60.5213	1.1974	99.92%
26	59.3011	60.1552	59.3024	0.8528	99.85%
27	60.2420	61.0863	60.244	0.8423	99.76%
				Average	99.84%
				StDev.	0.08%

Summary:

Substrates:	Stainless Steel
Contaminants:	Adhesive, Coatings

Company Name:	Product Name:	Conc.:	Efficiency:	Effective:	Observations:
US Polychem Corporation	Polyspray Jet 790 P	50	44.82	☐	
US Polychem Corporation	Polyspray Jet 790 XS	50	37.04	☐	
US Polychem Corporation	Polyspray Jet 790 C	50	41.51	☐	
Frederick Gumm Chemical	Clepo 228 D Paint Stripper	50	48.82	☐	
EcoLink	Safe Strip	100	94.81	☑	
US Polychem Corporation	Product 69 MC	100	50.79	☐	
Tarksol Inc	Tarksol HTF 85 B	100	98.61	☑	
Inland Technologies Inc	EP 921	100	99.84	☑	

Conclusion:

The Safestrip, Cleppo-228C, PolySpray Jet 790C & 790XS were determined to be ineffective and should not be considered. The 69MC and the Polyspray Jet 790P will need a longer cleaning time to remove all of the urethane. The EP921 and HTF 85B performed excellent. The only concern may be the low flash point of the EP921 (146 F). Rinsing will definitely need to be looked in in phase II.