CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2002
DateRun:	09/22/2002
Experimenters:	Jason Marshall
ClientType:	Cleaner Manufacturer
ProjectNumber:	Project #1
Substrates:	Wood
PartType:	Coupon
Contaminants:	Coatings, Paints, Resins/Rosins
Cleaning Methods:	Manual Wipe
Analytical Methods:	Visual
Purpose:	To evaluate and compare client products for various coating removal with other vendor products
Experimental Procedure:	Surface Solutions Laboratory Modified procedure for ASTM D6189-97 Standard Practice for Evaluating the Efficiency of Chemical Removers for Organic Coatings (Copyright 2002 ASTM International, West Conshohocken, PA. All rights reserved.)

Summary of Practice
Test panels are coated and forced dry. The coatings remover is applied with a brush and the loosened coating is lifted with a plastic scrapper after a specified time. Coatings removal efficiency is determined and recorded using the rating scheme 5 to 0.

Testing Materials
Finishes - It is recommended to test coatings removers on a variety of finishes such as latex enamel, alkyd enamel, polyurethane, varnish, shellac and nitrocellulose lacquer or as agreed upon between the purchaser and the seller.
Wood test panels of solid wood or wood laminate such as birch plywood, fir, pine, oak or walnut. Smooth sawn panels of dimensions not less than 12 by 12 in and 5/16 in thick.*1

Panel Preparation
Wood Panel Preparation - Store the wood for a least 6 days under standard conditions as specified in Specification D 3924.
Sand the panels lightly with sandpaper (Very Fine Garnet Abrasive-Type Sandpaper, 240 to 220 grade).
*2 Coat one side of a panel with a test coating by any method specified in Practices D 823 to ensure uniform film thickness, using manufacturers' recommended coverage rate. Allow the coating to dry overnight under standard conditions.
Apply a second coat of the same type of coating using the same method. *3 Force dry at 120 F overnight. Allow the panel to cool to ambient temperature.
Apply and dry a third coat of the same type of coating as in previous step.
*4

Procedure
Apply coating remover in accordance with the manufacturers' instructions, using a solvent resistant brush unless otherwise directed by the manufacturer. Stroke the surface in one direction only. Start the stopwatch after the panel has been fully coated. Leave the panel in the horizontal position during the test. Wait 15 minutes for solvent-borne removers and 60 minutes water-borne removers, or at times specified by the manufacturer for the type of coating being removed.

*5 Scrape the surface with a plastic paint scraper to remove the coating without damaging the substrate.
*6 Rate the test panel for coating removal efficiency on a scale from 5 to 0 in accordance with the following:

Rating	Amount of Coatings Removal %
5	100
4	75
3	50
2	25
1	10
0	0

Rate the effect of the coatings removal on the condition of the substrate on a scale from 5 to 0 in accordance with the following:

Rating	Condition of Substrate
5	No effect
4	Very slight
3	Slight
2	Moderate
1	Considerable
0	Complete failure

CLEANING LABORATORY EVALUATION SUMMARY

Note: Typical effects of coatings removal on wooden substrates include grain-raising and an increase in surface roughness.
Modification from ASTM Standard D6189-97

*1 Coupons size were decreased to 3" by 8" in order to obtain gravimetric weights
*2 After removing sanding dust, weigh coupons on an analytical balance to determine base-line weight.
*3 Second and third coatings were not forced dried using an oven as the space required for 36 coupons exceeded capacity of the lab's oven. Second coatings were dried for 20 minutes using a Master Appliance heat gun at 300 F and then allowed to dry for 7 at room temperature. Third coating was also dried using the heat gun for 20 minutes at 300 F but allowed to dry overnight.
*4 After final coating was applied and dried, a second gravimetric weighing was performed to determine the overall amount of coating applied to the test coupons.
*5 Time required for coatings removal via scraping was recorded. Maximum time for removing coating was set at 2 minutes.
*6 After cleaning was completed, a final weighing was performed to determine the amount of contaminant removed.

Note: Efficiencies were calculated by the following method: Subtract the final weight of contaminant from the initial weight of the contaminant. This value was then divided by the initial weight of the contaminant and multiplied by 100 to get percent removal or percent efficiency of the coatings remover.

Contaminants Applied: A: Paint - Glidden Paint Company Ultra Hide Alkyd semi gloss paint (136-52-7, 1317-65-3, 1332-58-7, 66402-68-4, 8052-41-3, 64742-88-7, 71-43-2, 13463-67-7, 68604-95-5, 66070-62-0, 67746-05-8)
B: Paint - Rust Oleum Corp Apple Red acrylic resin paint (25265-77-4, 57-55-6, 111-77-3, 7632-00-0, 2786-18-5)
C: Coating - Minwax Company Fast Drying Polyurethane

Results:

The alkyd paint was not easily removed by Vertec Paint Stripper. Visually, most of the paint remained after the 2 minute scraping. The Take Off Green required more effort to strip the paint than Citristrip or SI#4. Visually the wood blocks for these three products were about the same, with Citristrip performing the best. Upon ranking with the ASTM method, most of the paint, <75%, appeared to have been removed for Citristrip and SI#4. After gravimetric analysis, less than 40% of the paint was removed. This discrepancy may be due to the wood soaking up the coating removers. Table 1 lists the calculated efficiencies, gravimetric ranking, visual ranking and the ASTM rank.

Table 1. Alkyd Semi Gloss Paint Removal

Cleaner	Vertec Paint Stripper	Take Off Green	Citristrip	SI #4
Coupon 1	14.13	37.97	35.74	26.90
Coupon 2	21.39	35.06	41.40	31.79
Coupon 3	11.57	35.04	43.69	32.78
Ave	15.70	36.02	40.28	30.49
Std Dev	5.09	1.69	4.09	3.15
1-4 (1-best) Gravimetric Rank	4	2	1	3
Visual Rank	4	3	1	2
5-0 (5-best) ASTM Rank	1-2	3-4	4-5	4-5

For the Acrylic resin paint cleaning, the Vertec Paint Stripper worked much better than in the alkyd paint removal. A majority of the paint was easily removed from the wood. Take Off Green caused the resin paint to become very sticky and difficult to remove from the wood. Citristrip, again, was very effective in removing the paint, resulting in the cleanest looking samples. SI#4 was not very effective in cleaning. Table 2 lists the different rankings for each cleaner.

Table 2. Acrylic Resin Paint Removal

Cleaner	Vertec Paint Stripper	Take Off Green	Citristrip	SI #4
Coupon 1	14.25	-1.67	16.94	11.91
Coupon 2	8.58	12.70	20.13	16.34
Coupon 3	9.13	11.60	12.76	0.35
Ave	10.65	7.54	16.61	9.53
Std Dev	3.13	8.00	3.70	8.25
1-4 (1-best) Gravimetric Rank	2	4	1	3
	2	4	1	3

CLEANING LABORATORY EVALUATION SUMMARY

Visual RankVisual Rank				
5-0 (5-best) ASTM Rank	4	2	4-5	3

The urethane coating was not removed by Vertec Paint Stripper. The other three products caused the coating to form a crystallized layer that was easily removed with the scraping. Table 3 lists the results from each product.

Table 3. Polyurethane Removal

Cleaner	Vertec Paint Stripper	Take Off Green	Citristrip	SI #4
Coupon 1	-32.94	13.62	9.89	-0.30
Coupon 2	-8.53	-20.20	17.11	16.13
Coupon 3	-102.63	16.50	1.19	3.42
Ave	-48.04	3.31	9.39	6.42
Std Dev	48.83	20.41	7.97	8.65
1-4 (1-best) Gravimetric Rank	4	2	1	1
Visual RankVisual Rank	4	2	3	3
5-0 (5-best) ASTM Rank	1	4	4-5	4

Summary:

Substrates:	Wood				
Contaminants:	Coatings, Paints, Resins/Rosins				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Vertec BioSolvents	Paint stripper	100	0.00	☑	Acrylic resin coating
Vertec BioSolvents	Take Off Green	100	0.00	☑	Alkyd, polyurethane coating
WM Barr & Company	Citristrip	100	0.00	☑	Alkyd, acrylic, polyurethane coating
Savogran Company	SI #4 Coating Remover	100	0.00	☑	Alkyd, polyurethane coating

Conclusion:

Vertec Paint Stripper performed well on the acrylic resin only and Take Off Green was successful for Alkyd paint and the polyurethane coating. Citristrip was the best performer, successfully removing the three types of coatings. SI#4 was capable of removing the alkyd paint and the polyurethane coating.