CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2023

DateRun: 08/14/2023

Experimenters: Alexander Symko, Amelia Wagner

ClientType: Tool Manufacturer

ProjectNumber: Project #2

Substrates: Steel

PartType: Coupon

Contaminants: Adhesive, Resins/Rosins

Cleaning Methods: Ultrasonics

Analytical Methods: Gravimetric

Purpose: To find an effective aqueous cleaner to remove varnish from steel coupons.

Experimental Procedure: Three steel coupons were used for each cleaner tested, for a total of six coupons. Initial weights of coupons were taken. The varnish was heated to 350 F on a hot plate. Each coupon was placed on the hot plate for a total of 30 seconds. The varnish was then applied to the heated coupons with a metal scraper in order to achieve a thin layer of varnish on the bottom third of the coupons. Once the varnish had solidified, dirty weights of each coupon were taken.

In order to determine the accuracy of in lab soiling of the coupons compared to the pre-soiled coupons, fluorescence levels were taken using the Cleanospector. The larger the fluorescence value, the more soil has been applied to the coupon. It was found that the coupons soiled in lab are consistently, significantly more soiled than the pre-soiled coupons.

Coupon	Cleanospecter Values
31	210
32	190.8
33	182.9
1	192.4
2	189.5
3	190.3
Pre soiled 1	82.2
Pre soiled 2	96.3

Coupons were then subjected to 10 minutes of unheated ultrasonics. The chosen solvents/cleaners tested were A. D Limonene 85% + Dimethyl Glutarate 15%, and B. Metalnox 6386 100% (an aqueous cleaner identified through previous successful silver bullet/ TCE alternative testing). After being removed from the ultrasonics machine, the coupons were left to air dry and clean weights were taken.

Results:

Cleaner	Initial wt of cont.	Final wt of cont.	%Cont Removed	% AVG
D Limonene 85% + Dimethyl Glutarate 15%	0.0438	0.0013	97.03	97.72
	0.0268	0.0002	99.25	
	0.0321	0.0010	96.88	
Metalnox 6386 100%	0.0482	0.0015	96.89	96.65
	0.0300	0.0004	98.67	
	0.0161	0.0009	94.41	

Because both cleaners were successful in removing the varnish with 10 minutes of ultrasonics from the coupons soiled in lab (more soil than pre soiled coupons), the pre-soiled coupons were then tested to see if they could be cleaned in a shorter amount of time. The pre-soiled coupon that was cleaned with cleaner A. D Limonene 85% + Dimethyl Glutarate 15% was completely clean after 1 minute of unheated ultrasonics. The pre-soiled coupon that was cleaned with cleaner B. Metalnox 6386 100% was completely clean in 4 minutes of unheated ultrasonics. Pictures were taken from comparison.

Summary:

Conclusion:

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A. D Limonene 85% + Dimethyl Glutarate 15% and B. Metalnox 6386 100% are both very effective in removing varnish from steel coupons with unheated ultrasonics.