CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	1996
DateRun:	06/26/1996
Experimenters:	Jay Jankauskas
ClientType:	Machinery Manufacturer
ProjectNumber:	Project #1
Substrates:	Steel
PartType:	Coupon
Contaminants:	Cutting/Tapping Fluids, Greases, Lubricating/Lapping Oils, Tar, Oil
Cleaning Methods:	Immersion/Soak
Analytical Methods:	Visual
Purpose:	Update on testing to find a non VOC cleaner

Experimental Procedure:

The purpose of this trial is to determine a chemical replacement for current usage of Diversey Jettacin cleaner. For a successful chemistry to be chosen it must meet three requirements:
1) Must be able to remove various cutting oils, greases and pine-tar preservative better than Jettacin.
2) Must have no VOC content or close to no VOC content.
3) Must be able to be rinsed easily to allow painting after drying.
From the three requirements listed above ten different aqueous chemistries were chosen. The effectiveness in removing three different heavy greases will be used as criteria to determine poor-performing chemistries. Greases #1 and #2 are a light and a dark grease obtained from a previous client. Grease #3 is a Heavy-Duty Lithium Grease from Lubrimatic Inc.
Cleaning was performed in a simple immersion test for 10 minutes at 120 F with a 5% cleaning solution for all chemistries. After cleaning the coupons were rinsed in room temperature tap water for ten seconds and then allowed to air dry. Cleanliness was based on visual effectiveness of each cleaner. Each chemistry was graded on a scale of 1 to 10 with 1 being the most effective and 10 being the least effective. The results obtained are shown in Table 1.
SUBSTRATE MATERIAL: Steel
CONTAMINANTS: Various heavy greases, cutting fluids and pine-tar like preservative
CONTAMINATING PROCESS USED: Applied with Styrofoam swab and allowed to set for 4 hours

Results:

Company name	Contaminant Name	Basic Components
Citgo Petroleum Inc.	Cutting Oil NC 140	Refined Petroleum Oil, Highly Sulfurized Hydrocarbon Polymer, Chlorinated Alpha Olefin, Sulfurized Fatty compound.
Citgo Petroleum Inc.	Sliderrite 220	Refined Petroleum Oils, Sulfurized Fatty Compounds, High Molecular Weight Isobutylene.
Hubbard Hall Inc.	Metal Guard 420	Stoddard Solvent, Barium Compound, Dipropylene Glycol Monomethyl Ether, Propylene Glycol Monomethyl Ether.
Cooks Industrial Lubricants	Cut 20	Petroleum Based Oils, Sulfurized Fatty Oil Esters, Sulfurized 1-Decene.
Cooks Industrial Lubricants	Albavis 20	Petroleum based oils.
Cooks Industrial Lubricants	Grease #1	
Cooks Industrial Lubricants	Grease #2	
Lubrimatic Inc.	Heavy weight Lithium Grease	
Pine-tar preservative		

For each contaminant, 3 coupons were cleaned in the Miele for 5 minutes at 140 F and at a pressure of 13 psi. All cleaning chemistries were diluted to 4% by volume. After cleaning the coupons were rinsed with room temperature tap water and then allowed to dry under UV heat lamps. Cleanliness was determined by using a gravimetric analysis. The panels were weighed before and after contamination, and after cleaning. The results of the gravimetric analysis are shown in Table 3 and Figure 1.
A final test was performed to check for any paint adhesion problems that may occur due to cleaner residue left by the Ardrox 6333 and the Polyspray 790 XS. For each chemistry, four steel parts obtained from the client were contaminated with pine-tar preservative and cleaned in the Miele pressure wash unit. Cleaning was for 4 minutes at 140 F and at 13 psi with a 4% cleaning solution.

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After cleaning, the parts were allowed to dry first, and then two parts were rinsed in ambient tap water for 10 seconds and the other two were left unrinsed. Once the parts were completely dry, they were painted with Armstrong white touch-up paint. The paint was allowed to cure, and then the parts were immersed in room temperature water for two days to see if any peeling or cracking of the paint occurred. Results from this test were also positive. All four rinsed samples showed no signs of cracking or peeling. Some cracking occurred on the unrinsed samples as expected, but it appeared that unrinsed residue for the Polyspray 790 XS reduces paint adhesion to a lesser extent than the Ardrox 6333 does. Table 3: Cleaning Efficiencies of Polyspray XS, Ardrox 6333 and Jettacin on various contaminants.

Table 3: Cleaning Efficiencies of Polyspray XS, Ardrox 6333 and Jettacin on various contaminants.

	Polyspray 790 XS		Ardrox 6333		Diversity Jettacin	
Contaminants	Avg.	Std	Avg.	Std	Avg.	Std
Cutting Oil 140	96.36	1.53	98	1.28	94.8	4.27
Sliderite 220	91.14	4.23	83.59	6.91	73.62	1.87
Cut 20	91.84	5.07	85.41	6.24	78.94	9.31
Albavis 20	91.74	5.56	88.52	6.26	75.76	9.79
Rust Guard 420	98.53	0.84	99.68	1.11	64.74	8.25
Grease #1	85.05	2.88	86.03	10.85	3.11	2.01
Grease #2	44.48	25.94	95.31	7.18	2.61	0.79
Heavy Duty Lithium Grease	29.09	17.8	17.03	4.67	0.17	0.13
Pine-Tar Preservative	100.06	0.14	95.49	1.29	24.84	2.49

It appears that both the Polyspray 790XS and the Ardrox 6333 would be a vast improvement over the Diversey Jettacin. Both chemistries passed all three requirements for a successful replacement:

Summary:

Substrates:	Steel
Contaminants:	Cutting/Tapping Fluids, Greases, Lubricating/Lapping Oils, Tar, Oil

Company Name:	Product Name:	Conc.:	Efficiency:	Effective:	Observations:
US Polychem Corporation	Polyspray Jet 790 XS		85.05	☐	
Ardrox Inc	6333		98.00	☑	
Gemtek Products	SC 1000 Aqueous Cleaner Concentrate	5	0.00	☐	
Ardrox Inc	6333	5	99.08	☑	
US Polychem Corporation	Polyspray Jet 790 XS	5	96.36	☑	
Environmental Technology	RB Degreaser Cleaner	5	0.00	☐	
Valtech Corporation	Valtron SP 2201	5	0.00	☐	
General Chemical Corporation	Aluminex 5761	5	0.00	☐	
Hurri Kleen Corportion	Special Formula Degreaser	5	0.00	☐	
Brulin Corporation	Formula 815 GD	5	0.00	☐	
US Polychem Corporation	Polyspray Jet 790 P	5	0.00	☐	
Oakite Products	Inproclean 2000	5	0.00	☐	
Diversey Corporation	Jettacin	5	0.00	☐	

Conclusion:

I have just finished a round of tests to find an effective no-VOC replacement for Diversey Jettacin. After testing ten different aqueous cleaners, I have found two that should work well for you. One chemistry is U.S. Polychemical Polyspray 790 XS while the other is Ardrox, Inc. Ardrox 6333. Both chemistries outperformed Jettacin on a number of greases, oils and the pine-tar preservative that you sent to me (the enclosed test sheet contains detailed information about the testing and results).
From a performance perspective both the Polyspray 790 XS and the Ardrox 6333 seem almost equal. From a regulatory standpoint, the Polyspray 790 XS contains no VOC's as opposed to 10 g/l of VOC's in the Ardrox 6333. Because of this, I think you would be better off going with the Polyspray 790 XS. Below are contact names and numbers for both U.S. Polychemical and Ardrox, Inc.
1) Both chemistries obtained higher cleaning efficiencies than Jettacin on all nine contaminants tested (see Figure 1). The Polyspray 790XS was more effective on the cutting oils and the pine tar preservative than the Ardrox 6333, whereas the Ardrox 6333 appeared to be slightly more effective on the heavy greases.

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2) The Polyspray 790 XS has no VOC content whereas the Adrox 6333 contains 10 grams of VOC per liter of concentrate (approximately 1% by weight).
3) Both chemistries appear to be fairly easy to rinse. If insufficient rinsing occurs, it seems that the Polyspray 790 XS is not as detrimental to paint adhesion as the Ardrox 6333 is.