CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 1995

DateRun: 06/14/1995

Experimenters: Donald Garlotta, John Bulko

ClientType: Manufacturer of Motion Control Devices

ProjectNumber: Project #1

Substrates: Aluminum, Steel

PartType: Part

Contaminants: Cutting/Tapping Fluids, Lubricating/Lapping Oils, Oil

Cleaning Methods: Ultrasonics

Analytical Methods:

Purpose: Results of aqueous cleaning switch

Experimental Procedure:

Background
The company manufacturers motion control products for industrial and aerospace applications. The company is headquartered in Cleveland, OH and is part of EPA's voluntary 33/50 program. At the Massachusetts facility, pumps for aircraft engines are manufactured under SIC 3724.

In 1992, the company began investigating the replacement of their two vapor degreasers with an aqueous cleaning system. The original idea was to replace both vapor degreasers with one immersion cleaning system at a capital cost of $145,000. After careful consideration of cleaning needs and logistics, the company decided to replace the vapor degreasers with three pressure spray washers for frequent cleaning following machining, one ultrasonic unit for the highest cleanliness needs and one immersion tank for cleaning following heat treatment. The capital costs for these five aqueous cleaning systems were $84,095.

Substrate	Contaminant	Aqueous Process	Aqueous Product
aluminum	hydraulic oil with silicone	pressure spray	Daraclean 282 GF
steel with mineral spirits pre-wash	hydraulic oil with silicone	pressure spray	Daraclean 282 GF
steel	non-silicone machining oil	pressure spray	Brulin 63-G
steel & aluminum	rust inhibiting oil	ultrasonics	Brulin 815 GD
steel & aluminum	heat treat quench oil	immersion	Oakite Inpro-Clean 2500

The three ADF Systems Ltd. Pressure spray washers, operating at 750-800 psi, clean aluminum and 8620 steel parts with a 10-20 minute wash followed by a hot a dry. These parts were previously cleaned in a vapor degreaser using CFC-113. One washer cleans aluminum parts in WR Grace's Daraclean 282 GF. Steel parts, heavily soiled with hydraulic oil containing silicone from a lapping operation, are pre-washed in a mineral spirits bath for 10-15 minutes and then cleaned in the second spray washer using WR Grace's Daraclean 282 GF. (Note: The company plans to evaluate an aqueous based lapping compound which could eliminate the mineral spirits pre-wash.) The third washer, using Brulin 63-G at 8-10% concentration, cleans parts which do not have the silicone contaminant.

Ultrasonic System
Both 8620 steel and aluminum parts are cleaned in the Talley ultrasonic system. These parts, contaminated with a rust inhibitor oil, require the highest level of cleanliness in the process. The system consists of a 2-minute wash, two tap water rinses at 140 F and 170 F, one DI rinse at 115 F, and a one-minute drying cycle at 150 F. The detergent is Brulin 815GD at 3% concentration. Previously these parts were cleaned in the vapor degreaser using CFC-113.

Immersion Tank
In the Kleer Flo immersion tank, 8260 steel parts are cleaned on the way from a quench oil heat treat to a nitriding process. The detergent in the immersion system is Oakite Inpro-Clean 2500 at an 8% concentration. The air agitated immersion tank operates at 160 F and parts are immersed for 20 minutes. Prior to this aqueous system, the parts were cleaned in a vapor degreaser with methylene chloride and for a short time with 1,1,1-tirchlroethane.

Results:

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As a result of the company's aggressive cleaning project, the use of chlorinated solvents was eliminated over a four year period.
Toxics Use Reduction Act Data
Pounds of Solvent Otherwise Used, 1990-1994

Chemical	1990	1991	1992	1993	1994
CFC-113	28,290	29,000	21,000	6,517	0
1,1,1-trichloroethane	0	0	600	1,200	0
Methylene Chloride	11,848	10,400	1,047	0	0
Total	41,138	39,400	22,647	7,717	0

As a result of implementing aqueous cleaning, the company is no longer a TURA filer. The company saves $10,500 annually in water and sewer costs; the cooling system on the vapor degreaser used 5,000,000 gallons annually. The total water usage for the aqueous systems is 3,150 gallons annually. Wastes from the aqueous systems are evaporated. Without the chlorinated solvent contamination of waste oil, the company saves over $8,000 annually in waste oil disposal costs.

This case is part of the Toxics Use Reduction Institute's Clean Alternatives Project funded by EPA's National Risk Management Research Laboratory in Cincinnati, OH.

Summary:

Substrates:	Aluminum, Steel				
Contaminants:	Cutting/Tapping Fluids, Lubricating/Lapping Oils, Oil				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Magnaflux	Daraclean 282 GF	10	0.00	☑	
Brulin Corporation	Brulin 63 G	8	0.00	☑	
Brulin Corporation	Formula 815 GD	10	0.00	☑	
Oakite Products	Inproclean 2500	10	0.00	☑	

Conclusion:

By purchasing aqueous cleaning equipment based on cleaning needs at various stages of their process, the company was able to replace two vapor degreasers with five remote cleaning stations with a total project payback period of approximately one year.