A Hassle-Free Switch to Aqueous Cleaning

Philips Lighting Company thought the switch from vapor degreasing to an alternative cleaning system would be a hassle, but it turned out to be a total process improvement . . .

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The Philips Lighting Company, Bath, New York, recently installed an automated cleaning system to remove fabrication soils from the metal support structures it uses when manufacturing lamps. The EPA ban on chlorofluorocarbons is what initially led the company to look for an alternative to the vapor degreasing machine it was using to clean the metal frames and connectors.

Recognizing that CFCs would be obsolete by the end of 1995, Philips began its search well in advance of EPA's deadline. What the company initially thought would be a costly, government-mandated change offering no improvement to its lamp-assembly process has actually improved the process, increased productivity and reduced operating costs.

The company's first step was to carefully research vapor degreasing alternatives. Philips learned that replacing a vapor degreasing machine could actually be an opportunity to improve the parts-cleaning operation. During a thorough evaluation of the production line, opportunities for improvement in all aspects of the process were uncovered.

While redefining each aspect of the cleaning operation (type of equipment, actual cleaning process, volume of parts to be cleaned, scheduling and waste disposal) Phillips turned up areas where improvements could be made.

During its research of the alternatives to vapor degreasing, it found that none of the options is as effective as vapor degreasing if not properly used. Philips knew it was critical

for them to understand each alternative to see if it was appropriate for its application.

Options were narrowed to either a semi-aqueous or aqueous system. The processes are similar, except that semi-aqueous cleaning uses chemistry that includes solvent. Proper disposal of the solvent waste, more a consideration with semi-aqueous, is not a factor with an aqueous system. An aqueous cleaning system was designed and tailored to the specific application requirements of Philips.

Philips determined how clean parts had to be. Over cleaning parts increases costs and production time and under cleaning may cause quality problems that could lead to part performance failure. Philips used Fourier Transform Infrared Spectrophotometer analyses to illustrate the cleaning potential of newer systems as opposed to the company's vapor degreaser.

To ensure that the cleaning system would fill Philip's needs, the company quantified the applications. The most appropriate cleaning system could not be established unless the production process was understood completely. This entailed a volume count for parts to be cleaned every shift, day, week, month and year. The physical description of all parts needed to be identified, including base materials, sizes and critical surfaces for cleaning. This was necessary to ensure the cleaning system did not damage the parts.

One of the potential disadvantages of the aqueous cleaning system was that the unit could possibly occupy more floor space than the vapor degreaser. To minimize this, the company studied its material-handling functions within the facility to ensure that the cleaning system worked with within the production flow.

To ensure that critical part surfaces were wetted and properly cleaned, the company had to decide whether to use an immersion or spray cleaning process. Immersion baskets are often used for multiple batches of small parts. The spray option is better for racked parts.

Waste treatment was also considered. With an aqueous system, effluent type and volume must be identified and a means of disposal established. The company's cleaning system was able to reduce oil and sludge waste, reduce water use and waste and extend bath life. The reclaimed oil is reused for forming applications. Only a concentrated sludge is left for disposal.

Finally, part testing and staff training were required for successful cleaning system installation. Philips chose a NuMatic system from Man-Gill Chemical Co., Cleveland, Ohio. The system features automatic indexing of production parts through a three-stage immersion/agitation chemical cleaning process.

Basketed work is cleaned using a

combination of pneumatic power and mechanical agitation. The system creates no hazardous fumes, helping the company meet environmental and OSHA compliance regulations.

The cleaning system has five stages: wash, initial rinse, secondary rinse and two drying stages. Because aqueous cleaning systems are application specific, the chemistry must be accurately controlled and monitored to clean at optimum efficiency. Electronic process control equipment continuously monitors and controls the washing and rinse stages to ensure optimum quality throughout the process.

The cleaning process is PLC controlled. This regulates the indexing of the basketed lamp fixtures as they proceed directly from the plant processing line to the cleaning machine's loading platform. From there, parts are moved simultaneously through each stage of the machine according to the preprogrammed and timed cycle of the machine.

The lamp fixtures Philips Lighting constructs consist of various metals in numerous application configurations. Fixtures are arranged in the baskets to ensure maximum exposure during cleaning. Contaminants, oils and solids must be removed from each fixture to meet the company's cleaning specifications.

The aqueous cleaning system has brought Philips multiple benefits. It has reduced toxic air emissions. Labor to run the cleaning system has been reduced 50 pct. Production efficiency has jumped nearly 130 pct.

The aqueous system runs five or six days per week, 16 hrs per day. If the system is loaded to maximum capacity, each basket of parts is in the system less than 25 min, with a basket completing a cycle every five min. The result has been an increase in production capacity of 300 pct. The company has also achieved a 50 pct reduction in work-in-process and a 30 pct reduction in material handling.

The wash tank has only been dumped twice in the last 10 months. Chemical costs have been reduced by 90 pct and waste disposal costs are 80 pct lower than with the solvent cleaning process. This has allowed Philips to enjoy an 18-month system payback.

What the company initially viewed as a cumbersome switch from vapor degreasing to aqueous cleaning to satisfy EPA regulations has actually turned into a positive. Toxic air emissions are reduced, employees working condition are safer, quality has improved and production has increased. Aqueous cleaning has proved to be a cost-effective alternative to vapor degreasing at Philips. **PF**

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