



Miraclean

Aqueous immersion parts cleaners, such as this one from Miraclean, can offer multiple wash stations and full automation.

THE AGE OF AQUEOUS

Industry transitions from solvent- to water-based cleaning.

Here is a manufacturing story: In 1985, after a hole in the ozone layer was observed over the South Pole, the nations of the world convened in Vienna to discuss how to save the planet's environment. In 1988, the Vienna Convention for the Protection of the Ozone Layer was ratified by nearly 200 different independent governments, including the entirety of the United Nations, making it one of the most successful treaties—in terms of participation—of all time.

The following year, agreed-upon, legally binding reduction goals for the use of chlorofluorocarbons (CFCs) were put into force in a second treaty, the Montreal Protocol on Substances that Deplete the Ozone Layer. As a result, the hole in the ozone layer is slowly recovering, and the United Nations Environment Programme projects it will return to 1980 levels sometime from 2050 to 2070.

So ... what does this all have to do with manufacturing?

Solvent Solution

"In the 1980s, a lot of manufacturers cleaned their parts with chlorinated solvents," said Lyle Carman, sales/technical director for Ransohoff, a parts-cleaning equipment manufacturer in Cincinnati. "Those gave off CFCs, and it was determined they contributed to problems with the ozone layer." (He also said there had already been a move away from solvent cleaning within the industry before the Montreal Protocol took effect.)

"Between environmental concerns and disposal costs, solvents were prohibitively expensive to use, on top of everything else,"



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said Ken Manninen, vice president of parts-cleaning equipment manufacturer Alliance Manufacturing Inc., Fond du Lac, Wis. Opening its doors in 1994, Alliance arrived on the scene in the middle of the push toward water-based systems, despite the widely recognized efficacy of solvents.

"Aqueous cleaning had been around for a long time, and it actually isn't too dissimilar from the dishwasher you probably have at home," Manninen observed. By adding an alkaline cleaning agent

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to break down the bond between oil and the surface of the part, the efficacy of the hot water is boosted tremendously.

"A lot of what [chemical companies] were looking to do was transition to biodegradable components," said Kindra Hannig, Ransohoff process applications manager. "The real challenge has been, and continues to be, addressing contaminants that were easily removed by solvent-based cleaners but are more resistant to other methods."

Carman and Hannig both worked on the development of water-based chemistries at Ransohoff, finding ways to get results equivalent to those achieved with solvents.

Bath or Shower?

There are two types of aqueous parts-cleaning systems: spray and

immersion. Spray systems typically involve high-pressure water streams directed at parts moving on a conveyor, while immersion cleaning involves submerging parts in various bath stations. Both methods have advantages.

"In a lot of cases, we prefer spray washing," said Alliance's Manninen. Spray washing can be performed

in either a batch or continuous process. "It combines chemistry and heat in a very different way, and the mechanical agitation is built in. The continuous-spray washing process offers an advantage in that it's typically faster in terms of throughput, because the parts are constantly moving on a conveyor belt or other conveying method. In batch-based



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The Age of Aqueous

immersion systems, you can only have so many parts in the bath at a time and contaminants that are removed can be redeposited onto the parts."

Miraclean, Ashville, N.Y., manufactures immersion systems, with an emphasis on automation and ultrasonic agitation. While the parts-cleaning approach a manufacturer takes has historically been deter-

tion about a particular lot of parts, you know exactly what they went through in your care."

Adding Advantages

The interactions of the components that comprise a water-based system determine its efficacy.

Ransohoff's Hannig said, "We have an acronym that we use among ourselves: WATCH." The acronym stands for the five variables that determine an aqueous-cleaning system: water, agitation,



Alliance Manufacturing

Alliance Manufacturing offers spray cleaning systems, which typically feature faster throughput than batch/immersion systems.

mined by a combination of part substrate, type of soiling agent and part geometry, many companies today—especially in industries such as medical and aerospace—have validation specifications that must be factored into the process as well, according to Cheryl Larkin, marketing manager at Miraclean.

"As requirements get more sophisticated, the value of an automated system that controls everything and can track each part's journey through the system ... becomes more apparent," she said. "That way, if there is ever a ques-

time, chemistry and heat. Changing any of those variables changes how clean the part gets.

"A huge part of our job is overcoming all the different barriers that customers, by necessity, put in place," Carman said. "They may have a part with plastic components that can't handle high heat. They might have an aluminum part that certain chemistries will actually dissolve. We have to adjust the process to make sure it fits the customer's needs and still results in a clean part."

Virtually none of those obstacles

existed with solvents, he continued. The comparative predictability of solvents was a struggle aqueous-system developers had to overcome. That doesn't mean solvents were perfect.

"Solvents are very good at removing oil," Carman acknowledged, "but they were never particularly suited to removing particulates. Generally speaking, unless a part was already free of particu-

'The biggest advantage to automation comes when you get into indexing.'

lates when it went into the vapor degreaser, particulates would still be there when the part came out. That is where aqueous systems truly excel, and, when combined with heat and chemistry, water can [remove contaminants] at a level solvents would never have been able to."

Miraclean, a division of Chautauqua Chemical Co. Inc., also of Asheville, has taken advantage of the parent company's ability to develop custom chemical formulations for its customers, Larkin said.

One customer discovered that the cleaning detergent used in its original cleaning line was a highly caustic, chelated solution (one

which bonds its ions and molecules to metal ions). As a result, the solution sometimes failed to remove unwanted matter from carbide tools, which contributed to carbide leaching.

Miraclean developed and recommended a mildly alkaline, nonchelated cleaner that minimized leaching and split oils for easier filtration

and more-effective cleaning. The product, called RD-531, was so successful that it's become a mainstay of Miraclean's catalog.

"We can customize a chemical agent, we can customize specific mechanical actions, we can even customize fixturing for parts going into the baths," Larkin said. "In that way, we can present the

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