Tech Article

Aqueous Cleaning Costs Explored: Report Published

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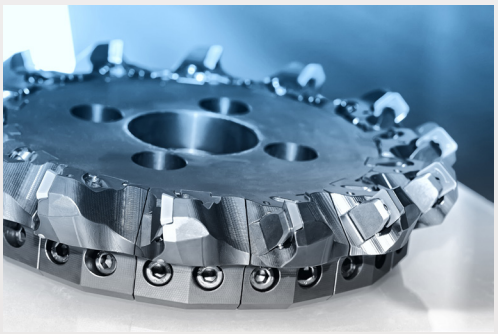

Vapor degreasers typically are better for cleaning small parts, complex shapes, tight stand-offs and blind holes.

The cleaning experts at MicroCare completed a highly detailed study comparing the costs of aqueous cleaning to the costs of vapor degreasing cleaning. This study was managed by Mr. Rob Lee, of MicroCare, and incorporates the latest information from industry sources, customer experiences and equipment makers.

“In many companies and regions of the world, there is very little knowledge about solvent cleaning,” Mr. Lee explained. “People default to the water-based cleaning choice because they are not aware that proven, reliable and safe solvent alternatives are available and will cost less.”

The results of the study were surprising. “The cost-per-part-cleaned of a well-tuned vapor degreaser can be as little as 1/10th the costs of an aqueous cleaner,” Mr. Lee reports. His team further calculated the capacity of a vapor degreaser is almost three times greater than the capacity of a similar-sized aqueous cleaning systems, all other factors being equal.

Comparison of Aqueous vs. Solvent Cleaning

Comparing an aqueous in-line system & an open-top vapor degreaser, both using a 1600in basket

	AQUEOUS	SOLVENT
Cleaning Performance	Excellent	Excellent
Contaminant Type	Polar, inorganic	Nonpolar, organic
Parts Geometry	Simple	Complex
Substrate Compatibility	May leave spots or stains	No spots or stains
Process Steps	Multiple wash, rinse, dry	Single wash, rinse, dry
Capital Investment	Over $100,000	Under $100,000
Power	~20 kW/hour	~7 kW/hour
Footprint	~40 sq. feet	~20 sq. feet
Cleaning Cycle	20-25 minutes	6-20 minutes
DI Water	30-40 gallons/hour	None
Waste Treatment	100,000 gallons/year	10 gallons/year
Boiling Point/Temperature	Higher	Lower
Detergent/Cleaning Fluid	$50/gallon	$160/gallon
Maintenance & Labor Costs	Higher	Lower
Fluid Density	Lower	Higher
Fluid Surface Tension	Higher	Lower

Difficult Comparisons:

The catalyst for the study, according to Mr. Lee, was the repeated confusion amongst customers about the difference between the cost of aqueous cleaning fluids — which often are 99% water — versus the cost of solvent cleaners, which are carefully engineered synthetic molecules formulated specifically for cleaning. Vapor degreasing systems are preferred for critical cleaning applications involving complex shapes, delicate substrates, maximum throughput or the highest cleaning standards.

At the heart of the confusion is the fact that aqueous cleaners and solvent cleaners operate completely differently. Aqueous cleaners generally use longer cleaning cycles, high-pressure sprays, expensive detergents and complicated drying systems to clean parts. In contrast, vapor degreasers use subtle chemical engineering to replace the brute-force cleaning of aqueous systems.

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These differences mean that vapor degreasers typically are better at cleaning small shapes — such as printed circuit boards — or complex shapes, tight stand-offs and/or blind holes. They also clean more quickly and more gently. A simple, ill-formed comparison of the per-liter cost of the cleaning fluids leads to distorted conclusions.

Study Design:
The study analyzed the main cost elements of operating two comparable precision cleaning systems. The comparative unit was “equivalent basket size” which defines the size of the largest components that can be cleaned in any given machine. To enable meaningful comparisons, the total cost of ownership then is normalized as a “cost-per-part-cleaned” over the life of the cleaning system.

“This actually was a ‘best-case’ scenario for the water cleaning option because, size-for-size, a vapor degreaser has far higher throughput than an aqueous cleaner,” Mr. Lee noted. “If we had modeled costs based on ‘equivalent throughput’ (parts-per-hour) then the aqueous cleaner would typically have been three or four times larger and even more expensive.”

Mr. Lee’s team analyzed the costs in two general categories: acquisition costs and operating costs. Acquisition costs included the price of the machine, installation, retrofits to factory spaces and the cost of capital. Operating costs included consumable solvents and detergents, electrical, floor space and incidental expenses such as filters and waste disposal.

Many assumptions were required in this analysis. For example, the specifications from different equipment manufacturers indicated benchmark vapor degreasers used 7 kilowatts of power while equivalent aqueous cleaners used 19 kilowatts. U.S. electrical costs were assumed, although energy costs in Europe and Asia are far higher. Mr. Lee’s team also assumed a floor space cost of $125/sq. ft. (approx. $1345 per sq. mtr.); obviously this will vary by region. Similar calibrations were developed on labor, waste disposal costs, and other significant factors. A scorecard was developed that you can use to “plug in” your own specific costs to develop localized cleaning cost estimates.

See the scorecard on page 3 and get started.

About the Author:
Mike Jones, retired Vice President of International Sales for MicroCare, has over 30 years of experience in the critical cleaning industry. He is a prolific writer and educator focusing on critical cleaning in general and vapor degreasing and benchtop cleaning in particular.
For more information, visit www.microcare.com.

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Cleaning Scorecard

When comparing long-term cleaning processes, you need to consider more than the cost of equipment or a drum of solvent. It's the total cost-per-part-cleaned that is important. Health, safety and environmental regulations must always be a priority when evaluating the best cleaning process for your business.

Use these important calculations to determine the lowest cost-per-part cleaned.

One-Time Capital Costs

Cost of Capital	$ _____
Cost of Cleaning System	$ _____
Freight & Insurance	$ _____
Site Engineering & Architectural Planning Costs	$ _____
Construction	$ _____
Electrical Changes	$ _____
Water/Plumbing	$ _____
Ventilation	$ _____
Total Capital Costs:	$ _____

System Set-Up

Actual Footprint or Size of Machine	_____
Work Space Multiplier	_____
Cost per Square Foot	$ _____
Total System Set-Up:	$ _____

Throughput Calibration Factors

Cycle Time	_____
Parts per Cycle	_____
Max. Parts per Hour	_____
Required Operating Hours/Day	_____
Stand-by Hours/Day (normally much lower costs per hour)	_____
Total Throughput:	_____

Operating Costs

Labor: Operator, Cost per Hour (fully-loaded labor rate)	$ _____
Labor: Inspection & Re-cleaning, Cost per Hour	$ _____
Labor: System Testing	$ _____
Labor: System Maintenance, Cost per Hour	$ _____
Electricity	$ _____
Water	$ _____
Consumables (Filters, etc.)	$ _____
Solvent	$ _____
Solvent Losses (Drag-Out)	$ _____
Solvent Disposal	$ _____
Total Operating Costs:	$ _____

Cost Per Part Cleaned = Total Operating Costs ÷ Total Throughput $ _____

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