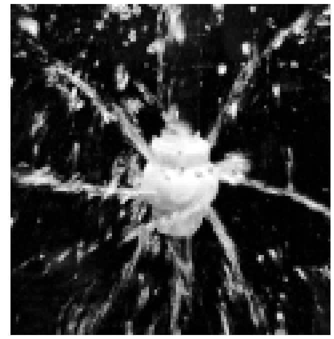
Cleaning and protecting glass lined tanks

Glass lined tanks are used frequently for high purity or very corrosive solutions. They work very well, but they're also very expensive. Customers frequently tell us that they're concerned about putting a stainless steel tank washing nozzle in one of these for fear that it could damage the lining. Many maintenance people have solved that by using one of our Teflon® Whirling Nozzles. Since they're made entirely out of plastic, there is much less chance of hurting the lining if it is dropped or comes apart.

This design is inexpensive and well suited for specialized applications where sanitation and contamination are special concerns. Ask for more information.



All Teflon® Whirling nozzles are excellent for glass lined tanks from 4 to 25 feet in diameter.

Do you want future issues of this newsletter?

You probably don't think about nozzles every day. Unless you work for a company like ours, there are other things on your mind. But, when the topic comes up, you need to know where to turn for help. These papers will contain technical information, application tips and ideas for nozzle applications specifically for the chemical and pharmaceutical industries.

If you want future issues (four each year) and our most current catalog information, fax this page back to us with the YES box checked. If there is someone else who might like it, send his or her name too. Make sure we can read your address label.

If you don't, check the NO box. It will save paper, printing and postage if you aren't really interested.

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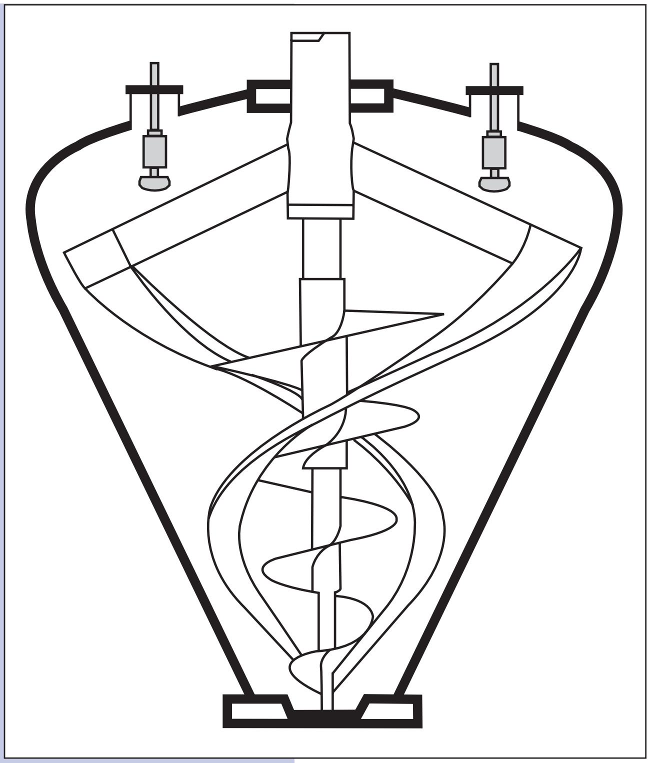
Chemical Industry Application Notes

Engineering to help you optimize nozzle applications



With a 1000 gallon helical mixer, it takes two ACCUCleans to do the complete job. Either run both at the same time or use one and move it to both locations. Turning the blades during the cleaning will ensure the most thorough coverage.

Tank Washing: Working Around Obstructions

Mechanical tank washing nozzles make the messy job of tank and vessel cleaning quick and easy, but working around internal obstructions such as mixing paddles or agitators, can be a problem. When spraying from only one location, these cause shadows and gaps in the coverage. The answer is to insert the washing nozzle through more than one access point or use more than one nozzle if they are permanently installed.

Mounting via a flanged tank spud is an excellent way to keep the nozzles aligned and well supported. If more than one nozzle has to be inserted through one opening, a split flange can permit two support pipes to share the one opening and still reach different parts of the tank.

You may need a tank washer that can operate in any orientation. Lechler's Dual Race Whirling Nozzle is an excellent choice as is our Teflon® Whirling Nozzle or Gyro. Even the ACCUClean performs well mounted horizontally. (Lechler's catalog of spray nozzles and accessories gives a detailed description of all our tank washers and their operating characteristics. If you don't have a copy, contact us!)

We can design and build a custom tank washer mounting system specifically for your installation or help you choose one that can be used over a variety of tanks and vessels. Ask for more information.

Droplet size distribution: How to interpret and use the information

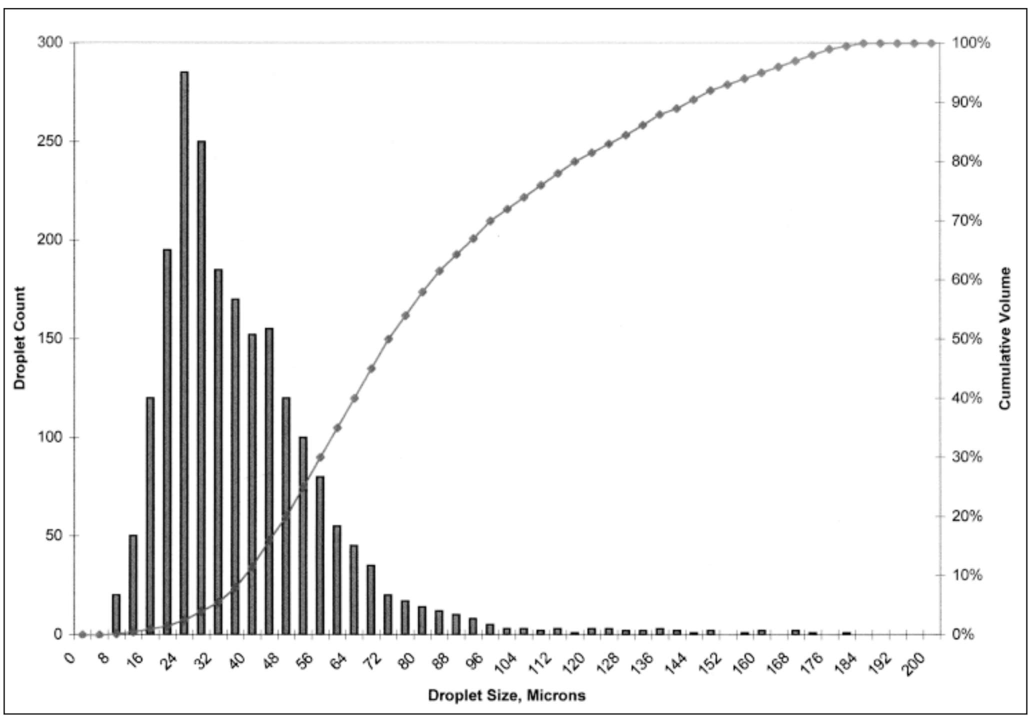
There is no nozzle design in the world that can create droplets that are all the same size. Looking at the spray coming from any nozzle, you will find a spectrum of droplet diameters from small to large but falling within a specific range.

These two graphs, superimposed on each other, tell the story. The bar graph shows the actual count of droplets (left vertical axis) against the droplet diameter measured in microns (horizontal axis). The plot forms a right skewed bell curve.

The line graph is the cumulative volume as a function of droplet size. The right vertical axis is a percentage, ranging from 0-100%. The horizontal axis is the same droplet size measurement. The cumulative volume graph shows how the total volume of the liquid sampled is distributed among the various droplet sizes. It climbs slowly in the small droplets, gains slope as the size increases and then begins to flatten out again as it nears the top. It illustrates the point that while small droplets may be numerous, they do not account for a major volume of the liquid. Big droplets, while they may have a lower count, carry a much larger proportion of the liquid volume.

Since using these graphs can get a little cumbersome, there are many different ways to represent all the data as a single number. The appropriate values for this example are listed. Each has its own specific method and purposes. Here are some of the more popular ones and how they can be used:

Arithmetic Mean—The weighted average of the entire population. While this is not the most useful measurement, it is very common and may be the only information available. It can be used for comparisons between various nozzles.



The information shown in these graphs can be distilled to single values for calculation purposes. Here are the appropriate numbers for this example:

Arithmetic Mean ...... 46 microns
Sauter Mean .... 65 microns
DV 10 .... 38 microns
DV 50 .... 72 microns
DV 90 .... 142 microns
DMAX .... 180 microns

Sauter Mean—This is the critical number for calculating surface area. It represents the droplet that has the same volume to surface area ratio as the entire population of droplets. You can use this to calculate the amount of surface area produced for a specific volume of liquid.

DV10—The size at which the cumulative volume reaches 10% of the total. These are the "fines" of the spray that can be carried by wind or may end up in your mist eliminator.

DV50—Volume (Mass) Median Diameter, or the droplet size at which the cumulative volume reaches 50% of the total. Half the volume is contained in droplets smaller than this and the other half larger.

DV90—The size at which the cumulative volume reaches 90% of the total. Those beyond this point are the biggest droplets that will carry the farthest, resist air movement the most and take the longest to evaporate.

DMAX or Maximum Diameter—This is the largest single droplet found in the sample. This is the most critical if you're trying to calculate how long it may take the spray to evaporate completely.

Who cares about droplet size?

If you're working with applications that involve heat transfer, evaporation, gas/liquid reactions, chemical injection, etc., this information is critical. Without it, you will have a difficult time quantifying a process. Knowing droplet size enables you to calculate and model characteristics such as surface area and trajectory. Surface area tells you how much interface you have between a gas and liquid. This can determine a reaction rate or how quickly heat transfers from one to the other.

If you work with these types of applications, feel free to ask us for help since they frequently require sophisticated measurements and specialized calculations. Our engineers are well versed in such processes and can give you real nuts and bolts assistance.

For a more in-depth discussion of this topic, ask for a copy of the paper we presented at the '99 Chem Show: *Designing and Optimizing Gas/Liquid Reactions*.

Impact vs. Surface Area
Opposite ends of the spectrum

The two most common nozzle applications in the chemical and pharmaceutical industries operate at opposite extremes.

Cleaning applications, such as tank washing, depend on droplet impact to break up and wash away soil and contaminants. Impact is the result of momentum, which is a function of mass and velocity. Big droplets moving at high speed create the most impact. That's cleaning power.

On the other hand, creating surface area for evaporation, chemical reactions or heat transfer depends on small droplets and lots of them.

A nozzle application designer has to use the characteristics that he or she knows to create the kind of spray that will work best for the situation. Since the demands that you face change every day, the problem you were solving last week may be nothing like the one that's on your plate today. The nozzle you used then may not work now. That's why we have so many designs. Each has its own attributes that can help you solve specific problems. Our engineers can help you balance the tradeoffs as you make these and other choices to optimize the results.