

SWEEP CAPTURE VS SCAN CAPTURE FOR POWERSIGHT PDPA MEASUREMENTS

APPLICATION NOTE POWERSIGHT-005 (US)

Spray Mapping Using PDPA

Because the PowerSight PDPA is a point measurement technique, it is often advantageous to use a traversing system, such as the TSI model# T3D traverse, to move the measurement volume (or, conversely, the spray nozzle) in order to take velocity and diameter measurements at a multitude of different points within the spray and thus characterize the spray globally. Within the TSI FlowSizer™ software, it is possible to automate this function so that the user does not need to standby and take data at each point individually, but this can be automated in different ways. What is the best way to achieve this, and what are the options available? This application note attempts to answer these questions.

Scan Capture

Scan capture is a method whereby the measurement volume is moved to multiple discrete points within the region of interest, one at a time, and data is taken at each point. The measurement volume location relative to the spray nozzle will change, by traversing the measurement apparatus (or the spray nozzle) through the use of a traversing system. Then the traverse will stop moving, and the measurement will commence. Once the measurement is complete at that location (whether through the maximum number of points being reached, or the time-out occurring) the traverse will move to the next location and stop. The process is repeated multiple times, until the entire spray is characterized.

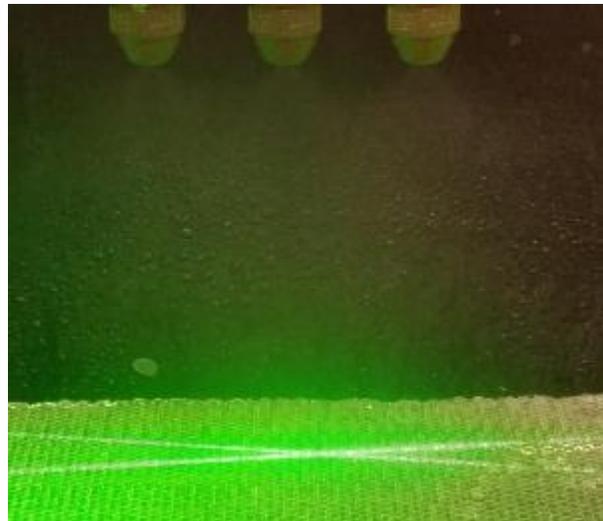


Fig. 1. A scan capture measures the spray at a discrete set of multiple points.

There are a number of advantages and some disadvantages to this approach. One advantage is that the user is free to determine the spatial resolution that is desired, by creating a test matrix with virtually any degree of measurement spacing, limited only by the user's patience, and the resolution of the traversing mechanism. The scan can be as fine or coarse as necessary to fulfill the intended

purpose. With a 3D traverse, the spray can be mapped out in all 3 cardinal directions. The process can also be automated. The scan capture location and settings matrix can be created easily in FlowSizer software or Microsoft® Excel® software and the PowerSight PDPA system will move to each point collecting data, all on its own, with no required user inputs after that point. The final result is a list of individual runs collected at many different points within the spray. The user can then analyze these runs individually, or in batch mode to more fully understand the spray.

Pros and Cons of the Scan Capture Method

Pros:

- High spatial resolution can be achieved
- Optimized capture settings can be set uniquely for each location
- More user control over the duration and location of data points
- Matrix of data points can be entered before capture; the system movement and data collection is then automated

Cons:

- More time-consuming; mapping a spray will take longer
- Typically a lot of data to analyze

While the scan capture is extremely useful for most cases, there are other situations where a sweep capture may be more appropriate.

Sweep Capture

The Sweep Capture is similar in many ways to the scan capture. In both methods, a traversing system is used to move the measurement volume with respect to the spray of interest. However, unlike the scan capture, the sweep capture does not stop at each point to take data. Rather, the sweep capture collects data *while the traverse is moving*. The user simply enters a starting and stopping location for the traverse, and a desired speed. When the sweep capture is then initiated, the traverse and the PDPA system begin taking data at the same time. Data continues to be collected while the traverse is moving, and ceases collecting data when the traverse stops. In this way, a single run contains information integrated over a continuous line of points through the measurement path.

Pros and Cons of the Sweep Capture Method

Pros:

- Provides a quick characterization of a spray in a single run
- Measurement time is relatively fast
- Gives a more global measurement of the spray

Cons:

- Need to account for a velocity bias that exists due to the movement of the traverse
- The same capture settings are used throughout the sweep
- A single run will have less “granularity” for data-processing

As can be seen, the sweep capture is generally employed in order to achieve a quick characterization of a spray nozzle that can then easily be compared with another nozzle.

Summary

This application note has covered some of the similarities and differences between the scan and sweep capture modes available in the FlowSizer software. Each mode has advantages and disadvantages. Typically the sweep capture is used to gain an overall characterization of a spray along one traverse line. This can be useful for example, in comparing a variety of nozzles to one another. The scan capture, on the other hand, is used to more fully map out the points within a spray.

References:

For more information, and examples of these techniques being applied, please refer to the following publication:

Bissell D, Lai W, Stegmeir M, Troolin D, Pothos S, Lengsfeld C (2014) An Approach to Spray Characterization by Combination of Measurement Techniques, *ILASS Americas 26th Annual Conference on Liquid Atomization and Spray Systems*, Portland, OR, May 2014



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