



**Spray Analysis
and Research Services**
A Service of *Spraying Systems Co.*

Advancing Spray Technology Through Consulting, Prototyping and Testing



Spray Analysis Eliminates Excess Scrap, Reduces Maintenance and Operating Costs

Spray Analysis and Research Services,

a service of Spraying Systems Co., was established in 2000 to help solve spray problems and optimize spray performance.

We work with customers that are:

- Experiencing quality problems due to poor spray system performance
- Seeking ways to improve operating efficiency and lower costs through spray system optimization
- Looking for new ways to spray as part of new product/process development

From our spray lab to your plant floor —
we deliver fast solutions for
real manufacturing challenges.

Operations that require precision spraying typically benefit the most from spray analysis. Chemical, food, pharmaceutical and pulp/paper manufacturers with coating, spray drying, gas cooling and marking applications are among those who utilize our services.

If your spray application requires a high level of accuracy, or if your reject rate is high, maintenance times long and the cost of consumables keeps creeping up, we can help. Tell us about the problems you've been having and we'll find a solution by determining the root cause just like we've done for many other customers. Following are just a few examples of process improvements we've developed for customers in the food and pharmaceutical industries.

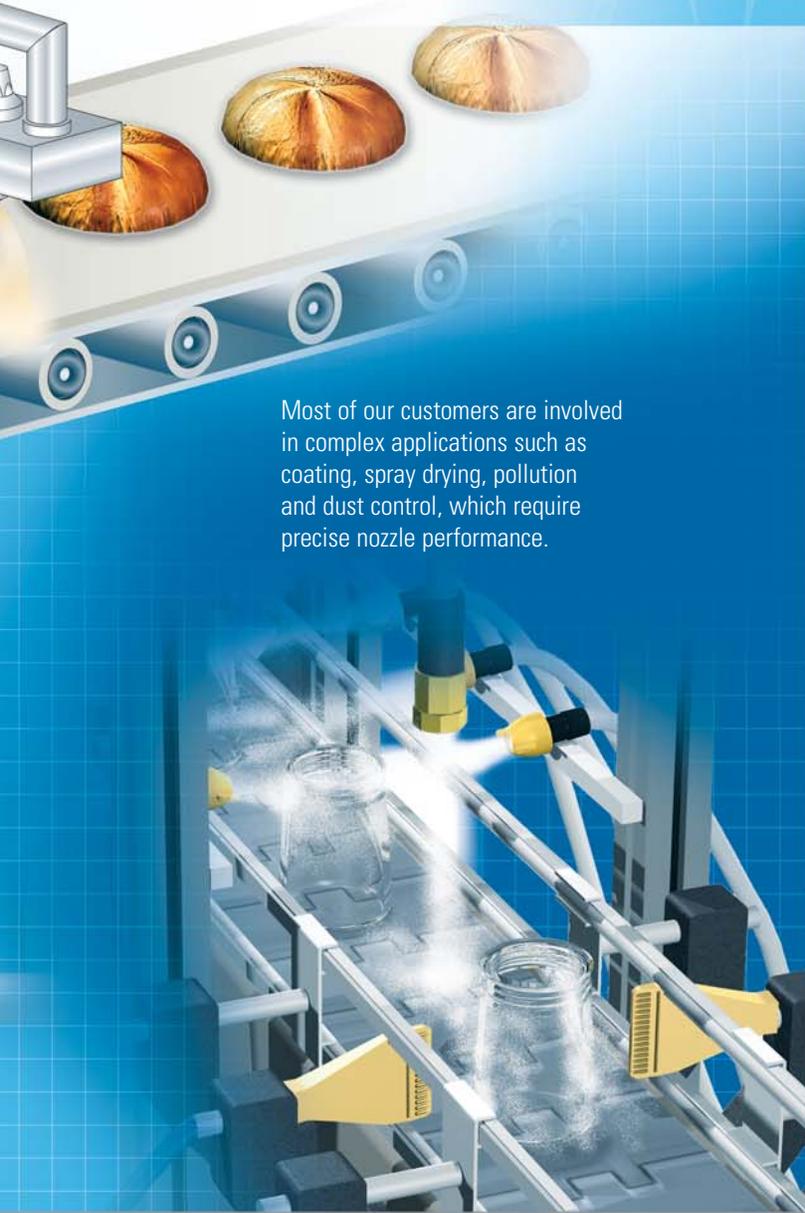
CASE STUDY:

Nozzle Re-design Increases Throughput

Maintaining your spray system is an absolute necessity. But what do you do when maintenance time becomes excessive? One manufacturer with a coating application was shutting down its operation every ten minutes to clean nozzles to ensure even spray distribution and product quality.

Spray Analysis and Research Services conducted extensive research and testing on a header consisting of a new nozzle designed to prevent drops from clogging the nozzle air cap. Our spray characterization testing validated the header would provide the same performance as the nozzles currently in use but could operate 12 times longer without requiring cleaning. The manufacturer saved \$60,000 annually due to a reduction in labor/maintenance costs and a decrease in production downtime.





Most of our customers are involved in complex applications such as coating, spray drying, pollution and dust control, which require precise nozzle performance.

Fine-Tuning Spray System Performance

How do you gauge the effectiveness of your spray system? If you're not having problems per se, perhaps you feel system performance is fine. However, there can be a big difference between a system that is adequate and a system that is optimized. The difference may not be visually noticeable, but the impact on the bottom line can be. As consultants, we are often asked to conduct on-site evaluations to determine if there is room for improvement in customers' applications. We'll tell you if your spray system is yielding optimal performance. However, in most cases, we conduct a variety of spray characterization tests to determine ways to improve system efficiency.

Customers are often surprised at our findings and delighted with the potential savings that may result from an adjustment of spray parameters or a change in spray nozzles.

At least that was the reaction of one customer when we demonstrated how a change from hydraulic nozzles to air atomizing nozzles would yield better performance with less scrap, lower operating costs by using lower operating pressures, and eliminate the need for high-maintenance, high-pressure pumps. In addition, the air atomizing nozzles offered longer wear life.

The change in nozzles enabled the customer to save approximately \$15,000 per month or \$180,000 annually.

In addition to problem resolution and refining existing applications, we spend a significant amount of time on proof-of-concept and new product development when an off-the-shelf solution isn't viable.

CASE STUDY:

Spray Performance Testing Improves Product Quality

Mold can be a huge problem for any manufacturer, but in the food industry it can be disastrous. When one food company detected mold on the outside of glass bottles, they didn't delay in contacting us. The culprit was traces of dried, excess product trapped under the bottle label.

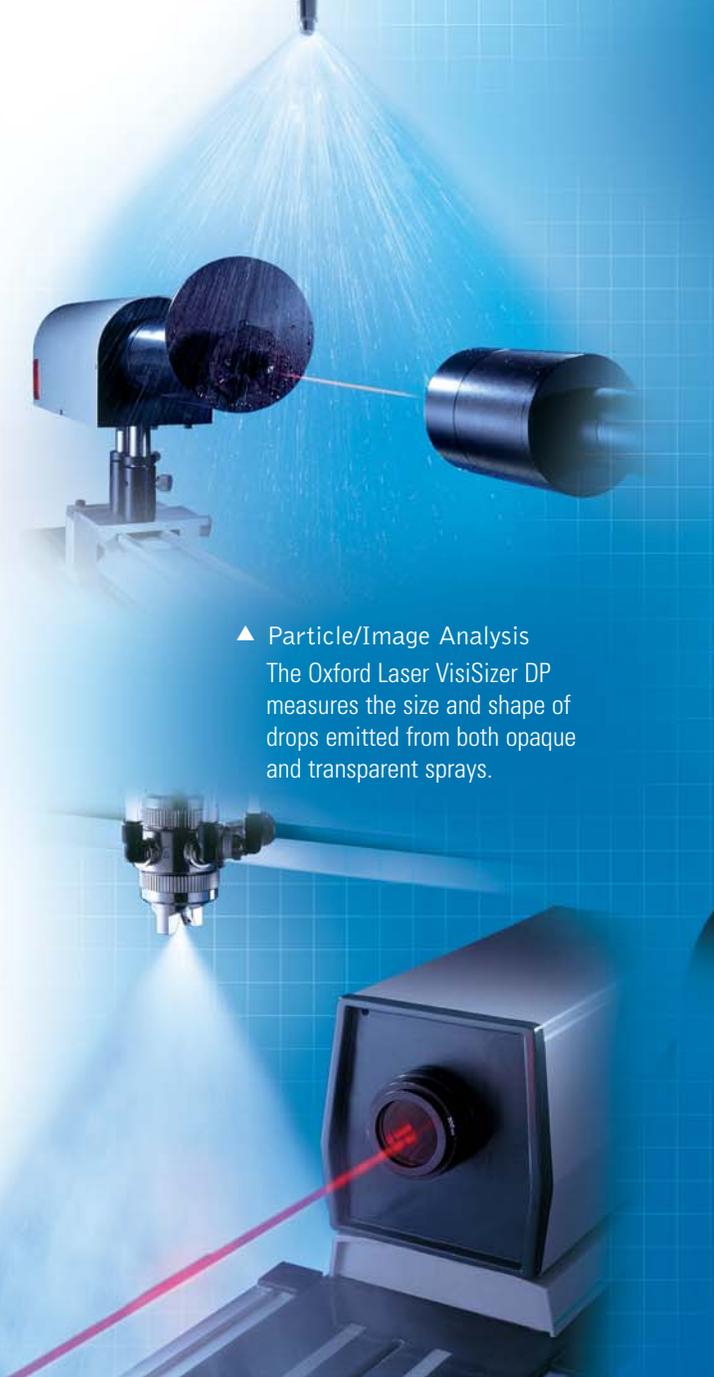
To determine how to solve this problem, we developed two headers for testing that would allow for maximum flexibility in the number of nozzles used, nozzle height and nozzle spacing. Various spraying pressures, spray angles and nozzle types were evaluated. The final solution included using multiple nozzle types in multiple positions and spraying from different directions to ensure adequate impact to remove excess product and thorough bottle cleaning.

Fully-Equipped Spray Laboratory Facilitates Finding Successful Solutions

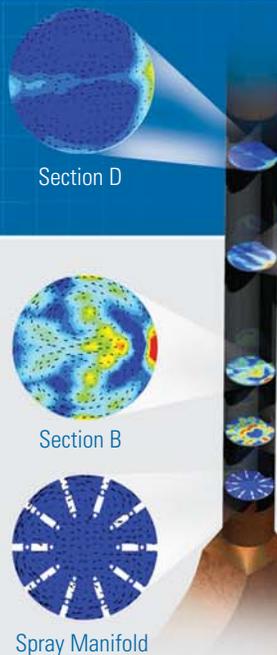
There's an old saying that goes "there's no substitute for reality" and it's one we strongly believe in. When it comes to solving spray problems, optimizing performance or finding new ways to spray, the best strategy is to conduct spray characterization studies with different nozzles under different operating conditions. Some companies rely on theoretical calculations and a bit of guesswork to predict spray performance. Our approach is different — we complement theory by testing spray performance using the actual operating parameters of the application. To be able to replicate our customers' environments, we've invested in specialized instruments and software. In fact, we have the largest spray laboratory in the world filled with state-of-the-art research equipment.

These are the tools of our trade. But, all the tools in the world won't yield actionable results unless you have the people that know how to use them. That's where our expert staff comes in. They have decades of experience in spray nozzle testing and research, spray nozzle design and nozzle fabrication. And, of course, they have been trained in how to use, calibrate and maintain these instruments as well as interpret results. This may sound like we're stating the obvious, but there are many different ways to measure spray performance and report the data — and both factors have a significant impact on results. That's why our lab is staffed by spray technology experts.

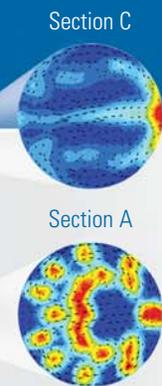
Top-rate instruments plus a top-rate staff equals top-rate spray performance — just ask our current customers.



▲ Particle/Image Analysis
The Oxford Laser VisiSizer DP measures the size and shape of drops emitted from both opaque and transparent sprays.



Spray Droplet Concentration at Various Locations in a Gas Conditioning Tower



Airflow: 9,350m³/min at 480°C
Liquid Flow: 760 l/min



Computational Fluid Dynamics (CFD)

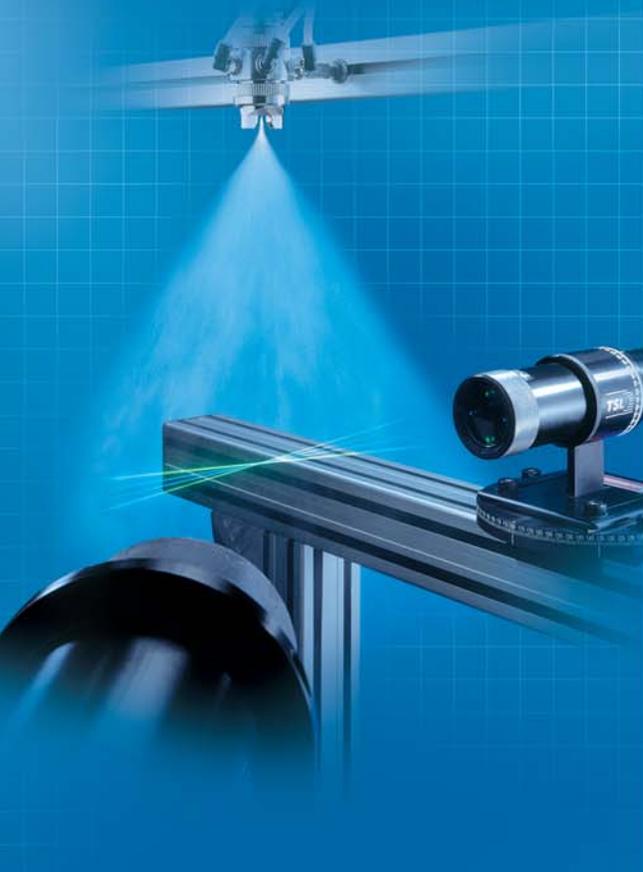
Our engineers use state-of-the-art tools such as CFD to simulate and predict spray performance using actual customer process conditions.

Customized Wind Tunnel

The Wenham (blower-type) wind tunnel was custom built for testing spray nozzle performance in environments with co-flow, counter-flow and cross-flow air such as gas conditioning, wet compression, spray drying and inlet cooling in turbines. A viewing area in the wind tunnel facilitates observation and measurement of spray characteristics under varying conditions.

▼ Phase Doppler Particle Analyzers (PDPA)

The Phase Doppler method is based on the principles of light scattering interferometry. These point sampling, flux-sensitive instruments are most effective in measuring the drop size and velocity of medium to large sprays.



◀ Laser Diffraction Particle Analyzer

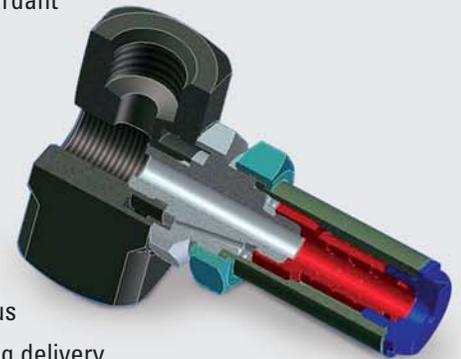
The Malvern Analyzer uses light scattering to measure small to medium sprays, and a curve-fitting program converts the light intensity distribution into drop size distribution.

Turning Concepts into Reality

If your application requires something out of the norm, we're the ones to contact. Our customers continually challenge us to come up with new and more efficient ways to spray.

Our track record is solid, evidenced by the fact nearly 80% of our projects involve prototyping, fabrication and proof-of-concept work. In the last few months alone, we've tackled projects like these:

- Developed an adjustable spray header system to minimize excessive misting, provide uniform coverage of paint on non-woven material and increase throughput
- Developed a way to efficiently produce heavy oils using new effervescent atomizing technology
- Developed a way to apply flame-retardant solutions to fabrics
- Designed a nozzle to withstand an extremely acidic solution and enable coating in a specialty optics application
- Designed a nozzle for spraying porous microparticulates for specialized drug delivery



Impact Measurement Devices

This device creates a 3D image of the spray, showing how impact varies throughout the pattern. The horizontal distribution is measured across the width of a spray as well as its impact (or force per unit area) through the spray width.

Spray Nozzle Patternator

The Patternator is a device that is used to measure spray distribution. Liquid is sprayed for a specified period of time and collected in channels aligned perpendicular to the spray nozzles. This volumetric distribution data is used to determine the optimal spray nozzle height and overlap required in various applications.

AutoJet® Modular System

The AutoJet Modular Spray System, from AutoJet Technologies, a division of Spraying Systems Co., is a self-contained, precision fluid delivery system. This system allows for real-time control of sprays as well as being flexible and easily adapted to testing situations.

Additional Instrumentation

- Laser Imaging (PMS Probe)
- Spray Dryer
- AutoJet AccuCoat® Low Mist Spray System
- Fluid Handling/Mixing Equipment

Our Deliverable is Actionable Information

At the conclusion of our consulting, prototyping and/or testing services, you will have specific, documented information you can put to use immediately. In some cases, this means knowing how to resolve a spray problem or optimize performance. In other cases, it will mean concept validation or a new spray nozzle design. You are under no obligation to us. Should you request further assistance, we will refer you to other divisions within our organization for nozzle or system purchase or production. Or, you can choose to implement the solution yourself or contract with others. Once we've delivered the solution you need, our role is complete. However, most of our customers use our services on an on-going basis in an effort to optimize spray performance to keep pace with changing process conditions and changing technology.

Here's How Others Have Benefited

Our customers have just one thing in common: the need to spray. Beyond that, every customer's requirement is unique. As a result, our applications expertise is significant.

Here's just a partial list:

- Aerosol spray characterization
- Nozzle testing and design for microparticulates used in drug discovery
- Development of new effervescent spray technology for use in chemical production
- Spray characterization and header design to ensure sanitary conditions in food processing

In the hundreds of projects we've completed, no two solutions have been identical. But, they've all been based on advanced spray technology and yielded the desired results. Read on for just a few examples of how we've helped others and would like to assist you too.



CASE STUDY:

Spraying Acidic Solutions Successfully

A military aircraft components manufacturer was spraying highly concentrated acids. However, leaching was occurring and the nozzle material was ruining the acidic coating solution. Extensive material testing by the manufacturer yielded no success.

We tackled the problem and not only solved it; we took it one step further and made enhancements to the nozzle design to improve the coating process. We developed a special air atomizing nozzle constructed of Hastelloy® C with all internal wetted surfaces made of Teflon®. The nozzle featured a special internal mixing chamber to ensure the acids are thoroughly mixed prior to exiting the nozzle orifice. This resulted in uniform coating of the components and reduced quality control problems experienced by the manufacturer.



Spray Technology Seminars offered throughout the year blend theory and science with practical application information.

CASE STUDY:

Encapsulated Particle Spraying Requires New Solution

Spraying microparticulates requires precise drop size. But when the microparticulates are organic organisms, which react adversely to light, heat or oxygen, there are additional critical factors to consider for successful spraying.

Drop size has a significant impact on the quality of the encapsulation matrix and the production volumes. This customer turned to us because they consistently produced oblong-shaped, non-uniform drops, thus adversely affecting the final product.

The first step in our solution was delivery of the required drop size. This was achieved by using an external-mix, two-fluid nozzle. Then, to minimize waste and reduce possible operator inhalation of the organisms, we added a mist suppression system. The final step was to add a control system to automate and regulate the spray application.

Our Expertise is Your Expertise – Just Ask

Keeping our customer's proprietary information confidential is critically important to us and we practice it with vigilance. But when it comes to information about spray technology and spray performance, we're pretty prolific. We publish technical manuals, guides, papers and technology updates on a regular basis.

Our Spray Technology Seminar is also available for those interested in an even greater understanding of spray nozzle performance. The Seminar focuses on how quality and efficiency can be improved and cost reductions achieved.

Seminar sessions include:

- The finer points of spray characterization
- Drop size — what it is, how to measure it and why it is critically important
- All spray characterization tests are not equal — the role of instrumentation on results
- How spray nozzles work — atomization mechanisms, spray coverage, flow rate equations and more

The final day of the seminar is spent in our lab where seminar attendees participate in a wide assortment of spray characterization tests.

Get to Know Us Better with a No-Obligation Consultation

The best way to see how we may be able to assist you is to give us a call. Tell us about your spray application and we'll tell you specifically how we may be able to help. If appropriate, we'll schedule a no-obligation meeting to begin the problem-solving process, evaluate your current application for improvement and/or review your specifications for a new concept.

Contact us today at 1.800.95.SPRAY.

There's no risk and the reward potential is high — new and better ways to spray.

Helpful Resources

We have an extensive library of bulletins and technical manuals available online. Our resource library is available without obligation at www.SprayConsultants.com.

Spray Technology Updates

Case studies that document research in a wide variety of applications — paper treating, spray dry, chemical coating scale up, optical coating, drug delivery and more.

Optimizing Your Spray System

Comprehensive 54-page booklet explains how to maximize performance and quality in your spray application.

[Request Technical Manual TM410](#)

An Engineer's Practical Guide to Drop Size

Sixty years of drop size knowledge condensed into a 28-page booklet to teach the fundamental facts of drop size measurement.

[Request Bulletin 459](#)



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Spray
Nozzles



Spray
Control



Spray
Analysis



Spray
Fabrication