



**A GUIDE TO
SPRAY TECHNOLOGY
FOR THE PULP &
PAPER INDUSTRY**



Spraying Systems Co.[®]
Experts in Spray Technology





COMPREHENSIVE SPRAY TECHNOLOGY SOLUTIONS FROM A SINGLE SOURCE

WE LOOK FORWARD TO HELPING YOU OPTIMIZE YOUR OPERATIONS INVOLVING SPRAY TECHNOLOGY.

We're uniquely qualified to assist:

Many of our showers and nozzles are specially-designed for use in pulp, paper and tissue mills. Our products are optimized for transfer efficiency, impact, precision, water conservation, quick maintenance and more. We have the most comprehensive line of spray products available, but we are always willing to make nozzles in different materials and sizes to ensure you get the performance you need. In addition to standard showers, we offer built-to-orders showers to maximize performance in your operating environment.

Our offering goes beyond spray products. We provide a wide range of testing and modeling services to provide the best possible solution. By simulating your operating conditions in our spray laboratories or using Computational Fluid Dynamics (CFD) modeling, we can determine which shower designs and nozzles will be most effective.

For nearly 80 years, our sole focus has been on spray technology. We provide engineering and technical support to mills around the world from our ten manufacturing facilities and more than 90 sales offices.

On-site, no-cost optimization, machine and maintenance audits can be requested from your local spray expert. Other educational programs at our Spray Technology Centers are also available. Let us show you why mills around the globe rely on us to help boost production, improve paper and tissue quality, lower operating costs, minimize waste and more.

Just give us a call at 1.800.95.SPRAY or visit spray.com to learn more.



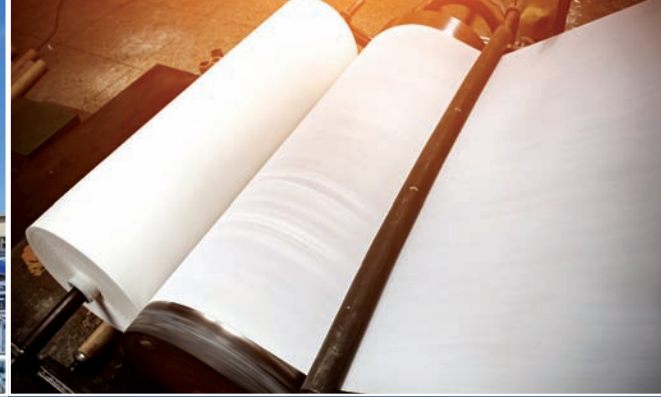


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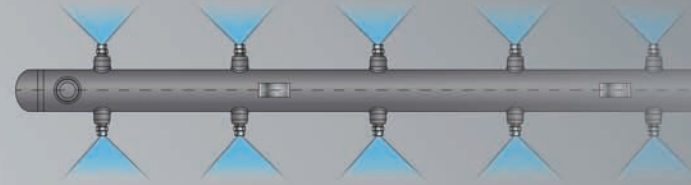




FABRICATION & TESTING

The most critical components in any spray system are the spray nozzles. Choosing the nozzles that will deliver the precise performance required for your operation is essential to quality. Flow rate, coverage, transfer efficiency, precision and other spray characteristics can be the difference between defect-free paper and tissue and high waste and scrap.

Once the nozzles are selected, it is just as important to ensure the equipment feeding the nozzles is optimized. Inadequate or excessive pressure and flow in showers can result in paper breaks and quality problems.



Here's how we can help:

BUILT-TO-ORDER SHOWERS

We design and build showers and manifolds for a wide range of operations throughout your mill.

Here are a few examples:

- Brushless and brush-type lubricating and chemical showers
- Brushless and brush-type pipe-in-pipe showers
- Enclosed air atomizing moisturizing showers

Showers can be equipped with a wide range of conventional or quick-connect nozzles, special nozzle orientations, multiple nozzle rows or spray zones, air barriers or blow-off curtains and more.

SPRAY CHARACTERIZATION

In operations where spray performance is critical, it is important to understand how factors like these affect performance:

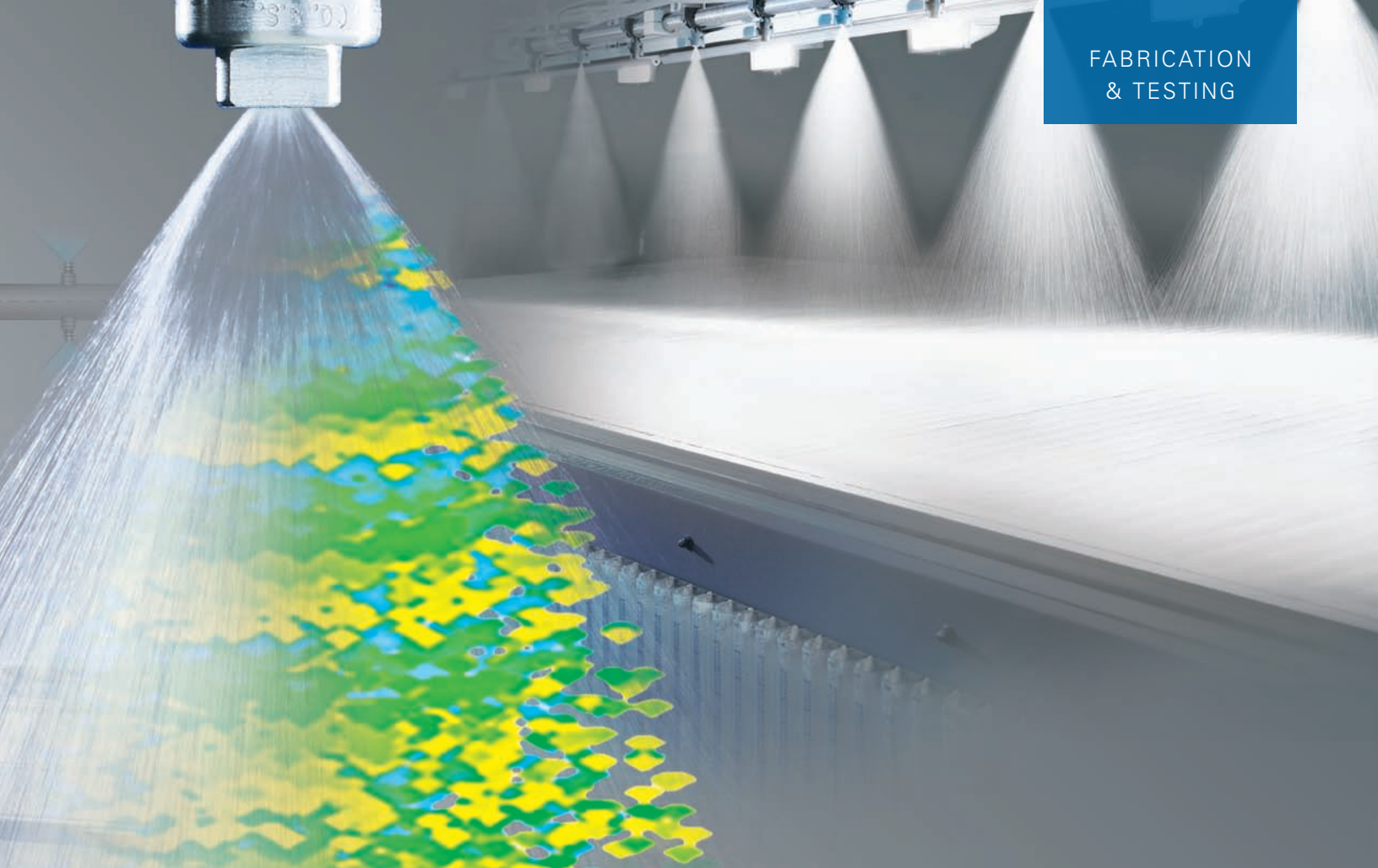
- Process conditions such as pressure, temperature and variable line speeds
- The liquid being sprayed
- The placement and position of nozzles in relation to the target

In many cases, experience and theoretical calculations can provide an indication of actual spray performance. However, testing in our spray labs determines actual performance and can eliminate costly specification mistakes or quality problems after installation.

While testing in our labs, we can adjust and/or test different nozzles and shower configurations to find the exact performance required for your operation.

Common tests include:

- Spray characterization
- Spray angle
- Drop size distribution
- Evaporation rate
- Spray impact
- Residence time
- Spray pattern
- Dwell time
- Spray coverage



COMPUTATIONAL FLUID DYNAMICS (CFD) MODELING

When exact operating conditions cannot be replicated in our labs, we use CFD modeling to help achieve an optimized spray solution. Simulation provides more information about the key factors that impact the success of an application. Our models use known inputs collected in our spray labs. This proprietary data improves model accuracy and illustrates flow patterns, velocity, turbulence, droplet trajectories, internal system pressure and more.

Typical uses for CFD modeling include:

- Determination of optimal shower design and nozzle placement
- Transfer efficiency in high-speed web lines
- Turbulence analysis
- Gas cooling/conditioning analysis to determine lance and nozzle placement in ducts, scrubbers, furnaces, cooling towers and more
- Internal flow characteristics of spray nozzles under specific operating conditions

WEAR TESTING

Like any precision component, nozzles will wear over time. This wear is not always visible – especially in the early stages. However, even slight wear (10 to 15%) can cost thousands of dollars per month in wasted water, energy and disposal costs. In addition, you may experience quality problems since wear compromises impact pressure.

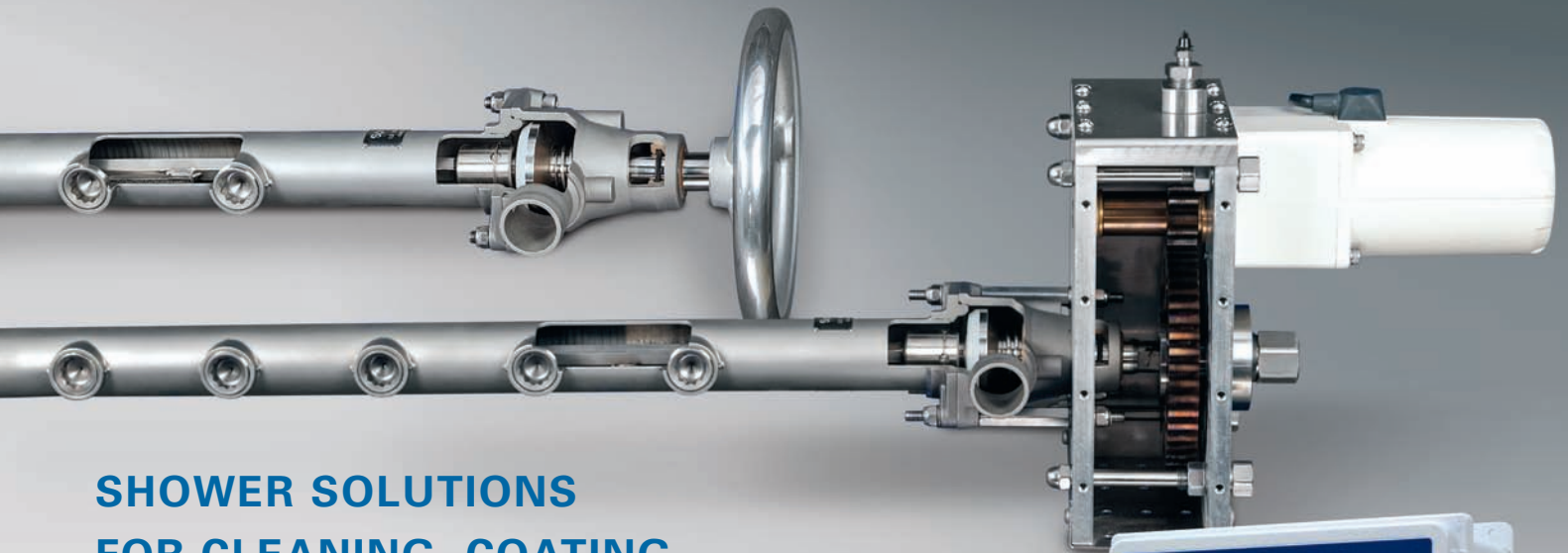
We offer a free nozzle wear testing program for our customers.

Program details:

- Ship nozzles from various points on a single shower to us after they've been in use for several months
- Tests will be conducted in our spray labs to determine the wear rate
- Your nozzles will be returned to you along with recommendations for optimal replacement intervals

Ask your local paper specialist for more information on our fabrication and testing services.





SHOWER SOLUTIONS FOR CLEANING, COATING, MOISTURIZING & MORE

We manufacture an extensive line of showers. If you don't see exactly what you need, be sure to contact us. We custom design showers and modify existing designs for customers daily.

BRUSH-TYPE SHOWERS ELIMINATE NOZZLE CLOGGING

- An internal rotating brush assembly scrubs the interior wall of the shower and nozzle orifices to sweep debris away
- Ideal for use with recirculating systems or white water
- The brushes operate while showers are in use to maximize machine uptime
- Brushes are staggered at 120° intervals to allow full system flow
- Manual handwheel and automated motor-driven versions available. Existing manual brush-type showers can be easily retrofitted for automatic operation
- No operator intervention is needed with automatic brush showers. Cleaning cycles occur regularly via a programmable timer. Dangerous climbing of paper machines is eliminated and personnel can be deployed to other tasks
- Competitively priced



ShowerJet nozzles are most often used with our brush shower. Our new one-piece design simplifies installation and maintenance. ShowerJet nozzles that produce a flat spray pattern are available with a stainless steel orifice. Solid stream versions are available with ceramic or synthetic ruby orifices for longer wear life.

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PRECISE MOVEMENT OF AUTOJET® OSCILLATING SHOWERS ENSURES CONTINUOUS AND UNIFORM FELT CLEANING

- The controlled, smooth movement of cleaning showers across the felt from the AutoJet 60030 AC Oscillator Shower Assembly ensures optimal felt cleaning with minimal water usage
- The assembly is easy to operate, easy to install and can be used with showers with a maximum pipe dia. of 3.5"
- Even distribution of water ensures uniform cleaning across the entire felt face
- Users can easily and precisely control stroke and speed; settings can be stored or adjusted on-the-fly
- Alarm messages display if the controller detects operational problems



- Durable construction – waterproof design withstands washdown; all wetted parts are constructed of 316 stainless steel
- Easy integration into existing lines
- Minimal maintenance

PIPE-IN-PIPE SHOWERS OFFER ADDED PROTECTION

- Ideal for use when the shower, feed tubes or nozzles require protection from the operating environment and/or accidental damage
- Outer slotted tube encloses a conventional pipe manifold
- Inside manifold slides in and out for quick maintenance
- Economical alternative to other traditional box-style showers
- Easily configure up to three zones for separate control of nozzle sections
- Lightweight for easy installation

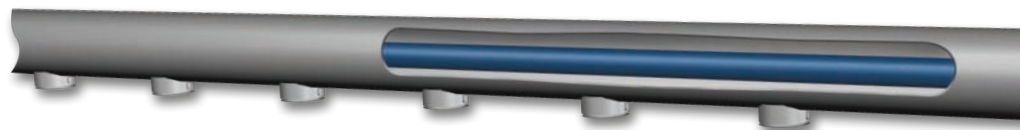


Ideal for use with automatic air atomizing spray nozzles.
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BRUSHLESS SHOWERS – BASIC AND EFFECTIVE

- Designed for use with fresh water and operations where nozzle clogging is unlikely
- Economical



Commonly used with standard hydraulic nozzles.
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SHOWERS FOR USE WITH AUTOMATIC NOZZLES

- Pipe-in-pipe for use with automatic air atomizing nozzles
- Channel/angle style for applications that require a header to support and mount nozzles and feed tubes. For use with hydraulic or air atomizing nozzles
- Box-style for messy environments such as starch spraying that require a header to support, mount and protect nozzles and feed tubes. For use with automatic air atomizing nozzles
- Modular air atomizing manifolds for applications that can benefit from organized tubing and fewer connections. Exposed or covered tube designs available
- You'll find dozens of nozzle types available for use with our showers and manifolds in hundreds of capacities, sizes, configurations, spray patterns and materials



An AutoJet® spray controller can be added to any of our showers to optimize spray nozzle performance, lower operating costs and automate operation. More critical operations such as coating and moisturizing tend to experience the greatest efficiency and performance gains due to precise control of our automatic spray nozzles.

Details on automatic hydraulic and air atomizing nozzles.
See page 11

SPRAY NOZZLES FOR SHOWERS

SHOWERJET NOZZLES

- New one-piece design simplifies installation and removal
- Disc-type nozzles fit inside the shower so the internal brushes easily sweep debris away
- Lock-ring holds the nozzles in place
- Available in flat and solid stream spray patterns. Solid stream has a choice of ceramic, stainless steel or synthetic ruby orifice material for longer wear life



NEEDLEJET NOZZLES

- Solid stream high-impact performance – ideal for cleaning felts, fabrics, wire, suction rolls and more
- Stainless steel or synthetic ruby orifice material options
- 21280 version features a tube on the back end that protrudes higher than competitive nozzles. This enables better quality water to be drawn into the nozzles and minimizes turbulence. Ruby orifice version is available for longer wear life



SELF-CLEANING NOZZLES

- Available with low or high actuator pressures
- Features a piston-type design. When line pressure is low, the nozzle's piston retracts to purge debris from the nozzle orifice
- Ideal for use in environments with suspended solids and showers with high solids content in the water
- Compact design makes it ideal for use inside paper machines



DISCJET® NOZZLES

- No better option when space is tight. Flush mount to shower pipe
- Provides the cleaning efficiency of flat spray nozzles
- Orifice designed to prevent clogging
- Best used with fresh water
- Threaded and threadless versions available



VEEJET® NOZZLES

- Flat fan with tapered or even edges and high-impact solid stream spray patterns
- Spray angles from 0° to 110°
- Wide range of material options; quick-connect versions also available



IMPROVE PRECISION, SPEED SET-UP TIME & MINIMIZE PAPER BREAKS

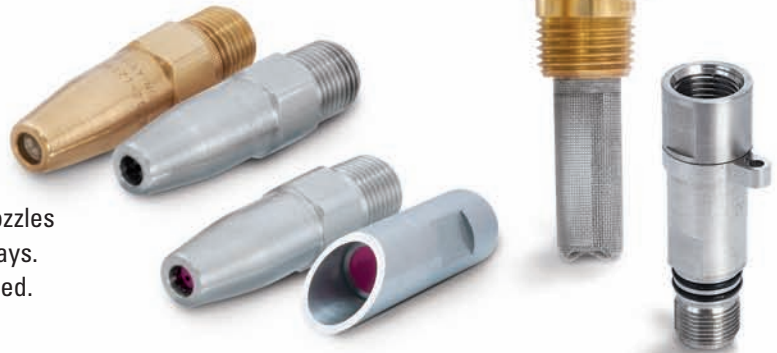
NEW SINGLE- AND MULTI-PIPE ALIGNMENT DEVICES

- Quick and easy adjustment of UltraStream® nozzles to the exact trim position required. Reduces downtime for nozzle alignment up to 70%
- Goose-necked pipe design prevents turbulence in pipe before nozzle
- Use with different paper widths and grades; horizontal and rotational adjustments with 10 mm increment adjustability ensure quick and accurate control of nozzle location. No tools required
- Operator safety is ensured – handles and scales are located away from the nozzles
- Multi-pipe alignment devices provide redundant streams to prevent sheet breaks due to splitting or broken streams
- Alignment arms can be removed without disrupting remaining arms and nozzle locations



ULTRASTREAM NOZZLES

- Precise, sharp, crisp edge trimming
- Single orifice version can be used with most paper grades
- Dual orifice version eliminates the need to use two nozzles in tandem by producing twin parallel solid stream sprays. Backsplash is reduced and spray alignment is simplified. Ideal for use with specialty or fine papers
- High-impact performance enables the nozzles to be placed further from the target which reduces build-up on the nozzles and downtime for maintenance
- Choice of orifice materials including synthetic ruby for long-lasting, precise performance
- Swivel-version allows precise, leak-free alignment without disturbing connections



AIR BARRIER ADAPTOR

- Creates a barrier of air to prevent build-up on trim nozzles
- For use with any 1/8" or M10 male threaded nozzle
- Integrates into existing set-up between nozzle and feed pipe



AUTOMATIC NOZZLES FOR OPTIMIZED COATING, MOISTURIZING & MARKING

PULSAJET® ELECTRICALLY-ACTUATED HYDRAULIC AND AIR ATOMIZING SPRAY NOZZLES

- Accurate spray placement and excellent spray pattern integrity ensure uniform coverage with minimal waste
- Fast, on/off cycling of nozzles reduces the amount of fluid used without compromising the spray pattern
- Hydraulic versions use only liquid pressure as the atomization force
- Air atomizing versions use compressed air as the atomization force and produce the lowest possible flow rates and drop size



Precision Spray Control (PSC) is achieved when Pulsajet nozzles are used with an AutoJet® Spray Controller.
PSC:

- Ensures consistent coating weight even when line speed changes
- Reduces scrap caused by over- or under-application of the sprayed solution
- Reduces the use of costly coatings by applying the proper coating volume directly on the target
- Eliminates maintenance time to clean overspray from equipment and/or floor due to over-application
- Improves worker safety by minimizing misting
- Eliminates the need for compressed air in some operations

JAU AIR-ACTUATED AUTOMATIC AIR ATOMIZING NOZZLES

- Compressed air is used to control air cylinder operation for accurate intermittent spraying (up to 180 cycles per minute) and for liquid atomization
- Wide range of configuration set-ups including clean-out needles, shut-off needles, swivels and strainers
- Liquid lines can be pressure-fed, siphon-fed or gravity-fed
- Drip Free™ spray set-ups ensure positive shut-off
- Use with an AutoJet® spray controller for enhanced performance such as on/off control, timing and sensor control, real-time monitoring and closed loop control



VAA/VMAU VARIABLE SPRAY AUTOMATIC AIR ATOMIZING NOZZLES

- Provides uniform spray distribution even when spraying viscous fluids
- Independent control of liquid pressure, atomizing air pressure and fan air pressure makes it possible to fine-tune flow rate, drop size, spray distribution and coverage
- Additional liquid ports allow for recirculation to effectively maintain the flow of viscous liquids



J SERIES AIR-ACTUATED STANDARD AIR ATOMIZING NOZZLES

- Finely atomized spray by mixing air and liquid
- Wide range of options: pressure or siphon spray set-ups, external or internal mix, spray patterns, needle assemblies, capacities, materials and more



TankJet AA190:
High-impact, motor-driven
unit for thorough cleaning
and trouble-free operation

AUTOMATE CHEST & TANK CLEANING TO IMPROVE WORKER SAFETY, REDUCE CLEANING TIME & MORE

TANKJET® EQUIPMENT

- Improve worker safety by eliminating the need for employees to enter large chests and tanks
- Minimize worker exposure to dangerous chemical fumes
- Dramatically reduce use of water and chemicals compared to fill and drain and hose-based methods
- Decrease downtime – high-impact sprays result in quick, efficient cleaning so chests and tanks can be returned to service faster
- Wide range of equipment available – nozzles, spray balls, motorized and turbine-driven units to clean chests up to 100' (30 m) in dia.

TankJet 360:
High-impact,
high-efficiency cleaning
for hard-to-remove residues



TankJet 78:
High-impact cleaning,
self-flushing design
and easy maintenance

TankJet 6353-MFP:
High-capacity cleaning
with clog-resistant design

WIDE RANGE OF NOZZLES AND SPRAY GUNS FOR CLEAN-UP

WHIRLJET® NOZZLES

- Hollow cone spray pattern
- Good atomization of liquid at lower pressures
- Material options include stainless steel, brass, polypropylene and PVC. Special materials are available upon request
- Quick-connect options include UniJet® and QuickJet® in a wide range of materials
- Unobstructed flow passages minimize clogging



FLATJET® NOZZLES

- High-impact flat spray pattern with a narrow spray angle
- Large flow passage minimizes clogging
- Material options include stainless steel, brass and steel. Special materials are available upon request
- Quick-connect QuickJet option available



CU150 GUNJET® SPRAY GUN

- For general clean-up
- Easy-change color-coded spray caps with three flow capacities
- Adjustable spray pattern – from solid stream to 50° hollow cone pattern
- Brass or lightweight aluminum with corrosion-resistant replaceable rubber cover



AA70 GUNJET SPRAY GUN

- Heavy-duty, impact-resistant, high-pressure gun
- Easy trigger pull at high pressure
- Excellent chemical resistance
- Large grip area accommodates work gloves and contour handle to comfortably fit small hands
- Vented gun housing keeps the handle cool at maximum operating temperature



ENERGY-EFFICIENT AIR NOZZLES & SYSTEMS FOR DRYING & BLOW-OFF

WINDJET® AIR KNIFE AND BLOWER PACKAGES

- Eliminates the need for compressed air for dramatic energy savings. WindJet air knives and/or air cannons are powered by a durable regenerative blower
- Blowers are energy efficient, quiet and easy to use
- Outstanding performance – uniform, constant, controlled air stream eliminates spotting and blotching in drying operations
- Ideal for use in areas with tough build-up that requires a concentrated stream of high-velocity air



727 AND 707 WINDJET COMPRESSED AIR NOZZLES

- Using compressed air, WindJet nozzles create an air barrier to prevent contaminants from entering defined areas
- Also used for drying and blow-off applications
- Ideal for use on sides of machines and prior to nip showers
- Wide range of flow rates, spray patterns and material options



WINDJET LOW FLOW COMPRESSED AIR KNIVES

- Low flow air knives deliver a high-velocity air stream but use less compressed air than conventional air nozzles
- A uniform air flow is provided across the entire length of the knife for fast drying and blow-off
- Maintenance-free
- Ideal for applications requiring one or two knives





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