



FLOMAX® TWO-FLUID NOZZLES

UNIQUE ATOMIZATION PROCESS
PROVIDES UNMATCHED EFFICIENCY
IN GAS CONDITIONING OPERATIONS



Spraying Systems Co.
Experts in Spray Technology





FOR APPLICATIONS DEMANDING PRECISION AND EFFICIENCY, FLOMAX[®] NOZZLES OUTPERFORM ALL OTHERS

If your application requires a finely atomized, controlled spray, you won't find a more effective solution than our high-efficiency FloMax two-fluid nozzles.

FloMax nozzles are not traditional two-fluid nozzles. Using patented multi-stage atomization processes, FloMax nozzles produce very small drops with exceptional efficiency. Compressed air use and energy consumption are low. The nozzles also offer significantly higher turndown ratios than standard two-fluid nozzles for maximum operating flexibility.

There are many other features that result in better spray performance and lower operating costs than competitive nozzles. In the sections that follow, you'll find more detailed information on the FloMax A Series, the FloMax Anti-Bearding Series, the smaller capacity FloMax X Series and the FloMax S Series that uses available plant steam.

TYPICAL APPLICATIONS AND INDUSTRIES

FLOMAX A SERIES:

Gas cooling and conditioning

- Cooling prior to baghouse, ESP, heat exchanger, kilns
- Cooling towers
- Induct cooling
- NO_x control
- SO₂ removal

FLOMAX ANTI-BEARDING SERIES:

Gas cooling and conditioning

- High concentration of dust particulates
- Slurry spraying
- Spray dry absorber

FLOMAX X SERIES:

Gas cooling and conditioning

- Induct cooling
- NO_x control

Chemical injection

FLOMAX S SERIES:

- Process gas cooling
- Gas scrubbing
- Moisturizing
- Desuperheating




INDUSTRIES:

- Aluminum
- Cement
- Chemical
- Petrochemical
- Power generation
- Pulp and paper
- Refinery
- Steel
- Waste incineration
- Waste-to-energy



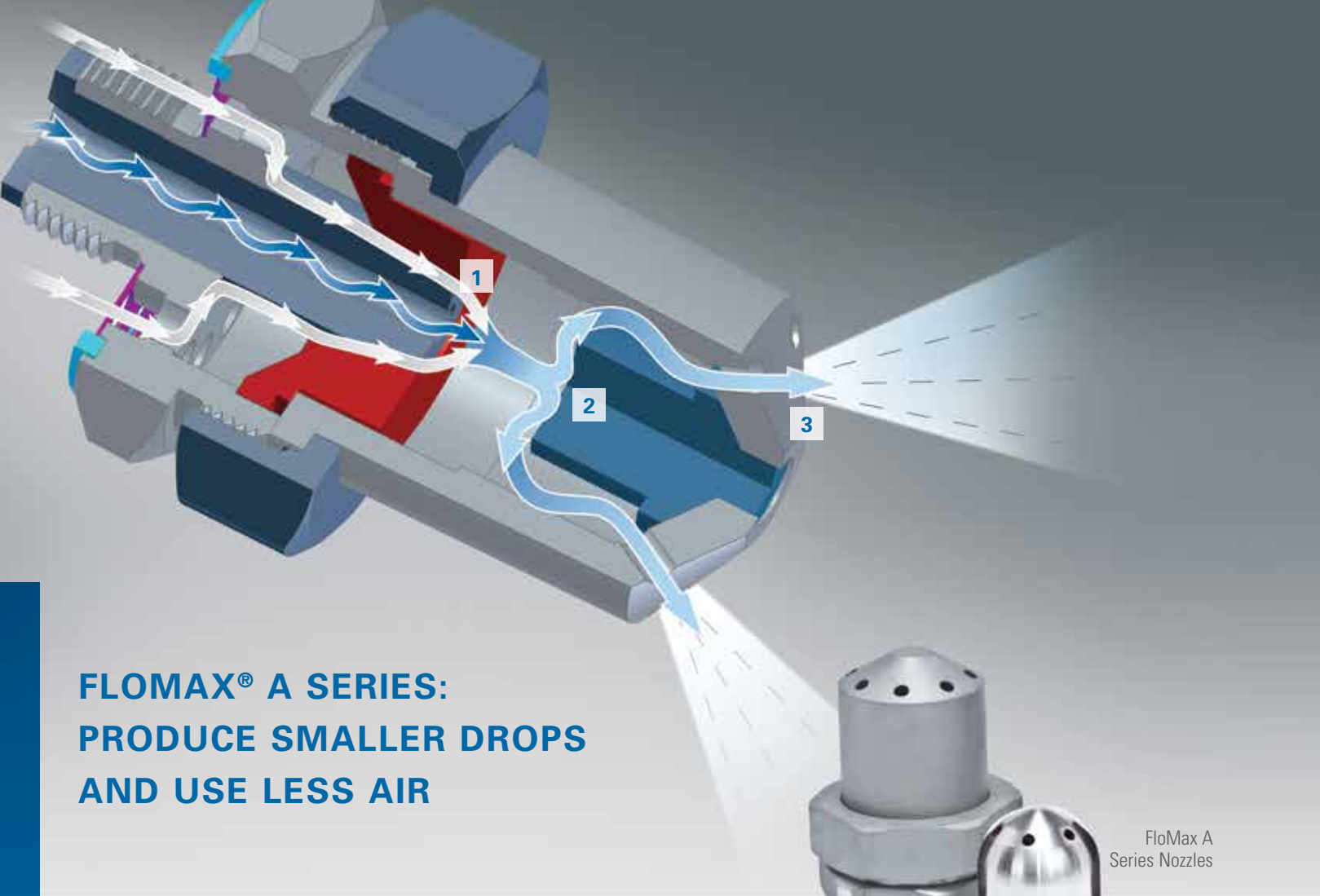


OVERVIEW OF THE FLOMAX® TWO-FLUID NOZZLE LINE

FLOMAX A AND FLOMAX ANTI-BEARING SERIES 	FM3A and FM3A-AB*: 0.3 to 3 gpm (1.13 to 11.3 lpm) Spray angle: 20° and 55°
	FM5A and FM5A-AB*: 0.7 to 7.0 gpm (2.6 to 26.5 lpm) Spray angle: 20° and 55° (95° optional)
	FM10A and FM10A-AB*: 1.3 to 13.0 gpm (4.9 to 49.2 lpm) Spray angle: 20° and 55° (95° optional)
	FM25A and FM25A-AB*: 10.0 to 30.0 gpm (37.8 to 114 lpm) Spray angle: 20° and 55° (95° optional)
FLOMAX X SERIES 	FMX015: 0.03 to 0.25 gpm (0.11 to 0.94 lpm) Spray angle: 20°
	FMX030: 0.05 to 0.5 gpm (0.19 to 1.89 lpm) Spray angle: 20°
	FMX090: 0.5 to 1.5 gpm (1.89 to 5.67 lpm) Spray angle: 20° and 55°
FLOMAX S SERIES 	FM01S: 0.4 to 15.8 gph (1.5 to 60 lph) Spray angle: 20°
	FM5S: 2 to 8 gpm (7.6 to 30 lpm) Spray angle: 55°
	FM10S: 5 to 17 gpm (19.0 to 64 lpm) Spray angle: 55°
	FM25S: 8 to 25 gpm (30 to 97 lpm) Spray angle: 55°

*Anti-bearing versions not available in 20° spray angle.





FLOMAX® A SERIES: PRODUCE SMALLER DROPS AND USE LESS AIR

FloMax A
Series Nozzles

When it comes to drop size, the goal is to minimize D_{max} and achieve a finely atomized spray with D_{32} less than 100 microns at 10 gpm (37.8 lpm). This drop size cannot be achieved with a single-step atomization process.

FloMax nozzles use a patented three-stage atomization principle to produce a focused air stream that shears the liquid with minimal air. The result is a D_{32} drop size 34% smaller using 20% less air than competitive nozzles (flow rate of 10 gpm [37.8 lpm]). Each nozzle uses as little as 45 scfm (76 Nm³/hr). Energy costs are lowered and compressor life is extended.

The very small drops produced by FloMax A Series nozzles reduce dwell time required for complete evaporation and reduce the risk of wetting. Plus, the liquid being sprayed generates more surface area per gallon (liter).

The uniform drop size distribution ensures precise, tight control of drop size. FloMax nozzles provide a narrower Relative Span Factor (RSF) than many other air atomizing nozzles at most air pressures.

FLOMAX A SERIES: PRINCIPLE OF OPERATION

- 1 Stage One: Primary Fluid Breakup**
Air and liquid converge at the annulus, allowing high velocity air to shear the liquid column.
- 2 Stage Two: Secondary Fluid Breakup**
Focused stream impacts the target bolt, forcing additional mechanical breakup.
- 3 Stage Three: Final Mixing**
Air cap acts as a final mixing chamber. As the liquid/air mixture crosses multiple orifices, an additional pressure drop provides the final atomization.



FloMax Anti-Bearding Series feature 10 to 12 orifices at compound angles. These orifices produce a very full spray when leaving the air cap. The spray pulls in as it travels and provides a 55° or 95° spray angle.

FLOMAX® ANTI-BEARDING NOZZLES

FloMax Anti-Bearding nozzles provide all the benefits of FloMax A nozzles but feature a patented air cap design to resist material build-up near nozzle orifices and prevent performance problems. These nozzles can last up to five times longer before maintenance is required to remove build-up and are suitable for use in high-particulate spraying applications.

The largest capacity FloMax Anti-Bearding nozzle is the FMA-ABD with flow rates up to 45 gpm (170.3 lpm). It features a new, patent-pending design that includes a diffuser in the air cap that is even more effective at resisting build-up. The FMA-ABD is ideal for spraying highly abrasive slurries.



FIVE ADDITIONAL BENEFITS OF FLOMAX A AND FLOMAX ANTI-BEARDING NOZZLES

Fewer nozzles required for cooling.

FloMax nozzles offer a large flow rate per nozzle. Competitive nozzles with equivalent flow rates produce larger drops. Fewer FloMax nozzles can be used, reducing initial costs and maintenance time.

Maximum flexibility because of high turndown ratios.

High turndown of flow rate – up to 10:1 – allows the air pressure to be constant while the liquid varies based on process requirements.

Effective in abrasive, corrosive and high-temperature environments.

Standard nozzle materials are 316 or 310 stainless steel and Hastelloy® is available on request. Air cap material options include reaction-bonded silicon carbide, Stellite®, ceramic and tungsten carbide.

Use lower quality water sources.

The nozzles feature large free passages that reduce the risk of clogging. Lower-cost water supplies can be used.

Reduced maintenance time.

Maintenance is fast and easy. Replacement of the nozzle or just the air cap and/or air annulus can be done without special tools. Competitive nozzles require more maintenance and frequent replacement because of smaller free passages and the use of higher air and liquid pressures.



Similar to the FloMax A Series, FloMax X Series nozzles feature:

- Large free passage to minimize clogging
- A choice of mounting options and easy installation

FLOMAX® X SERIES NOZZLES OFFER SIMILAR BENEFITS TO THE A SERIES AND OUTPERFORM ALL OTHER SMALL CAPACITY NOZZLES

A multi-stage cross-hole nozzle design provides superior atomization by shearing the liquid prior to mixing with the high-velocity air stream. This yields small drops at lower operating pressures than other nozzles and tight drop size control. Compressed air use is reduced, smaller compressors can be used and compressor life is extended.

FloMax X Series nozzles have a liquid turndown ratio of up to 10:1 and allow the air pressure to be constant while the liquid varies based on process requirements. Conventional air atomizing nozzles have ratios of 2:1 or 3:1. The high turndown ratio of FloMax X nozzles adds operating flexibility without compromising performance.

The narrow 20° spray angle is ideal for applications where spray precision is important. Multiple nozzles can be configured on a lance or in a duct or vessel to deliver targeted sprays in critical processes. FloMax X Series nozzles provide a narrower RSF than many other air atomizing nozzles at most air pressures.

A 55° spray angle is also available for applications requiring more spray coverage.

FloMax X Series nozzles are suitable for demanding applications – material options include 310 and 316 stainless steel and Hastelloy®. Other materials are available upon request.

FLOMAX X SERIES: PRINCIPLE OF OPERATION

- 1 Stage One: Primary Fluid Breakup**
The cross holes in the liquid orifice split the flow into four smaller streams.
- 2 Stage Two: Secondary Fluid Breakup**
The liquid – all four streams – is sheared by air as it exits the cross holes.
- 3 Stage Three: Final Mixing**
The air cap acts as a final mixing chamber. As the liquid/air mixture exits the orifice, an additional pressure drop provides the final atomization.





The mixing of steam and fluid just prior to exiting the nozzle orifices ensures tight drop size control.

FLOMAX® S SERIES: USE AVAILABLE PLANT STEAM AND ELIMINATE COMPRESSED AIR

Similar to our FloMax nozzles that use compressed air, FloMax S nozzles also produce the small drops required for cooling and quick evaporation. But, FloMax S nozzles eliminate the need for costly compressed air, compressors and some process piping and use available plant steam to atomize fluids and slurries. Using steam for atomization significantly reduces operating costs.

The unique, patent-pending design of FloMax S nozzles mixes the steam and fluid just before it exits the nozzle orifices. The result is efficient atomization without condensation and consistent drop size over a wide range of liquid temperatures – 72°F to 200°F (22°C to 93°C).



SIMPLE AND RELIABLE DESIGN REDUCES MAINTENANCE TIME

FloMax S nozzles consist of **ONLY** three pieces:

- 1** Nozzle body
- 2** Spray tips
- 3** Gaskets



Assembly can be completed in minutes.

Place the gaskets on the body, then insert the spray tips.

Maintenance is fast and easy.

Simple design ensures fast and easy maintenance. No special tools are required for installation or maintenance.

Simple and economical adjustments are possible should process conditions change.

All spray tips fit on the same size body.

Pre-assembled valve regulation packages available.

Save engineering and installation time.

Wear-resistant materials extend time between maintenance intervals.



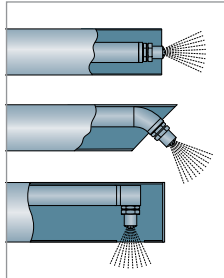


INJECTOR SOLUTIONS RANGING FROM SIMPLE TO COMPLEX

FloMax® nozzles are designed to yield very precise performance. Equally important in a spray system is the spray injector (also known as a spray lance) that delivers the liquid and/or gas to the spray nozzle. Spray injectors must also meet exacting standards to ensure optimal performance.

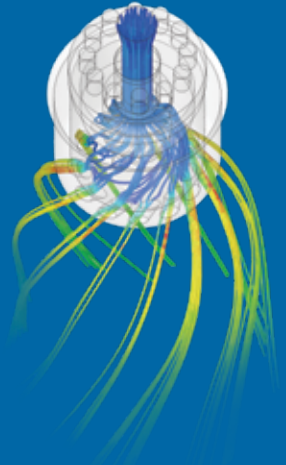
WE OFFER A FULL RANGE OF SPRAY INJECTORS:

- Our standard FloMax injectors are readily available in 0°, 45° and 90° configurations with quick-release or bolt-on flanges and optional adapters, cooling jackets, purge tubes and protective tubes
- When non-standard solutions are needed to meet challenging physical spaces or hostile environments, injectors are built to order. Common designs include insulated, water- and steam-jacketed, recirculating, retractable and/or cluster nozzle injectors in a wide range of high-temperature and corrosion-resistant materials. Manufacturing to meet B31.1 and B31.3 and other codes is available along with testing in accordance with ANSI® and ASTM® standards, material certification, magnetic particle examination, material test reports and more



ENSURE OPTIMAL PERFORMANCE WITH COMPUTATIONAL FLUID DYNAMICS

There are dozens of variables that can affect spray performance in a gas stream. In many cases, we can predict performance by using our sophisticated, proprietary gas cooling software and conducting spray characterization testing in our fully equipped spray laboratories. However, in some applications, we rely on Computational Fluid Dynamics (CFD) to model gas flow based on actual operating conditions.



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