



# AutoJet<sup>®</sup> Gas Cooling System

Compact, automated system for efficient gas cooling with guaranteed performance

## Benefits

- Precise control of gas temperature increases production by improving operating efficiency and reducing maintenance
- Automated control of spray nozzles optimizes performance, reduces energy costs
- System performance guaranteed
- Broad range of nozzles from which to choose including high-temperature, abrasion- and corrosion-resistant designs including our energy-efficient FloMax<sup>®</sup> air atomizing nozzles
- Compact footprint – 2' x 5' x 5' (.6 m x 1.5 m x 1.5 m); 4' x 5' x 5' with redundancy (1.2 m x 1.5 m x 1.5 m)
- Total solution from a single source eliminates integration problems and the hassles of working with multiple vendors
- Custom injectors including retractable and purge designs ensure optimal performance and reduce downtime
- Modeling using Computational Fluid Dynamics (CFD) ensures injectors are properly placed in the gas stream to optimize cooling
- Economical, durable solution



## Specifications

Three system options:

- GCS-30: 30 gpm (113.6 l/min) total flow
- GCS-60: 60 gpm (227.1 l/min) total flow
- GCS-100: 100 gpm (378.5 l/min) total flow

Liquid pressures to 250 psig (17.9 barg)

Air flow rates to 400 scfm (679 Nm<sup>3</sup>/hr)

FloMax air atomizing nozzles typical; other air atomizing nozzles available

System options: air flow measurement, second spray zone, system redundancy, system enclosure

## Typical Applications



Gas Conditioning

Cement  
Non-Ferrous Smelters  
Power Generation  
Steelmaking  
Waste Incineration

# Effective Gas Cooling Requires Control

Gaining control of gas temperature, humidity and volume is required to:

- Effectively control emissions
- Ensure peak operating efficiency of ESP and other downstream equipment
- Minimize energy consumption
- Reduce maintenance time caused by wetting and sludge build-up
- Extend wear life of critical equipment such as fans and duct work by reducing gas velocity

Our AutoJet® Gas Cooling System provides total control of all system components to simplify and streamline the gas cooling process.

Here's how the closed-loop system works:

- Automatic monitoring and adjustment of air and liquid flow based on temperature sensors ensure precise cooling even with variable operating conditions
- Total control of all system components – nozzles, pumps, sensors and other hydraulic and pneumatic components – minimizes the need for operator involvement
- In the event the system cannot make the needed adjustment based on operating conditions, operators are notified via alarms

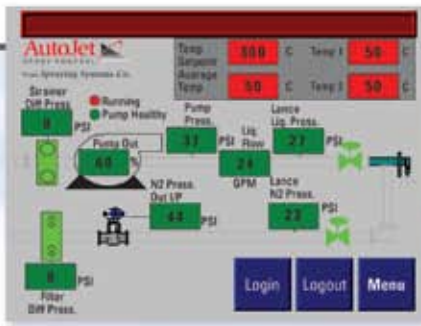
## Standard Monitoring Alarms

- Supply air minimum pressure alarm
- Spray nozzle atomizing air pressure deviation alarm
- Spray nozzle liquid pressure maximum alarm
- Pump outlet pressure alarm
- Liquid flow rate deviation alarm
- Outlet temperature deviation alarm
- Outlet temperature maximum alarm

## Optional Alarms

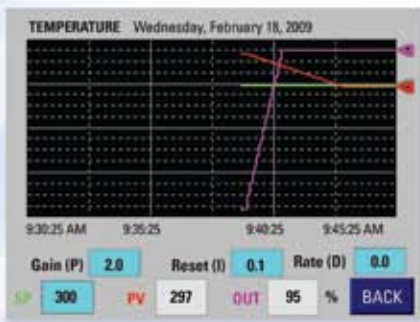
- Differential pressure (liquid strainer)
- Inlet temperature maximum alarm
- Air buffer storage tank (low pressure alarm)
- Liquid storage tank (low level alarm)





Full color graphical interface provides easy to read set point temperatures, air pressures and liquid flow rates

Alarms monitor supply pressure, nozzle atomizing air pressure, nozzle liquid pressure, pump pressure, liquid flow rate and outlet temperature



Temperature trending screen

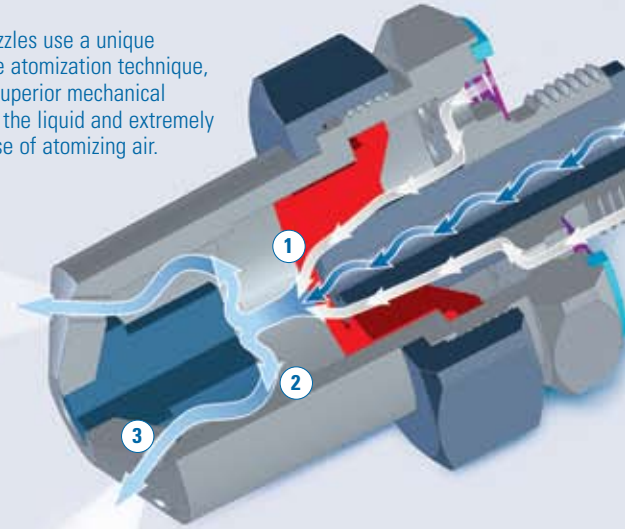


AutoJet® Gas Cooling Systems can be used with a wide range of nozzles including our standard and anti-bearding FloMax nozzles

## Nozzle Performance for Every Application

Our patented FloMax® air atomizing nozzles are usually the nozzle of choice for gas cooling. That's because these nozzles deliver a finely atomized spray using very little energy. The result is 100% evaporation, reduced consumption of compressed air and the elimination of maintenance problems caused by overwetting.

FloMax nozzles use a unique three-stage atomization technique, providing superior mechanical breakup of the liquid and extremely efficient use of atomizing air.



### FloMax nozzle benefits:

- Operates with air, other atomizing gases and steam
- Anti-bearding version minimizes build-up on the exit orifice and nozzle tip for reduced clogging
- Lower installation costs, fewer nozzles needed, higher flow per nozzle with finer atomization
- 10 to 1 turndown of liquid for flexible control
- Wide choice of materials – 316 stainless steel, 310 stainless steel, Hastelloy®, Stellite®, reaction-bonded silicon carbide and others upon request
- Robust, long-wearing design means less maintenance

**There are many factors such as drop size, fluid viscosity, spray pattern, spray angle, solids content and more that will determine which nozzle is suitable for your gas conditioning application. That's why our AutoJet Gas Cooling System can be used with any of our air atomizing nozzles.**

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Stellite® is a registered trademark of Deloro Stellite.




# Injector Solutions Ranging from Simple to Complex

We offer a full range of spray injectors. Our standard lightweight FloMax® injectors are readily available in 0°, 45° and 90° configurations with quick-release or bolt-on flanges with optional adapters, cooling jackets, purge tubes and protective tubes.

Many gas cooling operations require a non-standard solution to meet challenging physical spaces or hostile environments. Common requirements include insulated, water- and steam-jacketed, recirculating, retractable and/or cluster nozzle injector designs in a wide range of high-temperature and corrosion-resistant materials.

We're uniquely qualified to design and manufacture injectors for these applications:

- Dozens of engineering specialists, Professional Engineers (PE), manufacturing experts and welding experts on staff
- Manufacturing to:
  - ASME® Boiler and Pressure Vessel Code
  - ASME B31.1 Power Piping Code
  - ASME B31.3 Process Piping Code
  - Welding to ASME B&PV Code Section IX
- Testing in accordance with ANSI® and ASTM® standards
  - Material Certification
  - Magnetic Particle Examination (MT)
  - Material Test Reports (MTR)
  - Positive Material Identification (PMI)
  - Radiographic Examination (RT)
  - Ultrasonic Examination (UT)
  - Weld Map



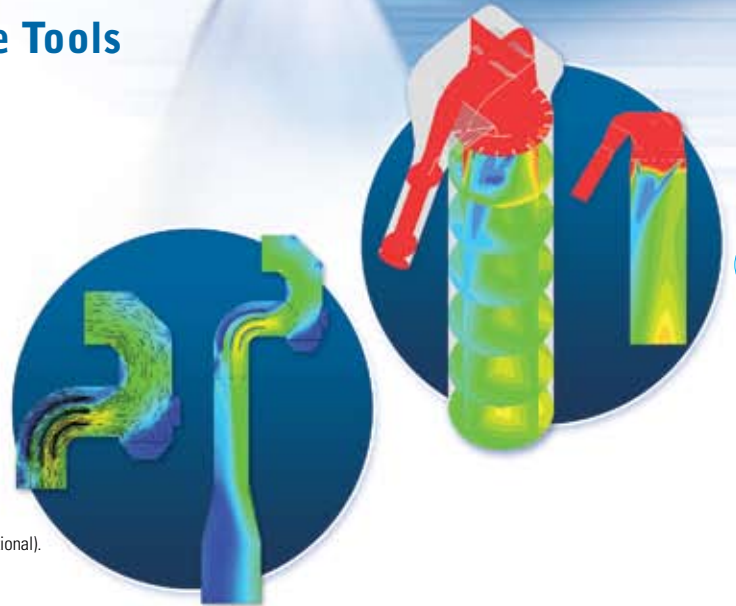
Anti-bearding FloMax injector



Custom injector

## Determining Optimal Nozzle Type and Injector Placement Requires Unique Tools

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 help model gas flow and determine optimal nozzle type, placement, spray pattern and angle based on the precise operating conditions used by our customers. Our CFD modeling uses our proprietary database of drop size and velocity data that has been collected in our labs to ensure the highest possible level of accuracy.



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