

# SpillAir™ mechanical atomizers

Spill-back nozzles produce a hollow cone spray by mechanical atomization (using water pressure only) and have been widely adopted in gas cooling applications as they produce a generally effective droplet size and acceptable flow rate control.

Listed below are the comparative advantages of spill-back and air atomized nozzles:

## Spill-back nozzle advantages

- Provides operating cost savings of 30-70%, depending on operating conditions.
- Avoids the cost and maintenance of air compressors.

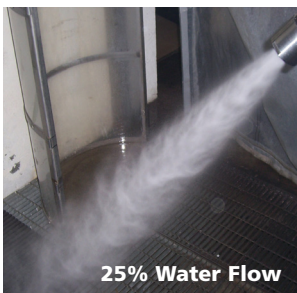
## Air atomized nozzle advantages

- Smaller average droplet size
- Better heat transfer due to improved relative droplet to gas velocity and water jet penetration into the gas stream.
- Greater turndown range
- Narrow and fixed spray angle of atomization
- Decreased propensity to fouling and wear
- Higher water flow rates per nozzle

BoldEco's patented SpillAir™ nozzle combines advantages of mechanical atomization with those of air atomization. This unique hybrid nozzle makes possible low-cost retrofits of poorly operating spray cooling towers. The SpillAir™ nozzle can also reduce the cost of new installations by allowing for much smaller evaporative gas cooling towers than with mechanical atomization alone.

## benefits of the BoldEco SpillAir™ nozzle

- Improved quality of droplet distribution and heat exchange
- Improved turn-down capabilities
- Constant angle of atomization avoids interference with neighboring sprays
- Shield air protects nozzles from fouling
- Shield air reduces scaling in the presence of hard water
- Maintains low energy consumption while improving performance
- Shorter residence time requirement for the same outlet temperature or reduced outlet temperature within the parameters of the existing residence time.



## the BoldEco SpillAir™ nozzle

The SpillAir™ nozzle is essentially a high volume, low pressure (HVLP) air assisted mechanical hybrid nozzle. The mixing between the air and the water takes place immediately outside of the spray orifice (external mixing) virtually at ambient pressure. A low-cost blower is installed for virtually maintenance free HVLP air. The following highlights the principal advantages of the BoldEco SpillAir™ nozzle:

- **Improved Spray Cone Characteristics:** By design, a high-velocity air shroud is produced around the mechanical atomization cone in order to improve the droplet formation and control the plume spray angle. This results in a constant angle of atomization and an optimized droplet size.
- **Improved Gas-to-Spray Interaction:** Flow vectors generated by the patented assist air annulus enable the naturally produced hollow-cone nozzle characteristics of the spill-back nozzle to become a full-cone spray. This results in droplets that are more diffused within the gas stream, improving hot-gas-to-liquid-droplet interaction.
- **Improved Evaporation Rates:** The annular air shroud that is created at the edge of the SpillAir™ nozzle entrains the liquid droplets into its high velocity flow field, increasing the velocity of the droplets and therefore the droplet-to-gas differential velocity, reducing evaporation time.
- **Lower Achievable Outlet Temperatures:** With standard mechanical spill-back nozzles, the droplet sizes are randomly distributed within the spray cone. This results in the smaller droplets removing much of the heat from the gases, leaving the balance of the gases with insufficient heat capacity to evaporate the larger droplets. With the BoldEco SpillAir™ nozzle, the finer fraction of the droplets, having less inertia, is easily moved by the air jet into the center of the spray cone, while the larger droplets, having more resistance to being moved, remain on the outside periphery of the spray cone. This droplet distribution results in significantly improved nozzle performance, because once the gases evaporate the larger droplets on the outside of the spray cone, where they have the highest heat content, as they cool, they converge with the smaller diameter droplets, which are easier to evaporate with cooler gases. This phenomenon allows for lower spray tower outlet temperatures within a given spray tower volume.



## system performance evaluation

BoldEco maintains an a team of experienced, multi-discipline inside and field service engineers capable of evaluating system performance at competitive rates utilizing the latest numerical models and testing technologies.

## program highlights

- low capital and operating cost
- small, uniform droplets
- rugged, flexible design
- reduced power consumption

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