Impact of Water on Dust (Water Sprays)

• Suppression – prevent generation
• Capture – remove from air (water or mechanical means)
• Redirection – directed away from worker
Water Sprays on Continuous Miners

**Function:**
- Suppress/wet
- Capture
- Redirect

**Application:**
- High flow/low pressure
- Droplet size/velocity
- High pressure/location
Spray Types

- Full Cone
- Flat Spray
- Hollow Cone
- Solid Stream
- Water Atomizing Spray

CDC
NIOSH
Spray Nozzles

Hollow Cone

- Conical shape, outer ring of circular spray
- Most widely used
- Small to medium droplets of water
- Larger orifice/less likely to clog
- Effective for dust mixing (knockdown) and redirecting
- Usually provided from manufacturer
Venturi – Uses Hollow Cone for Redirection

Redirection – direct dust away from workers
very good air movement

Hollow Cone

Venturi

Conflow, Inc.
Spray Nozzles

Full Cone

• Conical shape with solid circular pattern
• Medium to large droplets of water
• Provide uniform wetting
• Wide range of pressure and flows
• Effective for scrubber filters and belt transfer points
Spray Nozzles
Flat Fan

- Produce narrow ‘wall’ of spray at various angles
- Wide range of flow and spray angles
- Horizontal, high flow and low pressure as boom sprays suppress dust
- Vertically mounted on either side of miner directed toward face contains dust for scrubber capture
Spray Nozzles
Solid Stream

• Straight solid stream of water at high volume
• To be used close to the source
• Provide uniformity of wetting
• Effective for dust suppression bit cooling
• Most Commonly used on Shearer Picks
Atomizing Spray

- Generally not presently used in coal mining
- Uses air pressure, higher water pressures and small orifice to create small droplet size to remove (capture) airborne respirable dust
- Easily clogs due to small orifice
  - Clean water supply
- Very effective at removing respirable dust since droplet size is similar to dust particle size
Spray Capture Effectiveness on Airborne Dust

- Improved Capture with higher pressures
  - Smaller Droplet Sizes
  - High Velocity Droplets
- Unit gallon of water is more efficient at higher pressures and smaller droplet sizes
Airborne Dust Capture

![Graph showing dust knockdown percentage versus water flow in gpm for different models (BD3-3, BD8-1, GG-3, GG-3009).]
Air Moving Effectiveness

![Diagram showing Air Moving Effectiveness for different spray types (BD3-3 Hollow-cone, BD8-1, GG-3 Full-cone, GG-3009, VV-1510 Flat-cone, VV-2510) at 75 psi and 150 psi. The vertical axis represents Cfm INDUCED/gpm, ranging from 0 to 250. Each spray type is represented by bars in blue (75 psi) and red (150 psi).]