

SPECIFICATION

Nalco Retractable Injectors

SPEC-268

- Injection nozzle variations allow for proper injection into liquid, gas, or mixed-phase systems
- Standard length injectors can be used on pipes up to 8":203 mm in diameter; extended length injectors can be used on pipes up to 18":457 mm
- Nozzles can be removed for inspection without system shutdown
- Adjustable external frame permits precise positioning in the fluid flow and restrains stinger during insertion/withdrawal

DESCRIPTION

The application and distribution of chemical additives are extremely important factors in obtaining optimum results from chemical treatment programs. The Nalco Retractable Injector (Figure 1) is designed to properly apply and distribute a wide variety of Nalco products.

A variety of quill tips and atomizing nozzles are available to adapt the retractable injector to each specific application. Use Table 1 as a guide for choosing the correct retractable injector.

TO ORDER

Order all retractable injector assemblies and nozzles by their Nalco part numbers. See Table 1.

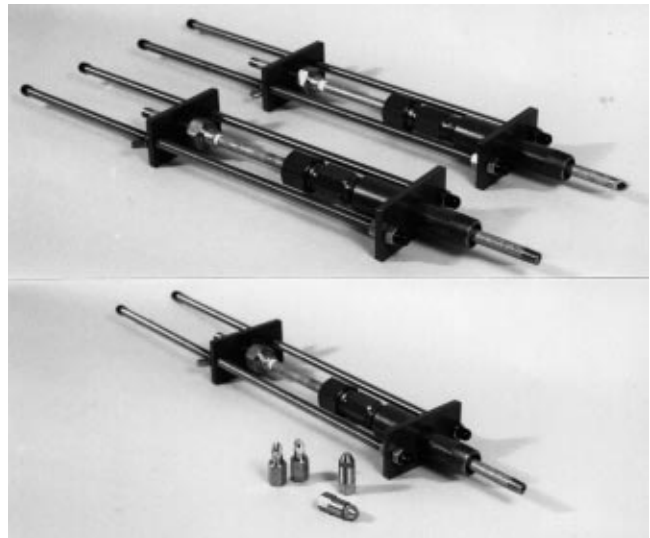


Figure 1 — Nalco Retractable Injectors

SPECIFICATIONS

Dimensions: See Figures 2 and 3

Materials:

Injector:

1/4":6 mm pipe "stinger": 304 SS

Support rods and nuts: 304 SS

All other parts: Carbon steel

Packing: Garlock AFP127

Nozzles:

Atomizing nozzles: 416 SS, 430 SS, 100 mesh

Monel screens

Quill nozzles: 304 SS

Maximum pressure: 2000 psi: 138 bar

Maximum temperature: 1100°F: 593°C

Atomizing nozzle characteristics: See Table 2

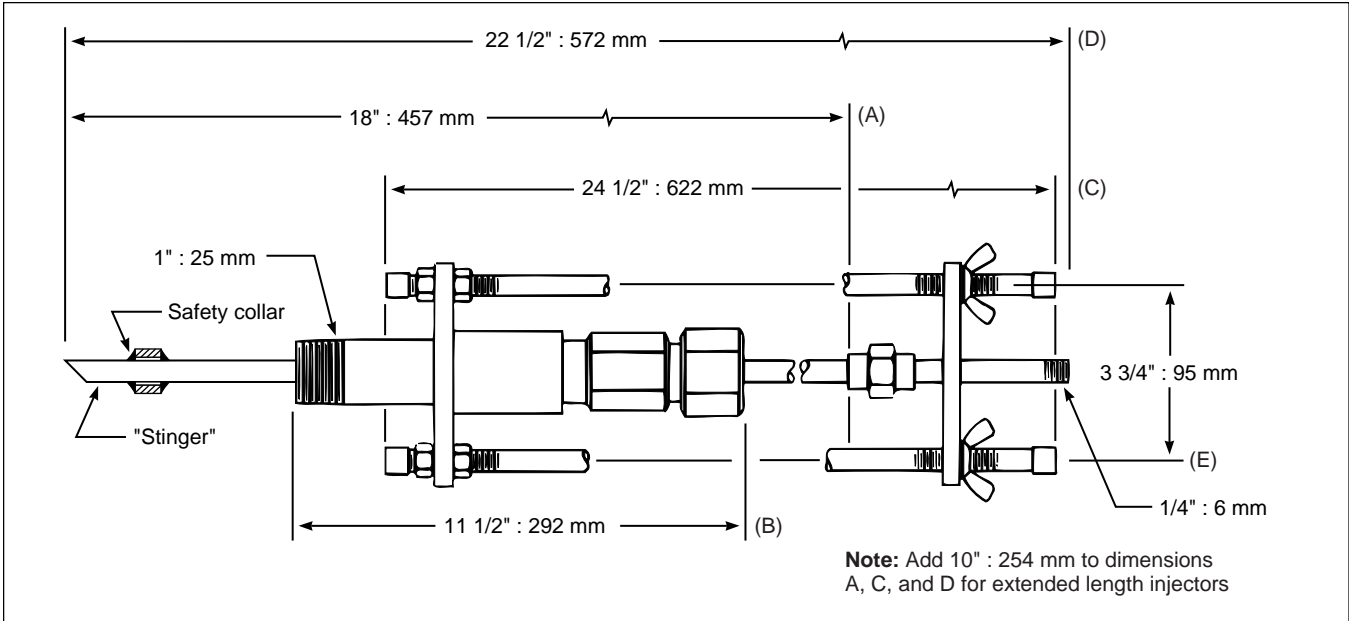


Figure 2 — Nalco Retractable Injector with cut and slotted stinger

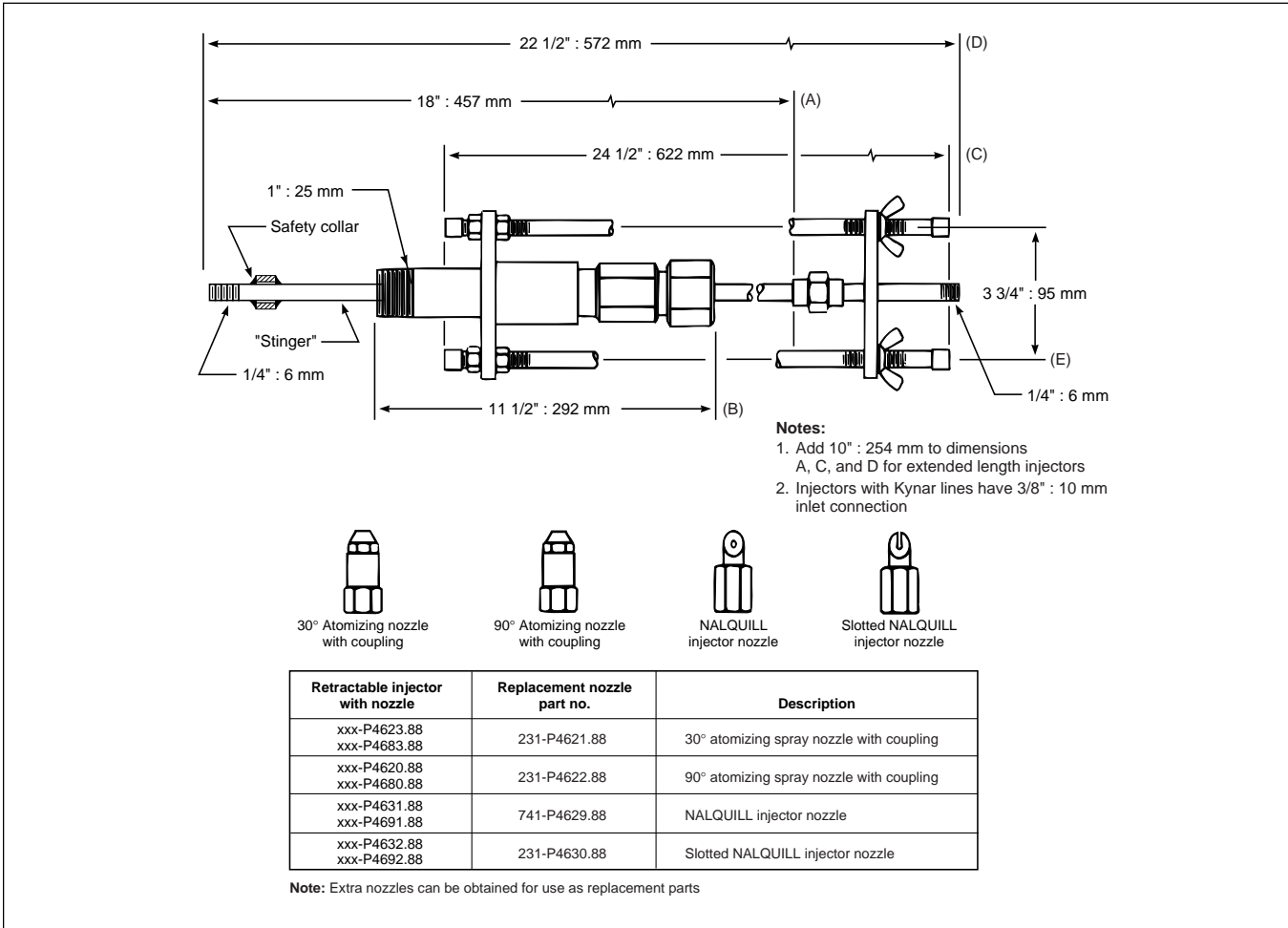


Figure 3 — Nalco Retractable Injector with threaded stinger and nozzles

Table 1 — Application guide

Nalco Part No.	Description	Inlet Connections	Reference Drawing	Typical Application
231-P4634.88	Injector with cut & slotted stinger	NPT	Figure 2	Oxygen scavengers and condensate corrosion inhibitors for boilers
232-P4634.88	Injector with cut & slotted stinger	BSP		
231-P4694.88	Extended length injector with cut & slotted stinger	NPT		
232-P4694.88	Extended length injector with cut & slotted stinger	BSP		
231-P4631.88	Injector with NALQUILL nozzle	NPT	Figure 3	Feeding liquid products into liquid streams
232-P4631.88	Injector with NALQUILL nozzle	BSP		
231-P4691.88	Extended length injector with NALQUILL nozzle	NPT		
232-P4691.88	Extended length injector with NALQUILL nozzle	BSP		
231-P4632.88	Injector with slotted NALQUILL nozzle	NPT	Figure 3	Feeding liquid products into mixed vapor/liquid streams
232-P4632.88	Injector with slotted NALQUILL nozzle	BSP		
231-P4692.88	Extended length injector with slotted NALQUILL nozzle	NPT		
232-P4692.88	Extended length injector with slotted NALQUILL nozzle	BSP		
231-P4620.88	Injector with 90 deg. atomizing spray nozzle	NPT	Figure 3	Atomizing liquid products into gas/liquid streams
232-P4620.88	Injector with 90 deg. atomizing spray nozzle	BSP		
231-P4680.88	Extended length injector with 90 deg. atomizing spray nozzle	NPT		
232-P4680.88	Extended length injector with 90 deg. atomizing spray nozzle	BSP		
231-P4623.88	Injector with 30 deg. atomizing spray nozzle	NPT	Figure 3	Atomizing liquid products into gas/liquid streams
232-P4623.88	Injector with 30 deg. atomizing spray nozzle	BSP		
231-P4683.88	Extended length injector with 30 deg. atomizing spray nozzle	NPT		
232-P4683.88	Extended length injector with 30 deg. atomizing spray nozzle	BSP		
231-P4633.88	Injector without nozzles	NPT	Figure 3	Customer provides nozzles
232-P4633.88	Injector without nozzles	BSP		
231-P4693.88	Extended length injector without nozzles	NPT		
232-P4693.88	Extended length injector without nozzles	BSP		
231-P4656.88	Injector with Kynar lined stinger	NPT		Feeding sulfuric acid into liquid streams
232-P4656.88	Injector with Kynar lined stinger	BSP		

INSTALLATION

General Installation

Figure 4 shows a proposed piping arrangement for use with the Nalco Retractable injector. Please note the following:

1. A pressure relief valve should be included to vent fluid from the pump discharge back into the chemical tank or pump intake if pressure builds up.
2. The pressure gauge verifies that the nozzle is operating properly and shows clogging of the atomizing nozzle.
3. A level gauge should be used to indicate tank level and also serves as a pump calibration gauge. For operation from bulk tanks, a pump calibration gauge, strainer, and shut-off valve should be installed in the pump suction line.
4. Direct piping to the chemical supply avoids the use of a diluent and adds convenience; however, a diluent may still be required for proper atomization. Make sure pump suction is flooded.

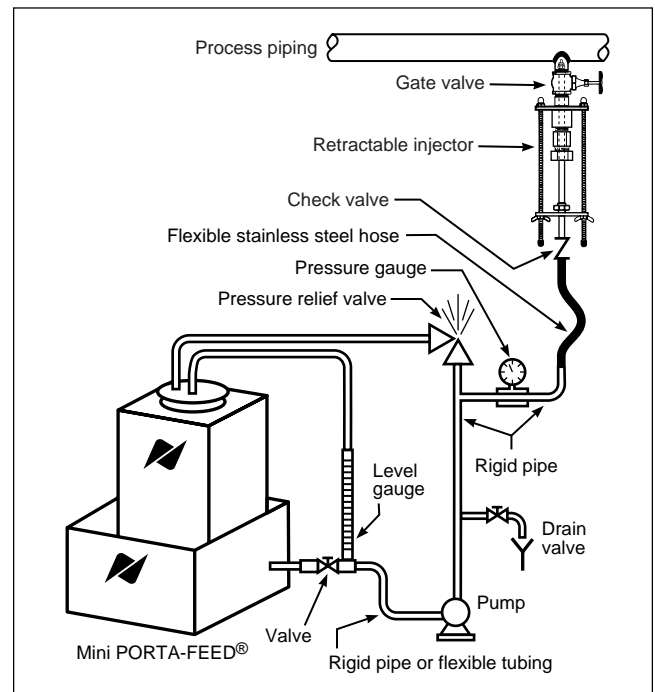


Figure 4 — Typical piping arrangement

5. The use of flexible stainless steel tubing is recommended only if pressure limitations are not exceeded.
6. A 1-1/4":32 mm minimum gate valve bushed down to 1":25 mm should be used to insert and retract the nozzle.
7. Install a short section of flexible stainless steel tubing (not included) immediately upstream of the retractable injector to simplify withdrawal. Rigid stainless tubing can be used if bent into a U-Shape or coil — *do not kink*.
8. Install a check valve on the inlet to the injector to prevent back flow of the process stream into the chemical feed line.

Precautions

1. Be sure to wear appropriate personal protective equipment when checking the retractable injector, e.g., goggles, face shield, and insulated gloves.
2. Be careful when breaking connections. Release the pressure on the chemical line using the drain valve on the pump discharge. Be sure to close the isolating gate valve on the process before inspecting the retractable injector. Break the connection between the retractable injector and the isolating gate valve slowly and carefully to release any pressure. Verify that the gate valve is completely shut and holding before removing the retractable injector.

3. The external threaded rod frame positions the nozzle correctly and prevents the stinger from blowing out. Inspect the frame periodically. Be sure that the top of the frame is flush with the union and secure. Never operate the retractable injector without the external support frame.

Retract or insert the stinger by loosening or tightening the wing nuts a few threads at a time. The operator should always position himself to the side when making retractable injector adjustments, never directly over the stinger.

Quill Injection Applications

Quill injection applications are not as sensitive as atomizing applications but a few procedures are recommended for more effective application of the product.

1. Figure 5 illustrates acceptable mounting positions for vertical and horizontal flow applications. Use only the bottom 120° of the pipe cross section so the unit injects upward into the flow if possible. For vertical applications, make sure the unit is angled upward. Installation on pipes with downward flow is not recommended.
2. Mark the long side of the quill on the “stinger” pipe. When inserting the quill in a water stream, orient it so the long side is facing **upstream**. (See Figure 6a.) When using the slotted quill on mixed phase applications, the orientation of the quill must be so the long side is facing **downstream**. (See Figure 6b.)

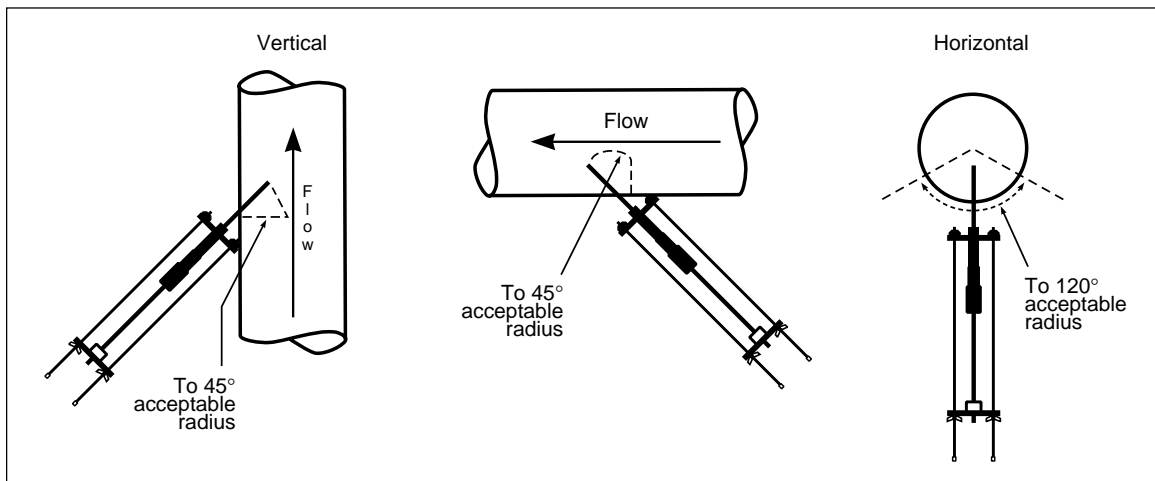


Figure 5 — Proper quill orientation

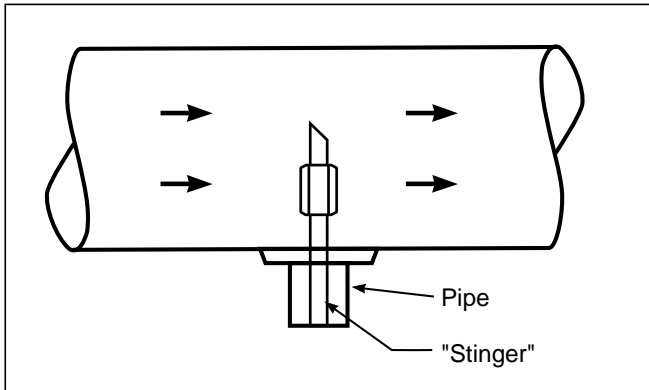


Figure 6a — Proper quill alignment in water stream

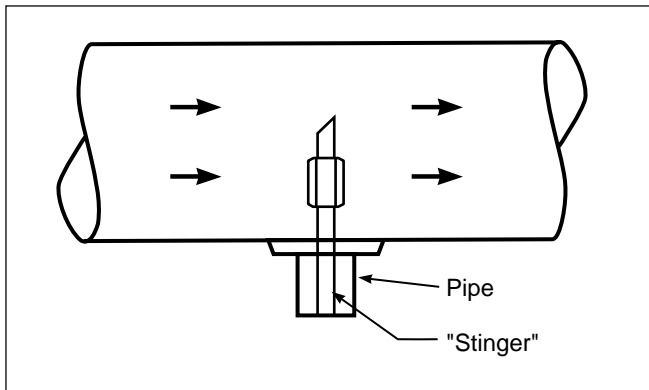


Figure 6b — Proper quill alignment in a mixed phase stream

Atomization Applications

It is recommended that customers purchase one or two extra nozzles with the retractable injector. The extra nozzle would be available for immediate replacement should the one in use plug or become unworkable.

Wide angle nozzles, 90° spray angle, are most applicable when the spray is at right angles to the gas flow. The wide angle would also be most appropriate for treatment of the vapor space in storage tanks. Mount the unit vertically on top of the pipe as illustrated in Figure 7.

Narrow angle nozzles, 30° spray angle, should be suitable for situations in which the system flow makes a right angle turn. For example, if a plugged tee is in the piping at the point where the fluid turns, it would be possible to install the narrow angle nozzle into the tee and spray the chemical along the axis of the flow through the pipe.

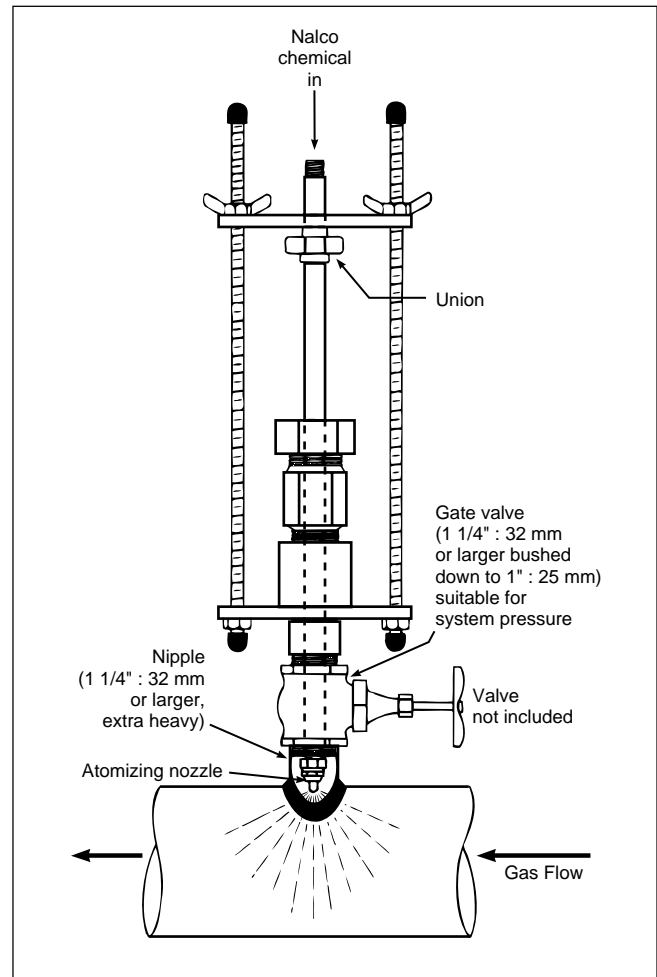


Figure 7 — Atomizing injector installed in pipeline

FACTORS AFFECTING ATOMIZING NOZZLE PERFORMANCE

Throughput — When used with a positive displacement metering pump, the pump output will determine the nozzle output. It is important to select a pump that delivers the appropriate flow and can develop enough pressure to overcome line losses, the back pressure due to the nozzle, and the system pressure.



Table 2 — Atomizing nozzle characteristics

Nalco Part No.	Spray Angle	Nozzle Type	Orifice Diameter,	Capacity rating vs. differential pressure								
				50 psi 3.5 bar	75 psi 5.2 bar	100 psi 6.9 bar	125 psi 8.6 bar	150 psi 10.3 bar	200 psi 13.8 bar	300 psi 20.7 bar	400 psi 27.6 bar	500 psi 3.4 bar
231-P4631.88	30°	WDAF 1.0	0.11"	0.63 gph	0.77 gph	0.89 gph	1.00 gph	1.10 gph	1.27 gph	1.55 gph	1.79 gph	2.0 gph
231-P4622.88	90°	WDAF 1.0	2.8 mm	2.4 lph	2.9 lph	3.4 lph	3.8 lph	4.2 lph	4.8 lph	5.9 lph	6.8 lph	7.6 lph

Table 2 illustrates the back pressure generated for a given pump output for the standard atomizing nozzles. Do not attempt to operate these nozzles below 0.63 gal/hr:2.4 Lit/hr. Lower throughputs do *not* atomize. If the flow rate through the nozzles is below 0.63 gal/hr:2.4 Lit/hr, use the cut and slotted retractable injector (xxx.P4634.88) or the slotted NALQUILL (xxxP4632.88). Smaller orifice nozzles are available, but field trials have indicated a greater plugging tendency.

Specific gravity — The higher the density or specific gravity of a fluid, the lower the velocity through the nozzle and the lower the flow rate. Spray angle and distribution are not strongly affected by change in specific gravity.

Viscosity — An increase in viscosity of the liquid being sprayed causes a decrease in the capacity of the nozzle. This is particularly true in small nozzles. With all nozzles, an increase in viscosity causes a decrease in spray angle.

When using a viscous compound, best results may be obtained by mixing the chemical with a suitable diluent.

Surface tension — An increase in surface tension reduces the spray angle. Effects on spray distribution vary with the type of nozzle, but in general the distribution tends to be less uniform as the surface tension is lowered. A decrease in surface tension permits operation of the nozzle at a lower pressure drop.

Temperature — An increase in temperature generally increases the spray angle and increases capacity.

Spray angle — A wider spray angle produces smaller particles.

Pressure — Increased pressure drop across the nozzle decreases the average particle size moderately and increases the capacity.

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