AIRLESS SPRAY SYSTEMS

The Efficient Choice For Many Liquid Painting Applications

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Conventional Air vs. Airless Systems: Selecting the Best Method

Introduction

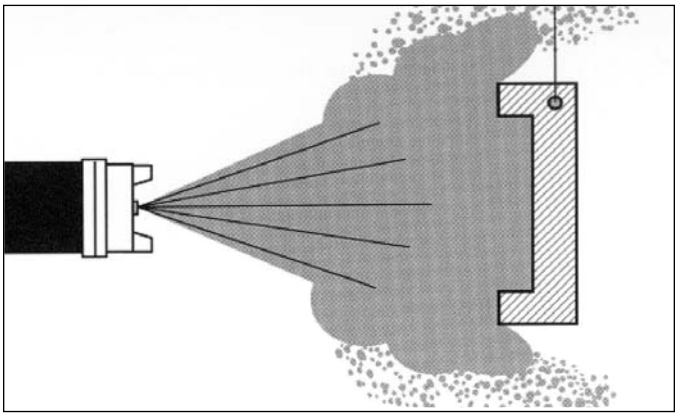
Most paint application systems are unique and designed for a particular manufacturing process and/or finish requirement. Selecting the best finishing method to meet both the technical and economic requirements for a specific system requires a careful evaluation of many factors.

When compared to conventional air spray, airless spray applications can provide a higher transfer efficiency in a finishing operation. In many applications airless can provide maximum material utilization and reduced operating costs. For finishers, this translates into superior finishing quality and optimum cost effectiveness, making it the efficient choice for many of today's liquid painting applications.

Effects of Conventional Air Spray

On internal surfaces *particles mixed with air rebound and fail to cover corners and recesses.*

On external surfaces *turbulent air spray creates excessive overspray and high material waste.*



Conventional air spray creates a "cloud" as high-pressure air jets atomize coatings. As coating particles are blown at high speed toward the part, many are dispersed into the air.

Conventional Air Spray Creates Overspray

Air spray systems use high-pressure jets of compressed air to atomize coating materials. Air pressure propels particles at high speed toward the part, but only a small amount is actually deposited on part surfaces. The rest is wasted.

In addition to overspray, high-velocity air combined with coating particles create a "cloud" as they bounce off the part. The turbulent spray also forms a cushion of air that prevents coating particles from settling in corners and recesses.

The more viscous the material, the greater the air pressure required for atomization. However, the greater the atomizing air pressure, the more overspray and bounceback is created which lowers painting efficiency.

Adding solvents, retarders, and thinners is a relatively easy and common method of making a coating more sprayable. However, it is costly and environmentally unacceptable as regulations become increasingly stringent. By combining paint heaters and the airless spray process, less solvent is necessary so spraying pressures can be reduced by 50 percent or more.

Limitations of Conventional Air Spray

- Excessive overspray and bounceback
- Poor painting efficiency
- High quantity of solvents required to reduce paint and improve sprayability
- Low production rate since air spray, in many cases, requires two coats to achieve desired paint coverage
- Low potential paint output of air spray guns limits production speeds
- High maintenance costs of booths and filters due to oversprayed paint

Heated Airless Spray Delivers Control and High Efficiency

Instead of air, airless spray systems rely on hydraulic pressure to atomize and spray liquids.

Airless systems control atomization using three variables: hydraulic pressure, nozzle design, and changing a coating's physical properties with heat instead of solvent. Good airless practice is to find the optimum blend of these variables.

Increasing fluid pressure generates finer atomization, but excessive pressure can make the spray unstable and cause excessive wear of nozzles and other hydraulic components.

Typical airless systems have a working pressure of 1500 to 3000 PSIG. However, using specifically designed nozzles and heated paint systems, Nordson airless equipment can operate in the range of 400 to 600 PSIG. This reduces component wear and produces a soft, easy-to-control spray pattern. This is sometimes referred to as Nordson "soft" spray.

Improved Atomization Provides Better Finish and Savings

Mechanical devices such as restrictors and turbulence plates are used to promote atomization without excessive fluid pressure. Nozzle design, however, offers the greatest potential for improving spray characteristics.

Nordson Cross-Cut® nozzles are designed for use with difficult-to-atomize coatings. Cross-Cut nozzles can also significantly lower operating pressures and improve atomization for most materials. This can produce a high-quality finish at lower painting cost.

Reduced overspray also provides numerous production and maintenance cost savings as well as safety and environmental benefits.

Like air spray systems, solvents can be used to improve atomization. However, controlled heating of the paint is the preferred method to "thin" coatings.

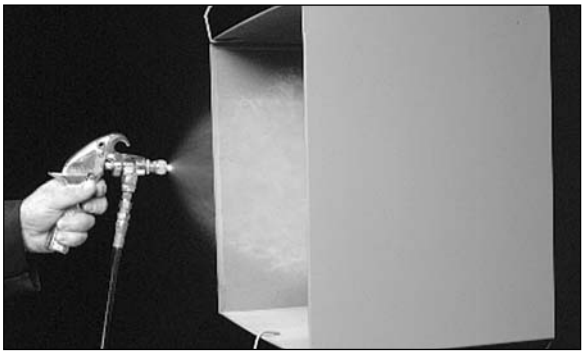
Benefits of Hot Airless Spray

- Reduced overspray and material waste due to softer spray
- Higher paint film build with single-pass coverage
- Reduced touch-up for fewer rejects
- Excellent for coating large parts and open-floor spraying
- Reduced maintenance of booths and filters due to reduced overspray
- Improved labor savings
- Reduced compressed air consumption

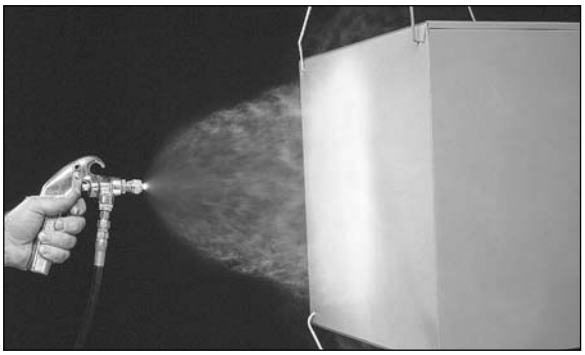
Airless Spray System Components Checklist

- Electrostatic or nonelectrostatic manual and automatic guns
- Pumps
- Fluid heaters
- Electrostatic power units
- Paint filters
- Circulation valves
- High-pressure hoses and fittings
- Airless nozzles and preatomizing devices

Effects of Conventional Airless Spray



On internal surfaces *no visible bounceback indicates easy-to-control spray for improved first-pass coverage.*



On external surfaces *soft spray creates little or no overspray for minimal waste and cleaner, safer operating environment.*

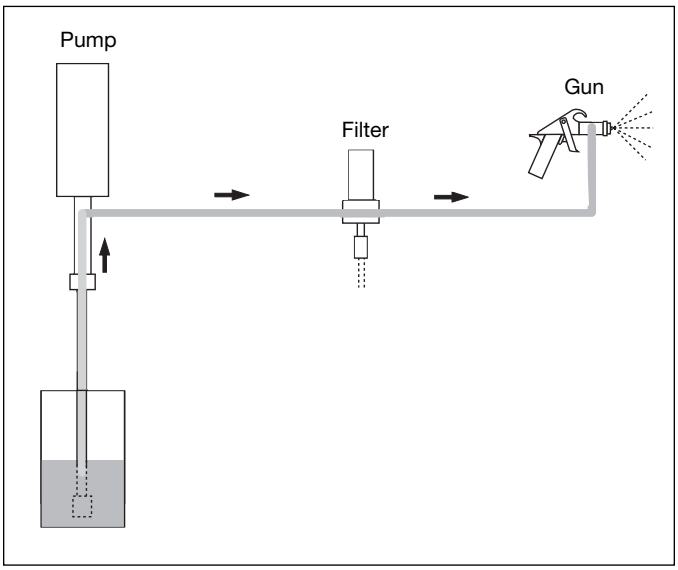
Several Airless Systems Meet Varying Finishing Requirements

Conventional Airless Systems

The conventional airless system is simple. It requires only a pump, filter and airless gun. The pump siphons material from a container and propels it, under high pressure, through a filter and to a gun where it is atomized and directed to the part.

Drum- or pail-mounted systems are recommended for high-viscosity coatings. Dolly- and wall-mounted systems use a siphon hose and rod for fast, simple color change.

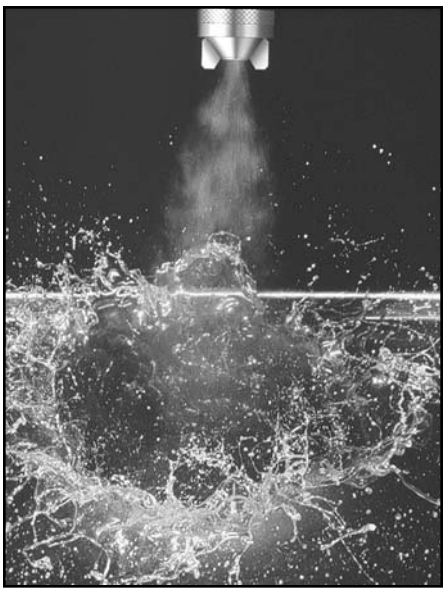
Typical systems include maintenance, shipyards, furniture/wood cabinets, and open-floor spray applications such as large fabrications and machinery.



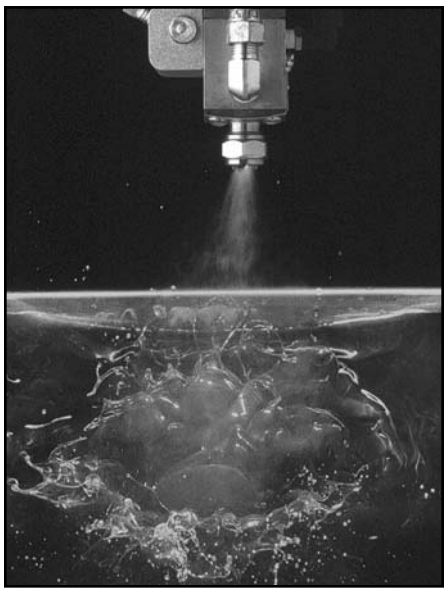
Conventional Airless System

Characteristics of Spraying Velocity

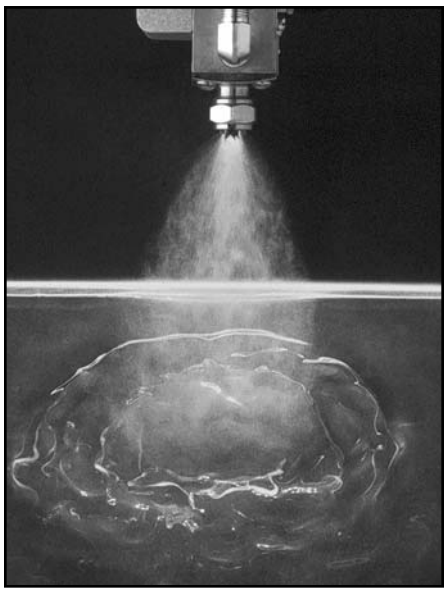
Photographs taken at 1/10,000 of a second reveal the differences between a turbulent spray and a “soft” spray.



Air Spray. *At test pressures of 60 psi, an average of 600 parts of air were used to atomize one part of paint. The large volume of air means excessive turbulence, paint bounce, and overspray.*



Airless. *Hydraulic pressure during test was 1500 psi, but there is no air discharge to carry paint particles long distances from the gun.*



Heated Airless. *Spraying at 600 psi without air produces a soft, direct spray with minimum bounce and overspray.*

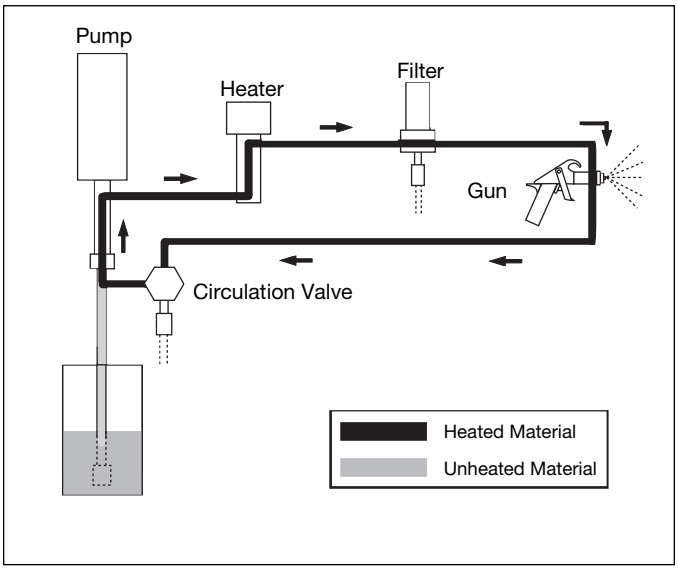
Heated Airless Systems

The best method of applying viscous or hard-to-spray coatings is to “thin” the coating by heating it. This reduces coating viscosity and improves sprayability so less hydraulic pressure is required.

Reduced pressure produces a “softer”, more controllable spray, while thinning with heat reduces the solvent content so a thicker dry film can be applied per pass.

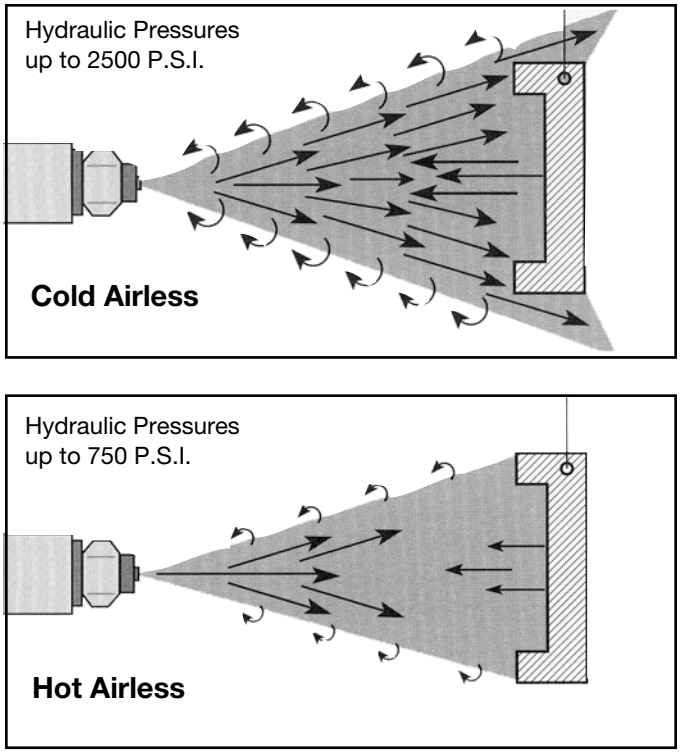
Heated airless systems use conventional airless components but with the addition of a heater placed between the pump and filter. A circulating gun and valve provide constant circulation throughout the system so optimum paint temperature and viscosity are continually maintained.

Heated paint, therefore, is not returned to the drum and the problem of solvent evaporation caused by heating the drum is eliminated.



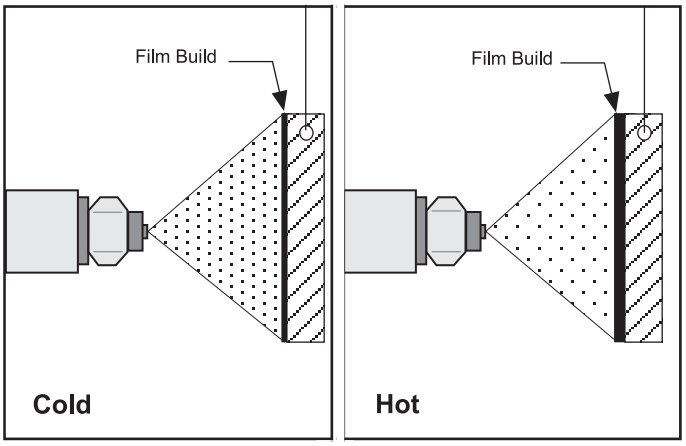
Heated Airless Circulating System

Improved Material Usage



As heat is applied, solvent vapor pressure increases so atomizing pressure can be reduced. Lower pressure results in lower particle velocity and a softer spray. Better coating coverage and less solvents improve material savings.

Higher Film Build



Heating coatings reduces viscosity and improves sprayability. A higher film build can be applied without sags or runs, and often equals two air-sprayed coats.

Added Benefits of Heating Coatings

- Shorter flash and dry times
- Higher solids coatings sprayed
- Reduced labor and improved quality due to high film build per coat
- Less overspray by using 25 to 50 percent lower spraying pressures

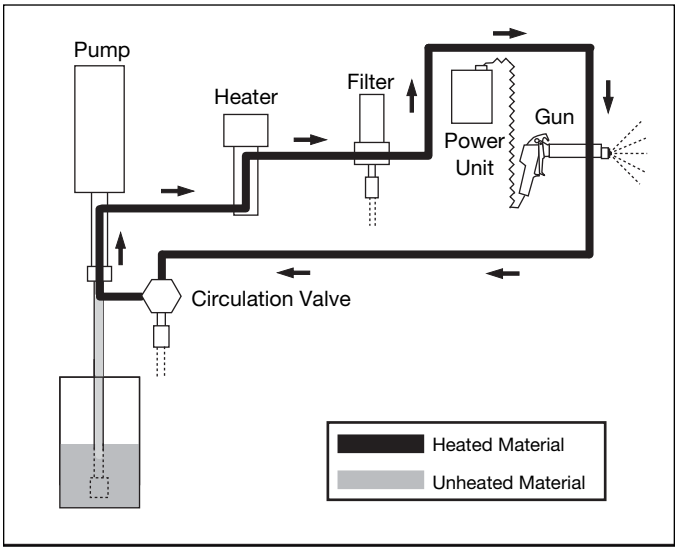
Several Airless Systems Meet Varying Finishing Requirements

Electrostatic Airless Systems

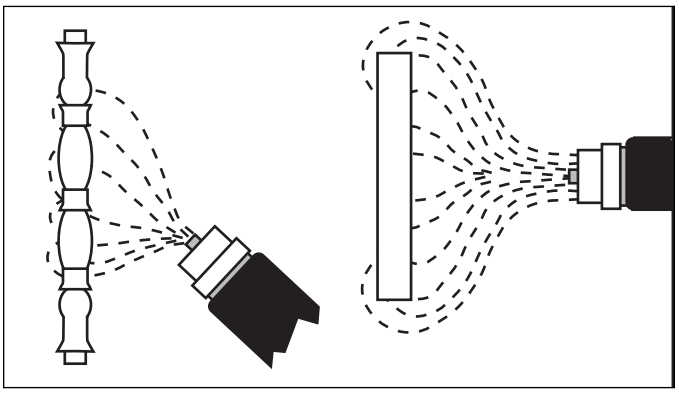
The addition of an electrostatic power supply and a manual or automatic electrostatic gun to a conventional or hot airless system offers additional economic benefits in paint savings as well as improved finish quality.

The electrostatic power supply provides an electrostatic charge to the paint droplets so they repel each other. This improves atomization and produces a wider pattern compared to nonelectrostatic systems. The electrostatic charge increases attraction and direction of the coating particles to the part. This phenomenon is known as wrap-around effect.

The combination of electrostatic plus heated airless systems provides a fast return on investment and a quality finish under average factory conditions.



Heated Airless Electrostatic System



Electrostatic Wrap-Around Effect

Added Benefits of Electrostatic Charging

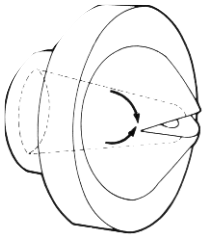
- Lowers paint costs with maximum material utilization
- Reduced labor costs due to high-speed painting capability
- Good coverage of edges, recesses and hard-to-reach areas for overall efficiency
- Uniform film deposition for improved finish quality
- Increased productivity with reduced rework and rejects

Nozzle Size and Design: Critical Factors to Consider

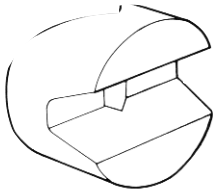
On all airless systems, it is extremely important that nozzles be properly sized for the specific application.

Dome-Style

Dome-style carbide nozzles are the most commonly used type of airless nozzles. Variations in dome geometry and surface finish affect atomization and pattern uniformity. Dome-style nozzles are most effective for thin, easy-to-atomize materials.



Dome-Style



Cross-Cut

Cross-Cut

Nordson Cross-Cut nozzles utilize a proprietary method of generating more atomizing energy at the same fluid pressure. This type of nozzle can improve atomization of standard coatings and dramatically improve atomization of hard-to-spray coatings.

Using Cross-Cut nozzles, very low atomizing pressures have been demonstrated on high solids and cohesive coatings. Cross-Cut nozzles are also more resistant to plugging than dome-style nozzles, which allows the use of lower flow rate nozzles for smaller parts.

Cross-Cut nozzles can greatly enhance electrostatic efficiency which depends on fine atomization and a low-velocity, soft-spray pattern.

Conclusion

Today, many industries with widely varying coating applications already enjoy the advantages of airless spray processes.

From wood furniture, steel fabrication and farm implement manufacturing, to off-road equipment and shipyard and marine applications, to coating of steel pails and drums, airless spray technology delivers a higher transfer efficiency that provides optimum material utilization and reduced operating costs. For finishers, that means optimum finish quality and end products, and superior operating efficiencies.

For many, liquid painting applications, both manual and automatic, the benefits of airless spray technology is the best choice for quality, economical operation, and high-production speeds.

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