TN98-048
February 1998

WMRC Factsheet

Spray Painting Options

A common form of industrial painting is spray painting. There are at least five ways of spray painting, not counting variations. Each one is suitable or unsuitable for a particular job. This factsheet gives an overview of the kinds of spray painting methods and their strengths and weaknesses.

Air Spray

The air spray gun uses air at 30 to 85 pounds per square inch (psi) to atomize the paint into a fine spray. This produces a smooth finish, and can be used on many surfaces. Air spraying is versatile; the operator can vary the air pressure, air volume, paint pressure, and spray pattern. With a transfer efficiency of 30 to 60%, air spraying produces a lot of overspray (the paint that missed the intended target), causing preparation and clean-up to take more time.

A High Volume Low Pressure (HVLP) spray gun uses a higher volume of air at only 10 psi. This reduces the overspray, increasing the transfer efficiency. An HVLP gun is portable and easy to clean, and has a lower risk of blowback to the worker. However, the atomization may not be good enough for fine finishes, and production rates when using HVLP may not be as high as with conventional spraying.

Airless Spray

This method uses paint under high pressure, 500 to 6,500 psi. Airless spraying has several distinct advantages over air spray–it is twice as fast, produces a higher film build, is more portable, has a transfer efficiency of 65 to 70% and is thus cleaner, and more economical. But airless spray is limited to painting large areas, requires a different nozzle to change spray patterns, the nozzle tends to clog, and the nozzle can be dangerous to use or to clean because of the high pressures involved.

There is also an air-assisted airless spraying system. The paint is still pressurized, from 150 to 800 psi, and is mixed with air pressurized at 5 to 30 psi. This method also has a higher transfer efficiency and a lower chance of blowback. It atomizes the paint well, although not as well as air spray. Air-assisted airless spraying has the same dangers as airless spraying, but it also requires more maintenance and operator training, and has a higher initial capital cost.

Rotary Atomizing

Another variation of electrostatic painting, rotary atomizers use centrifugal force generated by discs or bells (not air or hydraulic pressure) to drive the paint from the nozzle. The atomization of this method is excellent, as is the transfer efficiency. This method can also be used with paints of different viscosity. Cleanliness is especially important in this method.

Electrostatic Spraying

The differences between this and air spraying are that the electrostatic gun has an electrode at the nozzle and the object to be painted is grounded. The electrode runs 60,000 volts through the paint at 225 microamperes. The charged paint is attracted to the grounded object. This requires less pressure, produces little overspray, and uses relatively little paint. Electrostatic guns are good for painting oddly shaped objects. They also produce a uniform coat because the paint itself acts

as an insulator; once the object is covered, it can take no more paint.

The atomizing for an electrostatic spray gun can be air, airless, or rotary atomized. Air atomized spraying has a transfer efficiency of 60 to 70%, airless runs from 70 to 95%, and rotary goes from 80 to 90%.

The disadvantages are: only one coat is possible, only conductive materials can be painted, it's more expensive, slower and has higher maintenance costs, is limited to chargeable paints, and the surface of the object must be extremely clean. Because the gun uses electricity, this method presents a possible shock hazard. Another problem with electrostatic spraying is that the paint is attracted to all grounded objects, not just the object to be painted–the conveyor and conveyor protection systems in assembly line painting, the paint booth ceiling, the spray gun and the spray gun handler. Work has been done on developing a electrically charged paint repelling panel to protect against stray paint. A repelling panel is not 100% effective, but it does cut down on problems from stray paint.

Powder Coating

This uses the same principle as electrostatic spraying, but sprays something a little different, powder paint. The object then moves through an oven, and the powder melts into a smooth, durable coat. Overspray can be reused, and no other pollutants are created or released because the powder contains no solvents. The equipment for powder coating is expensive, so it may be economical only for larger businesses. Objects that are powder coated must be able to withstand oven curing, about 350°F for 30 minutes, without any loss of strength. Most metals, except aluminum, can be powder coated.

A variation of this is plasma powder coating. The powder is fed into an extremely hot gas stream–5,000° to 15,000°F–and is then sprayed at the object. Application and curing occur at the same time. Plasma powder coating is for large objects that can't fit into a conventional curing oven or that would lose tensile strength in a conventional oven. Overspray cannot be reused because it hardens. Because of the high temperature spray, protective equipment is required.

Another variation is flame sprayed powder coating, where the powder is melted with a high temperature flame. Again, it is for large objects and overspray cannot be reused.

Powder coats can also be applied by a fluidized bed of powder. Air is mixed with the powder, essentially creating a dense cloud of paint powder. The object to be painted is preheated, dipped into the bed, and then cured.

The paint powder itself comes in two varieties, thermoplastic and thermosetting. Thermoplastic paints melt repeatedly on exposure to heat and set again on cooling. Thermosetting paints undergo a chemical change during curing so they become stable.

For Further Information

Chemical Coaters Association International
513/624-6767
http://www.finishing.com/CCAI/index.html

National Paint and Coating Association
202/462-6272
http://www.paint.org

WMRC-Champaign
1 E. Hazelwood Drive
Champaign, IL 61820
217/333-8940
http://www.hazard.uiuc.edu/wmrc

WMRC-Chicago
1010 Jorie Blvd.
Suite 12
Oak Brook, IL 60523
630/472-5016