

Benefits of Proper Gun Setup

Proper spray gun setup, whether using air atomized, air-assisted airless or airless application equipment, is the first step toward optimizing efficiency. Actually, the first real step to an efficient coating operation is employee training and education, but that's part of what this article is about. All too often we encounter facilities that could become more efficient by simply changing their spray gun setup. One component of spray gun setup is proper tip or nozzle selection.

When selecting the right tip or nozzle for your operation, you should consider production speed, part size or geometry, operating pressures, fluid delivery rate and viscosity. Finding the right tip or nozzle for your application will also take some time and experimentation. Here are some things to think about.

HVLP and Compliant Air Spray Equipment

Remember, a variety of fluid nozzles, needles and air caps exist for your air spray gun. Iowa Waste Reduction Center staff often encounter facilities that limit themselves to the nozzle, needle and air cap combination originally provided with their spray gun even though it may not be the best fit for their operation. This leads to less than satisfactory results in finish quality, material consumption and overspray.

An appropriate nozzle, needle or air cap combination should be selected based on material viscosity, production rate and finish requirements. Trying to "make do" with whatever was supplied with the spray gun isn't a very efficient approach; it makes operating parameters more difficult than they have to be and often creates other problems. For an indication of what nozzle, needle or air cap combination to try, refer to your spray gun manual. The manual should provide some direction on what combination to use based on the viscosity of material sprayed. You'll find that some manuals provide very good information while others are vague and/or poorly written.

Once you find a recommended combination, try it out. If this doesn't produce the results you're looking for, then experiment. Increase or decrease the nozzle size and try again. For pressure feed systems, you will also need to experiment with fluid pressure. However, keep in mind that the paint stream from the nozzle (with the atomizing air turned off) should not shoot across the room. High fluid velocities mean less residence time in the region where paint is effectively atomized by compressed air. This may result in poor atomization and/or excessive atomizing air pressures - conditions that lead to problems with finish quality, overspray and material consumption. Generally, for pressure feed systems, you should look for a one- to six-inch horizontal stream of fluid from the nozzle before you see the effect of gravity.

Airless and Air-assisted Airless

Unlike air spray equipment which uses compressed air to atomize the coating, airless and air-assisted airless systems use hydraulic pressure to atomize paint. Paint is forced through a small orifice in the tip to achieve atomization and form the spray pattern. Airless and air-assisted airless tips are precision machined to a certain orifice size (which dictates fluid delivery rates) and spray angle (to produce the size and shape of the spray pattern). Therefore, it's the design of the airless fluid tip that dictates the size of the spray pattern (although fluid pressure and gun-to-target distance also affect spray pattern size).

One concept that is repeatedly stressed during the Iowa Waste Reduction Center's Spray Technique Analysis and Research for Defense (STAR4D) training program is to use a spray pattern that best fits the part. Although this applies to any type of spray application equipment, it is one of the common efficiency problems encountered at facilities that use air-assisted airless or airless equipment. It is not uncommon to find a spray pattern that dwarfs the size of the parts sprayed. Oversized spray patterns don't do much for transfer efficiency. They also cause excessive material consumption, air emissions and booth maintenance.

When selecting a fluid tip, first refer to the spray gun manual. Manuals provide information on the size of spray patterns produced by tips manufactured for the spray gun (the size of the spray pattern is typically indicated for a specific gun-to-target distance). Use this information to select a tip that will produce a spray pattern size that best fits the parts to be finished.

Once a fluid tip spray pattern size is selected, you'll need to select an orifice size. It's the orifice size, in addition to viscosity and fluid pressure, that determines the spray gun's fluid delivery rate. It also affects the degree of atomization. For a starting point, refer to the spray gun manual or technical data sheet for the product sprayed. Spray gun manuals often include information on fluid delivery rates for each orifice size (viscosity and fluid pressure are usually specified along with the rates).

When selecting an orifice size, think about fluid pressure in addition to production rate and finish appearance requirements. Efficient spraying with airless and air-assisted airless means finding the right orifice size/ fluid pressure combination. Avoid using fluid pressure as a primary fluid rate adjustment. Remember that the flow rate should be as low as possible. Deliver just enough paint to achieve the desired finish and mil build in the production time allotted. Too high of a fluid delivery rate results in wasted material, finish problems and loss of spray gun control. The operator should be in control - not the gun!

Experiment to find the right orifice size for your operation. Try two or three tips in a range of orifice sizes (while keeping the spray pattern size constant). Also, when trying something different, expect to encounter problems (e.g., more frequent tip plugging, persistent tails, poor finish, and/or film build problems). Keep records of your operating changes and the results obtained. Hopefully, with a few adjustments and a systematic approach, you'll find a more efficient fluid tip and improve your coating operation.