

# All the Right Moves



## TIPS FOR CHOOSING A POWDER GUN MOVEMENT SYSTEM

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The most sophisticated of single-axis machines, reciprocators are available with stroke distances from 6 inches to 7 ft.

**P**owder coating today is not the same as it was 10 or even five years ago, yet many still believe, incorrectly, that the equipment is the same as it has always been.

Any finisher would pay careful attention to appropriate gun technology and movement in liquid paint applications where the paint may cost \$100/gal and any overspray is lost. However, many powder coating shops believe that powder costs of \$3/lb and the fact that they are reclaiming means they can use less care in the powder application process.

This is a costly assumption. More careful attention paid to available powder coating technology available today can save money and reduce reject rates, and relatively low-cost investments in equipment can show quick returns.

### EQUIPMENT ADVANCES

Advances to powder coating application equipment just in the

last couple of years have changed the way most powder coating lines should be run.

Changes to soften powder delivery, new means of moving the guns, and different types of powder pumping technologies, as well as improvements to booths and availability of better color change technologies, have improved first-pass transfer efficiency anywhere from 10–40%. Additionally, better and more precise control systems, in conjunction with new gun designs, ensure more uniform coating thicknesses as well as lower cost of equipment ownership. But there's a catch: to take advantage of the available savings, shops no longer can use the same old application techniques simply because "that's the way we have always done it."

One of the most important areas to review as you take advantage of the technology changes available is in the area of gun placement and movement

technology. In North America, powder guns traditionally were either fixed or placed on simple oscillating gun movers. The idea was to create a cloud of powder that the parts would pass through to be coated.

Distance from the gun to the part was not as important in the past as it is today with the new designs of booths and guns. To take advantage of new softer powder delivery and soft air flow in booths around the parts, the gun-to-part distance has been reduced. Simply blowing large amounts of powder into the booth is no longer the desired approach. Proper selection of a gun mover will greatly impact the effectiveness as well as the cost of operation of your powder system.

So what are the options? They run the gamut from the traditional ways as well as newer, higher-technology approaches. Gun movement alternatives include:

- Fixed guns
- Oscillation and radial oscillation
- Short- and long-stroke reciprocation
- Multi-axis movement.

Following is a brief look at the advantages and limitations of each technology.

#### FIXED GUNS

Fixed guns are best used for complex parts where a large number of automatic guns with close gun centers can be employed, or when a specific area on a part must be coated. In conjunction with automatic "in and out" movement, this approach can focus on the part areas that require coating by maintaining optimal distance between the guns and the part.

Fixed guns can also be used

in applications where the part is moved and the guns are fixed, such as rotating parts on either an overhead conveyor or a chain-on-edge conveyor.

Limitations of fixed guns include difficulty coating large, flat parts, where overlapping gun patterns can cause streaking or striping. It is also critical that fixed guns are adjusted correctly to achieve the desired coating uniformity.

This approach leaves no margin

of error in gun performance, and many applications using it address potential problems by spraying more powder than is necessary, wasting powder and increasing the overall operational costs of the system.

#### OSCILLATORS

Oscillators move the guns up and down, typically using a simple mechanical system. Radial oscillators move the automatic guns on a pivot point in an arc path.



No offense to this guy, but there are better ways to control and move powder guns.

These types of gun movement are typically used when precise control of the powder cloud is not required.

Oscillation technology was developed as the first step in the process to overcome problems seen on certain applications with fixed guns. Oscillators typically have limited ability to vary gun movement, including speed or stroke length.

The majority of oscillators will have a maximum stroke length in the 18–24 inch range. This allows for a low-cost gun mover but constantly changes gun-to-part distance and speed at the extreme of the strokes, but in turn limits the consistency of powder application.

Most oscillators do not include electronic movement control, making automated changes of gun movement impossible. These types of units can also be used in conjunction with automatic “in and out” movement, but have the same limitations as the fixed gun approach.

The primary reason coaters choose the oscillator movement approach is to overcome the streaking seen with fixed guns, and oscillators will provide some margin of error in gun performance.

Oscillators are still an option when parts to be coated are relatively simple in design—an example would be flat panels—or parts have little variation in shape.

### RECIPROCATION

Reciprocators are the most sophisticated of the single-axis gun movement technologies, and are available in short- and long-stroke variations.

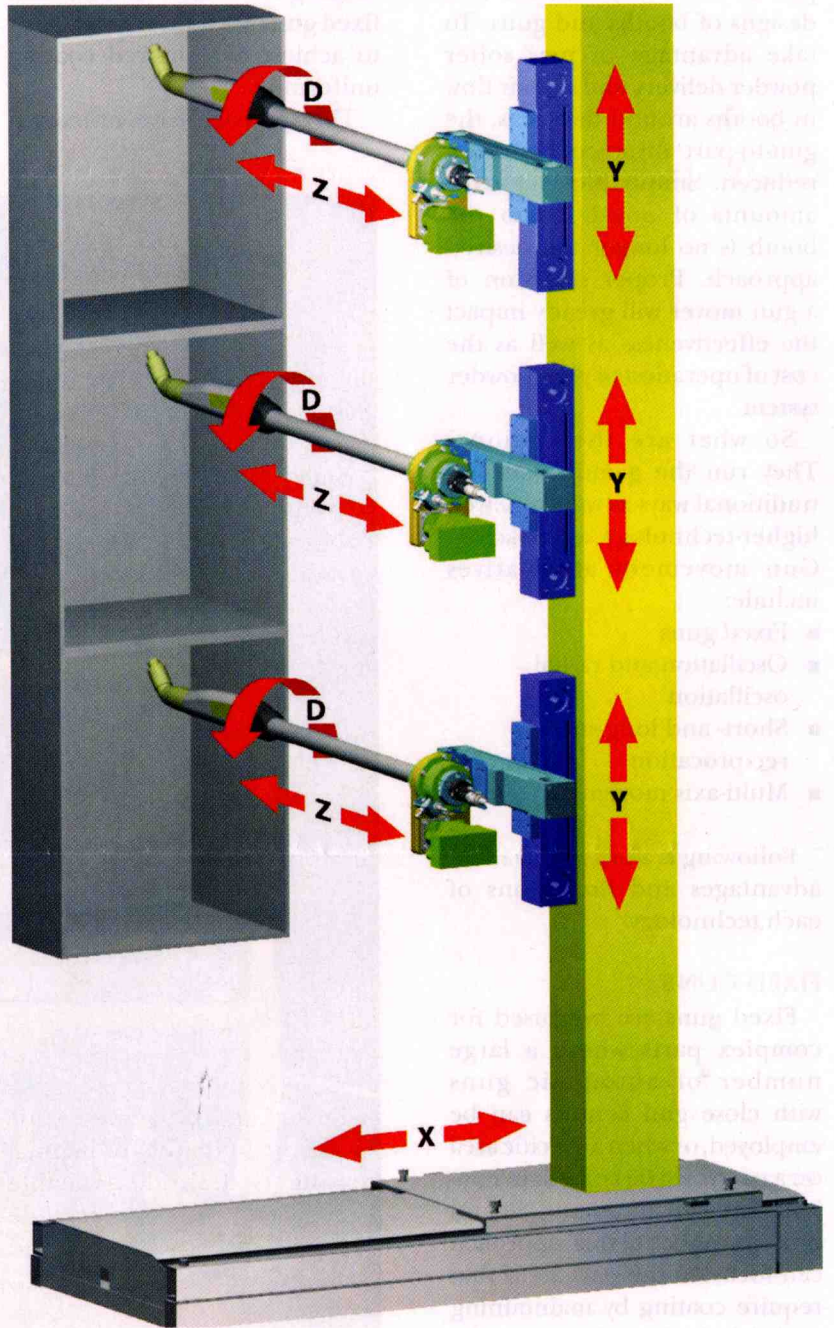
Like oscillators, reciprocating gun movers will move the guns in an arrangement up and down. However, stroke distance for a

reciprocating system can range from as little as 6 inches to the full height of the part. Reciprocators with stroke lengths in the area of as much as 7 feet are now commonly available.

Short-stroke reciprocation moves the guns a distance of 6–18 inches and is very effective

for blending gun patterns and providing consistent film build over large flat parts.

Use of reciprocators allows applicators to mount guns in either a vertical or horizontal arrangement, giving the ability to effectively coat both small and large parts. Under certain



Multi-axis systems can penetrate recessed areas and trigger guns as needed to ensure consistent coating of all surfaces.

conditions, use of automatic guns fixed in a horizontal plane can improve coating quality and consistency.

Reciprocating technology available today allows automatic stroke speed and length adjustments controlled by either light bar part identification or the system's recipe control software. Guns can be programmed to

reciprocator speeds—one for the upper and lower parts of the workpiece and one for the middle part of the work piece. Applied coating thickness is inversely proportional to speed: the lower the speed, the more powder is applied on a particular surface.

Two-way operation can be useful for coating families of

consistency is paramount. A multi-axis system can follow parts while the guns move in and out of recessed areas and rotate to concentrate on specific areas of the parts. In conjunction with multi-axis movement, gap and height triggering can be used to penetrate recessed areas while triggering the guns on and off as needed to ensure adequate

## Fixed guns are good for complex parts, using a large number of automatic guns with close centers, or for coating a specific area on a part.

move in and out between parts on the conveyor to coat both leading and trailing part surfaces. By controlling stroke length and speed, users can adjust film thickness on the top and bottom of the coated parts to desired levels. Stroke length can also be automatically adjusted by sensing varying part heights. Reciprocators available today also allow for other automated process changes, including increasing stroke speed at both the top and bottom of the parts to control edge build.

With the guns in the horizontal configuration, applicators can also control "fore-run" and "after-run" distances. In fore-run distance control, the gun mover adopts the required stroke length for a workpiece when the distance between the workpiece and the first gun is reached. For after-run control, the stroke length of the gun mover is not changed until the workpiece has covered the set after-run distance.

Two-way operation can be used if layers of varying thicknesses have to be coated on a single workpiece. In such a case, coaters would set two different

similar parts. The main advantage of this operation mode is that the workpiece is coated as evenly as possible.


Smart reciprocators that are currently available can also be programmed to stop under certain conditions where fixed guns are more desirable. Recipes can be set so that guns can be fixed on one part and moving on other parts, giving you the most flexibility. Reciprocators typically are more costly to purchase than oscillators, but can be a better choice depending on the application.

### MULTI-AXIS MOVEMENT

Multi-axis gun movers tend to be the most expensive of the gun mover options, but depending on the requirements of your application may be the best choice, especially for coating complex parts or when elimination of manual coating is desired. Available multi-axis gun movers include three-axis machines, robots and other multi-axis configurations for moving one or more guns at a time.

Multi-axis gun moving systems are often used where coating

coating of all part surfaces. Applications include cabinets and appliances.

Multi-axis robots can use single or multiple guns in movements that simulate human motion. These units can coat the entire part or be used to provide touch-up in conjunction with other automatic guns. 



## LEARN MORE

### Improving First-Pass Transfer Efficiency

This article describes available gun movement options and when they may be applicable to improve coating quality and efficiency. For more tips on increasing powder coating productivity, read "Improving First-Pass Transfer Efficiency." Find the link to this article at [www.pfonline.com/11070.html](http://www.pfonline.com/11070.html).

For more information on powder coating application equipment from Wagner Industrial Solutions, phone 630-784-8900 or go to [www.pfonline.com](http://www.pfonline.com).

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