

In Control

Choosing the right powder control systems to maximize productivity and efficiency is now easier than ever

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With lean operations quickly becoming the standard over traditional production methods, time becomes all the more critical. Faster is most certainly proving to be better. For today's powder coating operations that are spraying more colors than ever that often means fast color changes are a must. Those color changes could take as little as 20 seconds with spray-to-waste systems or as fast as 10 minutes with reclaim systems.

At the heart of these speedier operations are a couple of key factors, including the application process controls. Control systems at their most basic level control various gun, pump and system parameters. They are designed to provide a means for operators to monitor and adjust gun and system operations. The goal is to determine the equipment settings needed to produce one good part as efficiently as possible, and then use the same settings to spray each part the exact same way – and do it without waste, error and lost profits. Then, repeat the same actions as long as nothing changes. Because change is inevitable, the most advanced control systems must allow for easy adjustments to be made by the operator or even go so far as to anticipate change and be able to make adjustments to accommodate it. Quality control is all about repeatability.

There have been advancements in process control technology over the years that have improved the powder coating process, but more recent advancements have the newest process controls significantly raising the bar. These next generation manual and automatic control systems continue to further reduce powder usage while saving time and energy, reducing housekeeping, better accommodating just-in-time demands for color changes and most importantly, producing the highest possible cured film consistency. As demands change, there are control options to meet any need.

Closing the Loop

Regulating the flow of powder to the guns at the optimum level is a key component to maximizing finishing results. The problem is that the compressed air feeding the powder system changes constantly and unpredictably. Air pressure rises and falls as other plant devices draw air themselves. This change in



Figure 1

compressed air at the input to the powder regulators, if left unchecked, can cause the same sort of variation in the powder process.

That's why the newest process control technologies have paid a great deal of attention to powder flow. Older technology often relied on manual regulators, which could have some inherent limitations with accuracy (how consistently powder is delivered once the control is set or how close to the desired value the regulator can be adjusted from the beginning).

Most modern powder systems, whether manual or automatic, provide a closed-loop flow control over powder flow (Figure 1). Closed-loop flow control adjusts air pressure input to the pump, regardless of fluctuations in plant air pressure, to maintain consistent, repeatable powder flow. Such control means consistent, repeatable coating coverage for optimum finish quality and operating efficiency.

Operator ease is another important factor when considering process control technology. The more user-configurable presets available, generally the easier it is to build recipes for specific parts and powders. Presets allow operators to adjust various gun control parameters, such as flow rate, atomizing, electrostatic voltage (kV) and current limit.

Controlling Today's Manual Guns

Many of today's manual guns are focused on ease-of-use by the painter. These guns tend to be compact, lightweight and well-balanced, making them ideal to meet the performance demands of faster line speeds and shorter runs that come with leaner manufacturing. The system controls also feature procedures that are easy to learn to reduce training time required for operators.

With the new generation of guns comes the need for a new generation of controls. One of the latest innovations is the use of controls directly on the gun (Figure 2). The back of the gun features a keypad and display. Included on the gun are a gun purge button and a mode selection button that allows for quick mode changes on the fly for both presets and powder flowrate. The gun is also linked to a controller that provides additional control capabilities, such as closed-loop digital flow control and automatic feedback current control.

Having controls directly on the gun allows the operator to know the exact gun setting without taking focus off the part being coated. That allows for even greater flexibility to almost instantly respond to product and color demands that can change by the minute on the coating line.



Figure 2

Lean Systems

Such systems with controls directly on the gun can be used in reclaim or non-reclaim systems (lean systems). Lean systems (Figure 3) are being used where it may not be economically justifiable to reclaim powder

coatings. Fast color change, shorter line gaps between colors, and substantial increase in throughput and productivity can far outweigh the cost of unrecovered powder overspray. One development that has allowed for lean systems to be economically feasible is dense-phase powder delivery. Dense-phase powder delivery has provided enough boost in first-pass transfer efficiency that the cost gap between reclaim and spray-to-waste has narrowed considerably.

Dense-phase is a reference to the dense powder in the transport tubes. The control technology focuses on dense-phase powder transport with closed-loop digital flow technology. Moving more powder with less air results in higher transfer efficiency compared to conventional venturi-style pumps. Using less compressed air to propel the powder to the gun means less overspray, more powder on the part and greater powder material savings. With the improved transfer efficiency offered by dense-phase technology (more than 70 percent first pass transfer efficiency in some cases), many powder coaters are choosing to spray-to-waste rather than reclaim powder.

The controller with such a system uses a manual or automatic purgeable design in both suction and transport directions for ultra-fast color change. This added weapon in the color-change arsenal allows for automatic color changes in 20 seconds or less in a lean cell. This super-fast color-change capability allows guns and hoses to be rapidly purged for a second color.

One playground manufacturer is using dense-phase technology for spraying textures and metallics. The result has been an increase in line speed from 4 fpm to 5.5 fpm. The same technology has also reduced color change time from 3.5 minutes to 45 seconds, which has had a tremendous impact for a company that averages 40 color changes per shift and is running two shifts per day. Higher transfer efficiency has reduced scrap powder by as much as 80 percent.



Figure 3

Total Control

Not long ago, powder coaters had to have a separate control for each gun – even in automatic powder coating systems. Now, there are control systems that integrate all powder control function in one single system with one touch screen graphical interface for a single view of all system settings (Figure 4). These systems typically feature closed-loop digital flow



Figure 4

technology and provide for recipe-driven automatic control of all system parameters. These parameters can include booth airflow, spray gun air control, electrostatic control, powder pump operation, gun triggering, part detection and gun motion control.

Setting each of these manually for every gun for every part and for every powder would be physically impossible. Not to mention, each manual setting has the potential for error, which could be compounded when making dozens or hundreds of changes at a time. Integrated control systems allow all parameters to be stored together as a single-part recipe (Figure 5) that can be activated with a few keystrokes. Some of today's systems can accommodate up to 250 presets to optimize system performance over the widest variety of part profiles and configurations.



Figure 5

These advanced controls can also accept input from part identification sensors for gun triggering and in/out positioning of guns. Some systems even offer multiple language capabilities and voice prompts to tell the operator what product and color are coming next. This can be a big help in situations with operator turnover.

Realizing a Return

As more and more powder coating operations manage multiple colors and look for faster color changes to meet lean operation requirements, they are turning to today's next generation of process controls to improve their coating line and their bottom line.

The right coating technology and process controls can save anywhere from 15 to 30 percent in material costs through higher transfer efficiency, as well as provide a return on investment through reduced downtime, less energy used, less wear and tear on equipment, greater productivity and more consistent quality in both reclaim and spray-to-waste systems.