

COLOR CHANGE SYSTEMS FOR POWDER COATING APPLICATIONS

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Introduction

Color change is a critical issue most companies must address when purchasing a powder system. There is no magic potion for color change as it can vary from one minute to over two hours. This paper will discuss the color change systems available.

Color Change

The most commonly asked question regarding color change is, "how much time does it take?" The answer to this question depends on the following:

- Type of booth, manual or automatic system.
- Number of booths.
- Spray-to-waste.
- Type of recovery system, cyclone separator or cartridge booth.
- Type of booth canopy.
- Type of powder gun.
- Number of powder guns.

Additional color change variables:

- How many people will do the color change?
- What color(s) are you using?
- How well trained are the operators?
- What level of quality is needed?
- Are you looking at the right equipment for color change?

Because there are so many variables with color change, you should take steps to investigate all aspects of a color change system. Be leery when an equipment supplier remarks about how quickly certain color change systems perform. For instance, color change time on identical systems in different situations can vary. You can have the best powder coating system, but when it gets down to it, "people make the difference," and can make the difference in the time it takes to make a color change.

Spray-to-Waste Color Change Systems

When the production line is temporarily shut down, the time it takes to change color, will affect your cost of doing business. Spray-to-waste systems are very popular because they are very fast. The time it takes to change color is similar to the time it takes to clean out the gun.

The design of the gun(s), pump(s), and hopper(s) should be of a modular construction for fast, easy disassembly for color change. In some cases, you can have additional hoppers or box feed units that will give you almost instant capabilities to change colors. I recommend before making an equipment purchase to take the gun(s) and pump(s) apart to see how easy they are to service and clean. There are guns available that do not require disassembly tools, which makes servicing and color change easier.

Spray-To-Waste Color Change Booths

Spray-to-waste color change booths are a lot like a liquid paint system where 30 to 70 percent of the paint is thrown away. Normally, powder booths are designed to allow the workpiece to pass through a recovery area where powder is contained and used again. A spray-to-waste color change system will contain the powder and in some cases, will pump the overspray powder to a

scrap container for disposal. There are several good reasons why spray-to-waste booths are in use today.

- Number of colors and the time it takes to change colors.
- Lost production time can be 30 to 60 minutes.
- Short runs of various colors.
- Ability to test a new color or powder from a different material supplier.

The two most commonly used spray-to-waste booths are batch booths (Figure 1), and for larger operations, booths that incorporate roll-away filter modules for scrap colors (Figure 2).

Note: First-pass transfer efficiency is extremely important when spraying to waste.

Figure 1

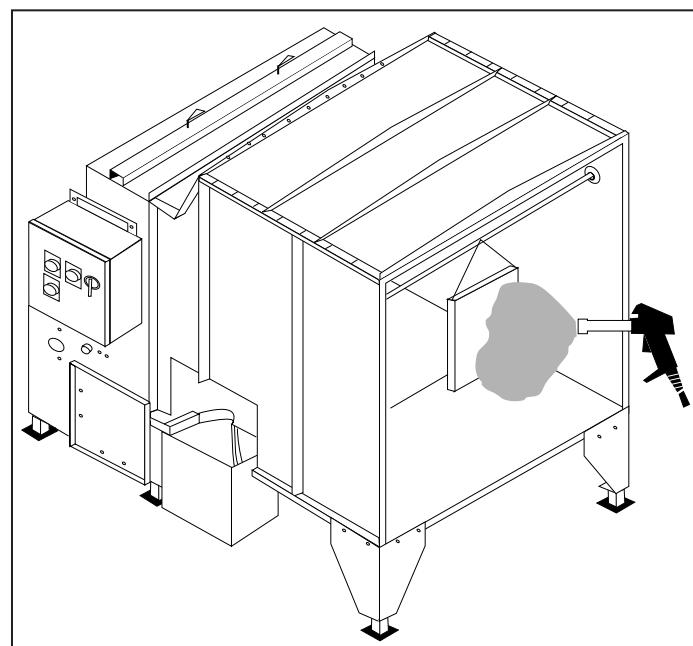
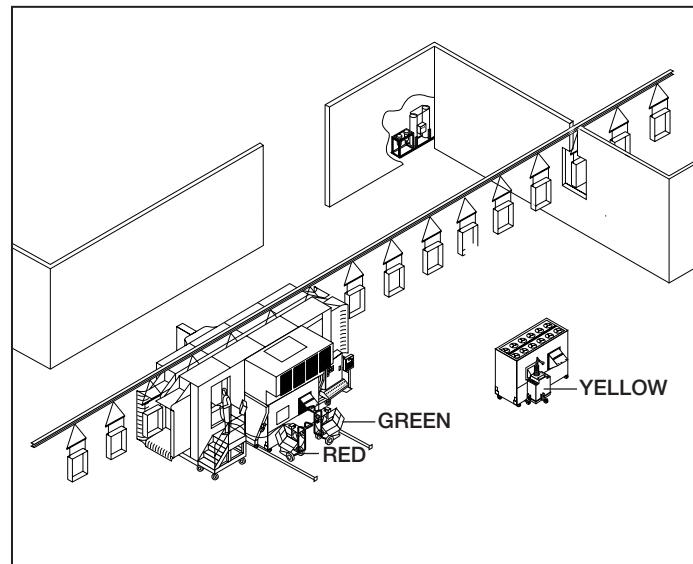


Figure 2



Cartridges vs. Cyclones

In North America, the two most commonly used booths in the powder finishing industry are a cartridge booth that uses a roll-away cartridge filter module (Figure 3) and a conventional cyclone separator that uses a cartridge collector for a final filter (Figure 4).

Figure 3

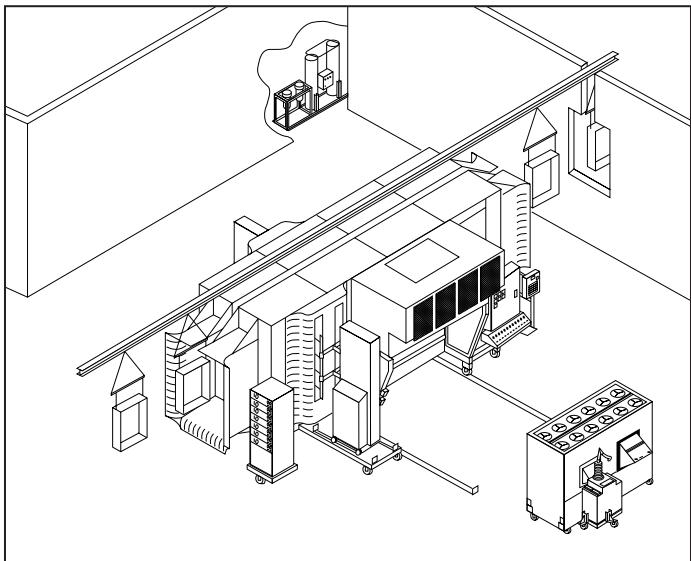
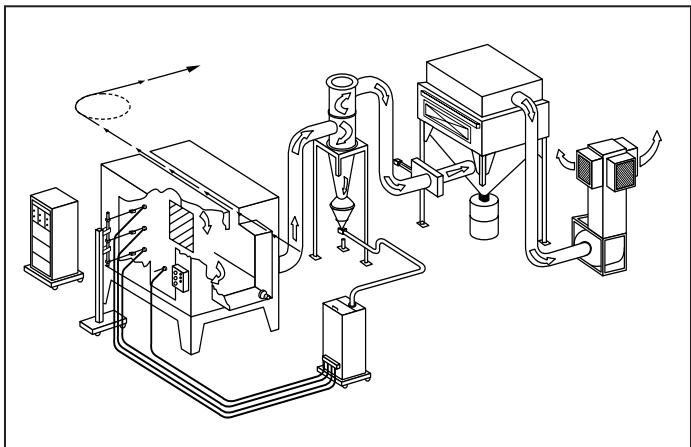


Figure 4



Booth Canopy

Cartridges or cyclones can use the same type of booth canopy. The booth canopy should be sturdy, easy to clean and maintain. Reasons for the booth canopy are:

- Powder containment.
- Enhanced transfer efficiency.
- Color change.

Powder is applied with an electrostatic charge, and the objective is to obtain a high, first-pass transfer efficiency. We want the powder attracted to the parts and not to the booth canopy. The canopy design is an important factor to the total integration of a powder coating system. The four most popular booth canopies are polypropylene,

stainless steel, a combination of polypropylene and stainless steel, and painted steel.

The most common canopy is the rigid polypropylene. It was first introduced in the early 80s and has grown to become the preferred canopy design. The polypropylene canopy has a translucency that improves visibility inside the booth and enhances gun transfer efficiency. It has a long wearing, smooth, slick surface that is easy to clean and does not attract powder or static build up. This is the most expensive booth material available.

The second canopy design is made out of stainless steel and is durable and solid. Although not as easy to clean as a polypropylene booth, it is less expensive.

A third canopy design is comprised of a combination of polypropylene and stainless steel. The polypropylene panels are located around the gun slots and the roof in the booth. Again, it is an economical option.

Lastly, the fourth canopy design is made of painted steel. The painted steel canopy is actually the earliest design, but after a few years and many color changes, it loses its appearance. It is durable and solid but not as easy to clean as the polypropylene or stainless steel canopies.

Booth air flow and gun placement are critical factors in how well the booth will perform. In a powder coating system, "more is not better." Air flow must contain the powder and not allow it to migrate through the opening. At the same time, however, the powder must reach the part. Optimal air flow will enhance the coating transfer efficiency. The powder coating gun should be positioned completely within the spray booth. What this means, is the grounded booth wall, whether it's conductive or non-conductive material, will be far enough from the electrostatically charged tip of the gun to eliminate any disturbances. Furthermore, booth walls and floors should be smooth and free of joints. When it's time to change color, the entire inside of the booth will need wiping down to remove excess powder. It is critical that all inside areas of the booth are visible to the naked eye for cleaning. Hidden areas, such as tight angles and enclosures, make color change difficult and more time consuming.

Color Change

The cartridge booth (Figure 5) recovers oversprayed powder by means of a self-cleaning cartridge contained within a removable color module. When a color change is required, the pumps, hoses, guns, and booth canopy are cleaned, powder deposited into the color module, and then replaced with the next color module. Painting can then resume. As with all other types of booths, the cleaning of the pumps, guns, and booth is completed with the fan motor in operation so the powder can be collected into the color module.

The cyclone booth (Figure 6) requires all the steps of a cartridge booth, and in some cases, cleaning of the duct-work and lower one-third of the cyclone. In general, color change for the cartridge booth is much quicker and easier than the conventional cyclone.

Figure 5

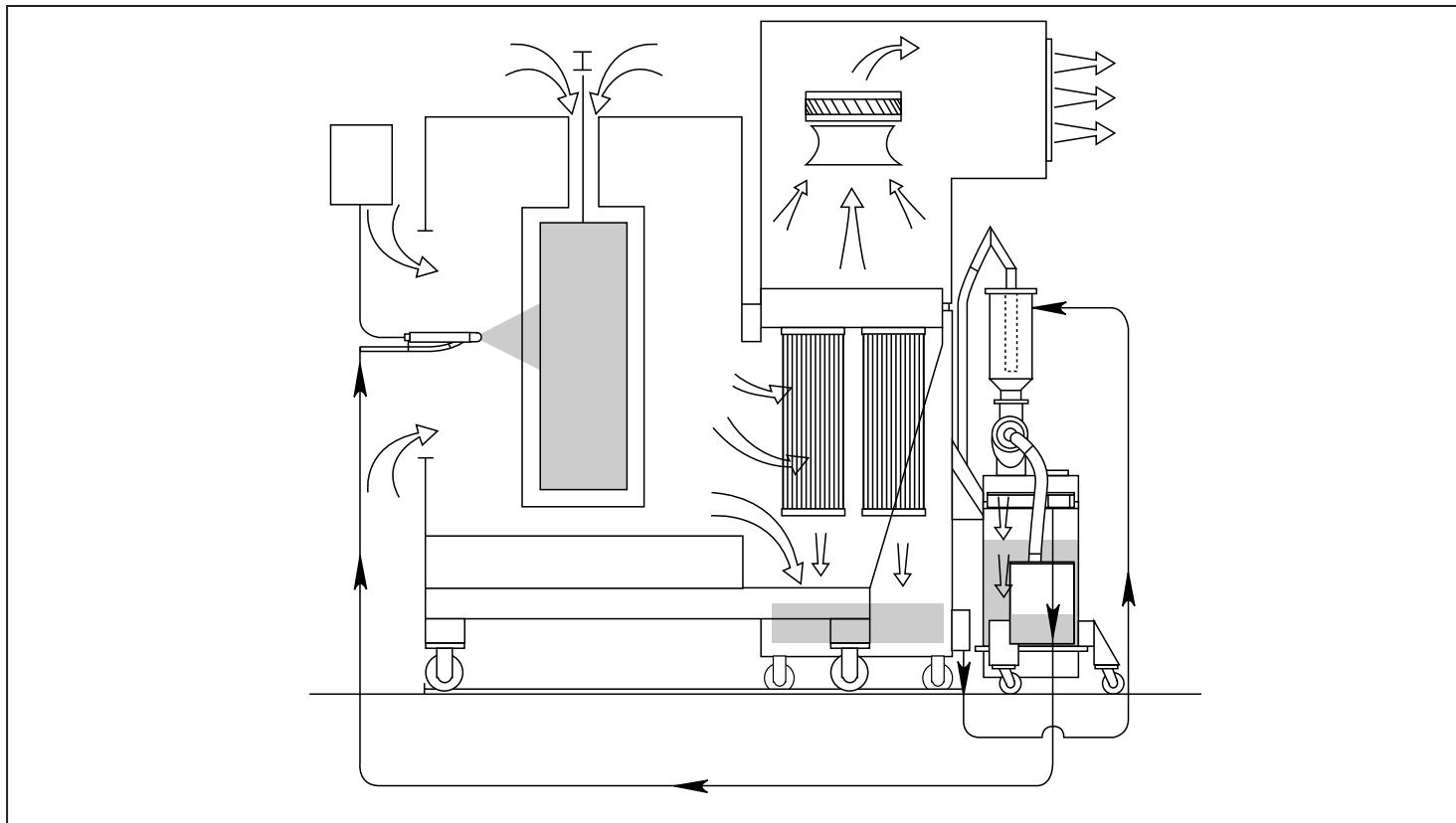
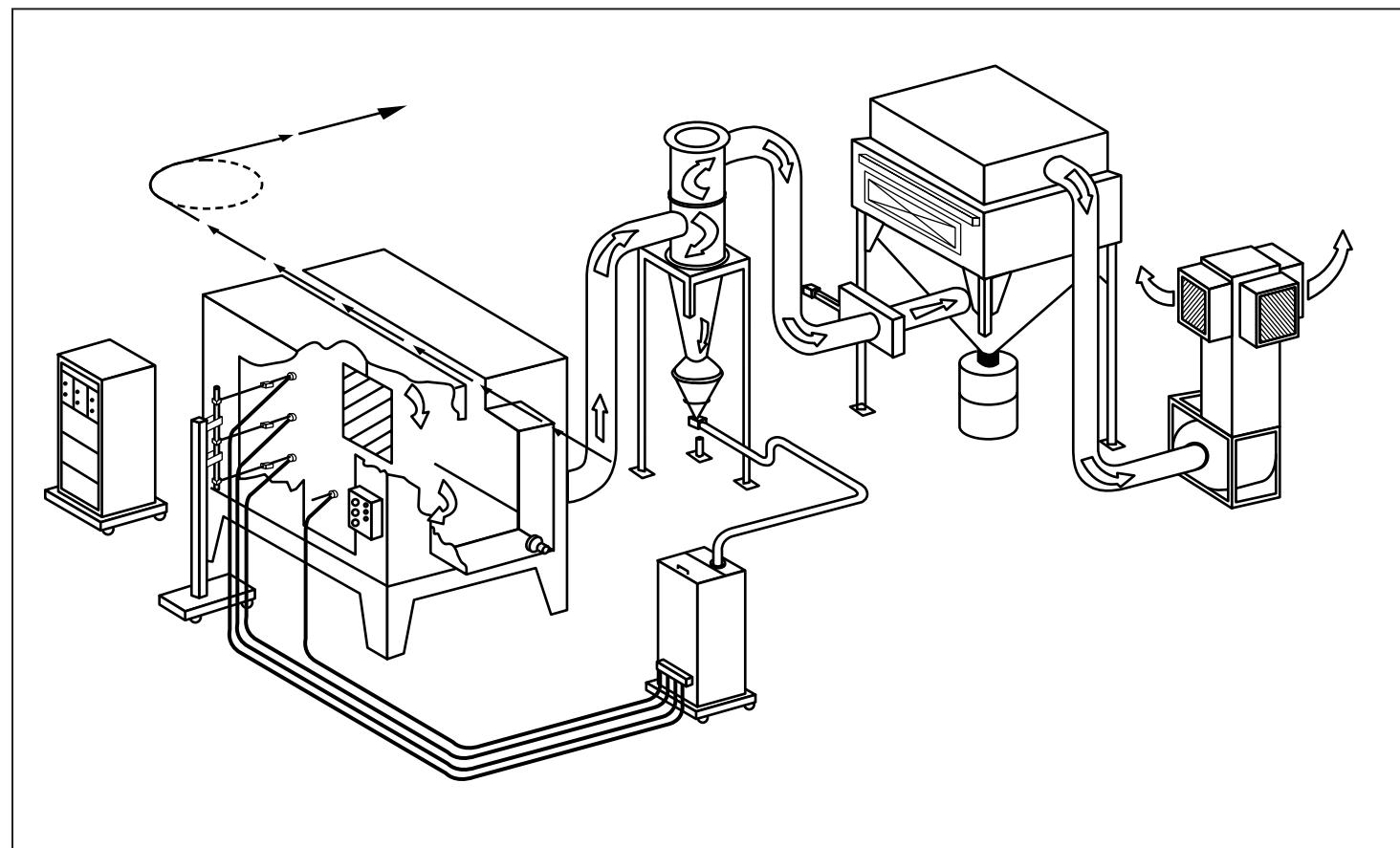


Figure 6

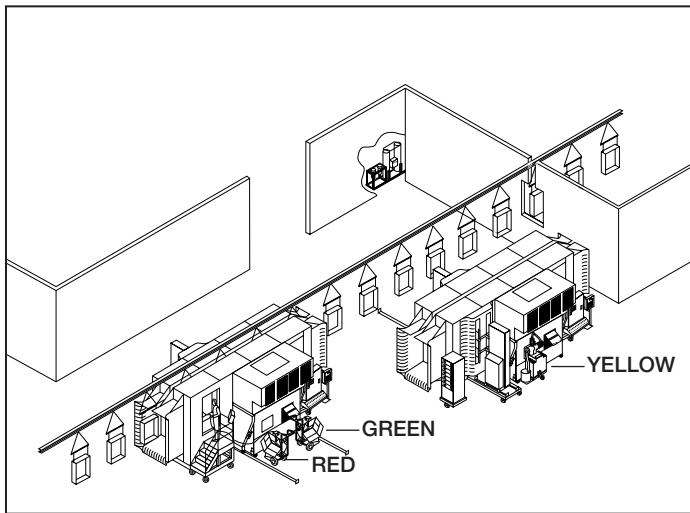


Multi-Booth Operation and Color Change

Up to this point, the discussion has focused on color change of a single powder spray booth. A multi-booth system might be the answer for your powder line. If your paint operation has many color changes and your production line is down for the color change, your operational costs will also change. More than one booth can save you money by reducing the amount of time your production line is down. There are many ways to get better use from your powder system. Let's discuss ways color change can be accomplished.

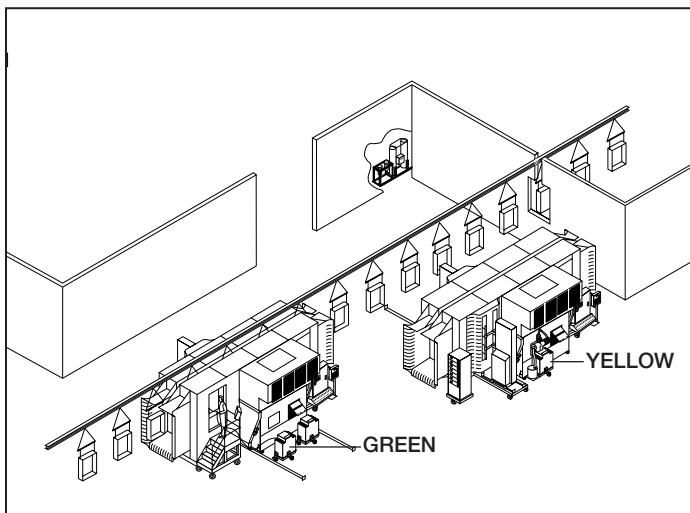
- Short Runs of Various Colors. Figure 7 shows a manual booth with two manual operators running short production runs. At the same time, the automatic booth is being prepared for its next color. The oversprayed powder in the manual booth is not saved because the length of time to clean this unit makes it cost prohibitive.

Figure 7



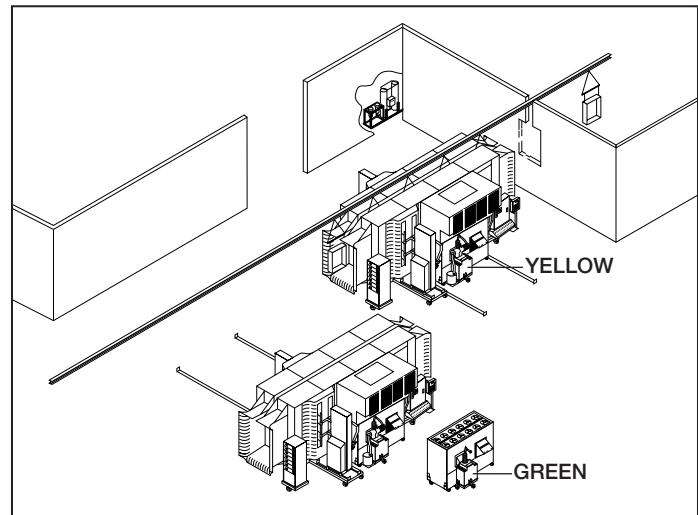
- Two-Booth System/Automatic and Manual Touch Up. Figure 8 shows an on-line/off-line two-booth system. While the on-line booth is operating, the off-line booth is prepared for painting.

Figure 8



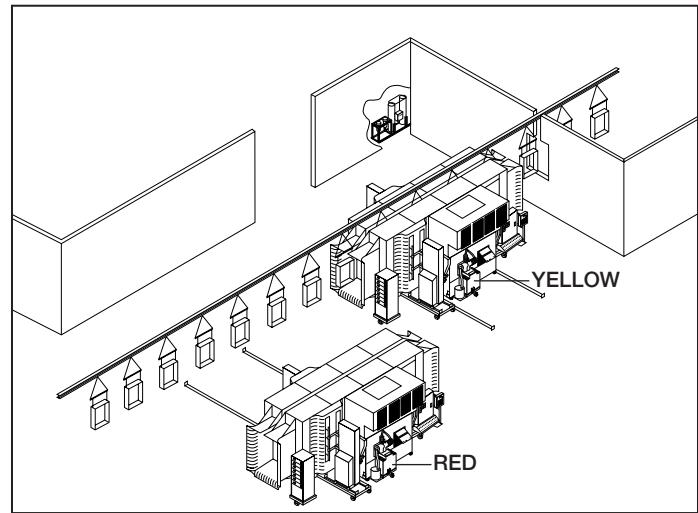
Once the first color run is completed, the operator creates a temporary break in the line that allows the first color booth to roll off line and the next color booth to be rolled into position (Figure 9).

Figure 9



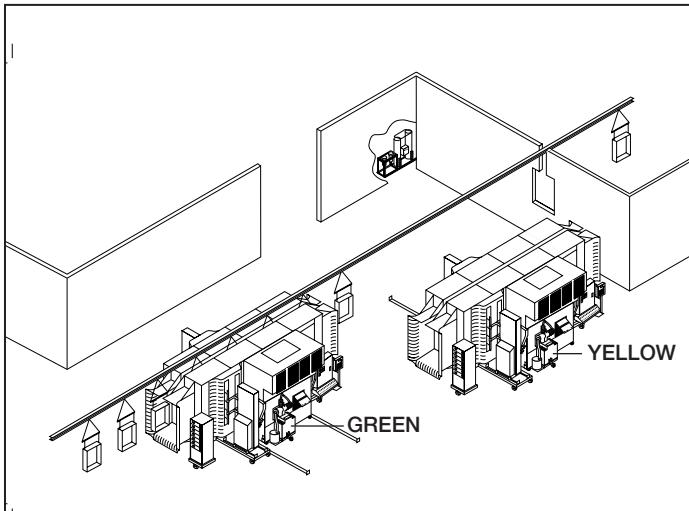
As the break in the line passes, the second color booth then begins its painting run (Figure 10).

Figure 10



While the second booth is operating, the first booth is cleaned and prepared for the next color. The entire color change process from a production standpoint takes only a few moments. This is a very practical way to color change quickly and efficiently when production parameters require it (Figure 11).

Figure 11

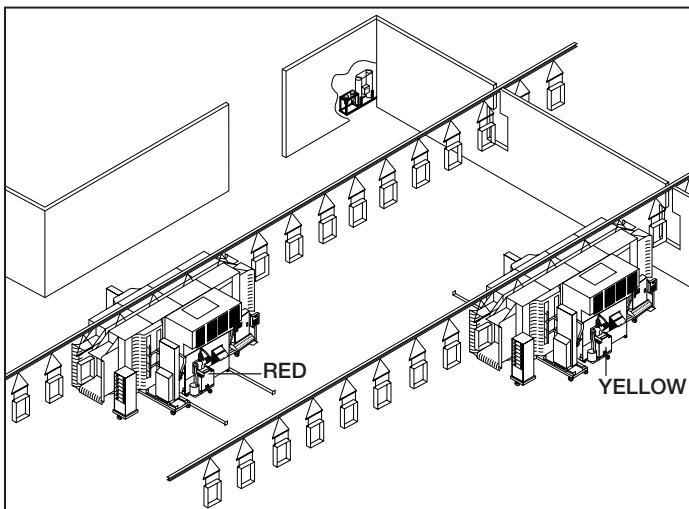


Summary

The success of a powder coating operation is determined by the quality and efficiency of recovered powder and how quickly a color change is accomplished. Over the last 20 to 30 years, many changes have taken place in the technology of recovery and reclaim systems. Equipment suppliers are constantly working to improve the efficiencies of their equipment. As we move toward higher first-pass transfer efficiency, color change will be less of an issue.

- Multiple Conveyors/Booth. Another way color change can be accomplished very quickly is by installing a conveyor that branches into different dedicated color booths (Figure 12). As parts move along the conveyor, they are directed to the proper color booth for painting. This design allows for more than one color to be applied to different parts simultaneously.

Figure 12





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