Latest Advances in Powder Porcelain Enamel Application and Booth Technology

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Introduction

Recent advancements in application equipment and spray booth technologies for powder porcelain enamel have improved application effectiveness and overall operational performance.

Robots have replaced conventional, 3-axis gun mover machines in newer cavity line installations, as well as provide a cost-effective alternative for single-gun reinforcement applications.

The use of non-conductive powder spray booth wall and roof materials, and patented, new booth base design help minimize powder in process, offering faster cleaning, as well as color change capability if/when required.

New Application Equipment for Powder Porcelain Enamel

New-generation powder porcelain enamel spray guns incorporate advanced features, including more efficient, higher-capacity voltage cascades, and improved spray pattern control, both in Venturi and dense phase delivery technologies.

Figure 1: New-generation electrostatic powder porcelain enamel spray guns
New Venturi pumps for powder porcelain are more efficient, using 20 percent less transport air, while producing softer spray patterns. Dense-phase delivery pumps use a fraction of the air to transport powder, compared to Venturi technology, with the added benefits of “linear” powder output, consistent over time, for unmatched repeatability and overall process control. Both pumping technologies offer savings in compressed air utilization and cost, with dense phase providing the highest savings. Dense-phase gun delivery pumps also purge clean and color change very quickly.

![Figure 2: Powder porcelain enamel dense phase bulk transfer pump, Venturi gun delivery pumps and dense-phase individual gun delivery pump](image)

The use of painting robots is rapidly growing. Not just for powder porcelain enamel, but many other powder coating material applications. Robots are ideal for cavity coating, replacing the conventional 3-axis machines. Also, for cavity reinforcement areas, as well as “cutting in” on oven doors and other non-cavity components.

Dense phase delivery technology is the perfect complement to a painting robot. With its lower-velocity, highly dense powder output, this technology enables the spray guns to work closer to the part, and apply powder much more quickly, taking advantage of the speed of a painting robot. This technology has shown the capability, in certain applications, to reduce the number of guns required to effectively coat a part.

![Figure 3: Robot-mounted guns for cavity coating](image)
Advanced Spray/Recovery Booth Designs for Powder Porcelain Enamel

Spray booth side walls and roof made of non-conductive materials minimize attraction of powder overspray. Patented, low-profile booth base with floor blow-off technology keep powder overspray entrained in the exhaust air stream, eliminating powder build-up on the booth floor. With this technology, no conventional fluidized powder recovery beds are required. The booths can be cleaned utilizing compressed air blow-off guns.

Figure 4: Patented, low-profile booth base, and highly effective exhaust design minimize powder in process and facilitate faster booth cleaning

The spray booth design provides the capability for utilizing different powder recovery modules to accommodate either cartridge primary filters, or sintered lamella panel filters. The recovery modules are removable, with different modules for different powders or colors, providing valuable operational flexibility in one booth.

Figure 5: Removable, cartridge or sintered lamella panel filter/collector modules
One of the largest appliance installations in the world features multiple roll-on/roll-off booths for powder porcelain enamel coating of flatware and cavity lines. The same installation also includes fast color change, organic powder booth systems.

Figure 6: Multiple roll-on/roll-off flatware and cavity booths

System Controls

The complete powder spray system, including part identification, all spray gun electrostatic and pneumatic parameters, gun movers, part recipes, gun triggering, bulk feed to delivery hopper replenishment, and all spray booth functions, are controlled by a PLC.

Figure 7: Powder booth system PLC and sample screens