

Modern Powder Coating Technology for the Enamelling Industry

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Introduction

This article describes the latest powder coating technology for the porcelain enameling industry, which include Nordson's Horizon PE 400 powder booth for improved transfer efficiency and quick color changes.

General description of powder application process

Virgin powder enamel is usually supplied in big bags or drums and automatically transferred to a rotary sieve hopper, which is equipped with a magnetic separator.

Any iron contamination and/or coarse particles are removed before fluidizing the powder enamel inside the hopper prior to the actual application process.

Heavy duty powder pumps, which are executed with ceramics inserts due to the abrasive nature of powder enamel, are used to transport the fluidized powder to the automatic guns.

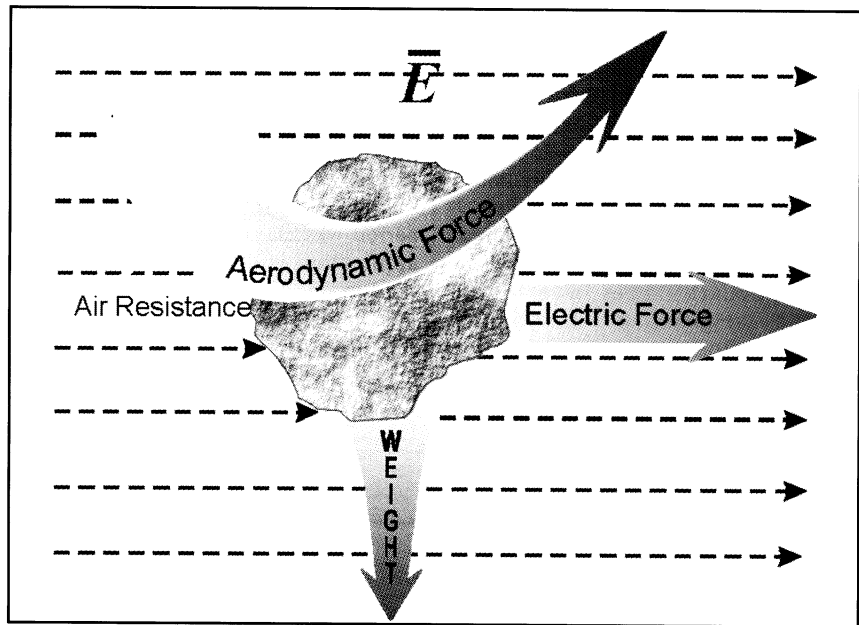


Figure 2: Forces during the electrostatic powder application process

The powder enamel is then led along an electrode at the tip of the gun, which is maintained at a high electrostatic voltage, and sprayed towards the products.

The charged powder particles are attracted by the grounded ware, which are usually suspended to an overhead monorail conveyor, thanks to the electric force from the field.

However, as shown in figure 2, the powder enamel particles are also subject to aerodynamic and gravity forces during the application process.

In consequence only a part of the sprayed powder will deposit on the products. (The ratio between the deposited and sprayed powder quantity is called transfer efficiency.)

Without an automatic powder recovery system, "overspray" enamel would accumulate at various locations inside the booth.

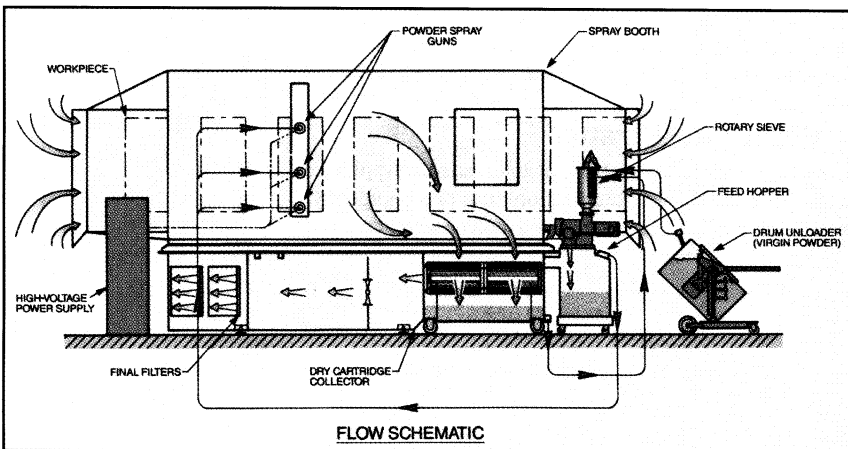


Figure 1: Simplified cross section of powder enamel system

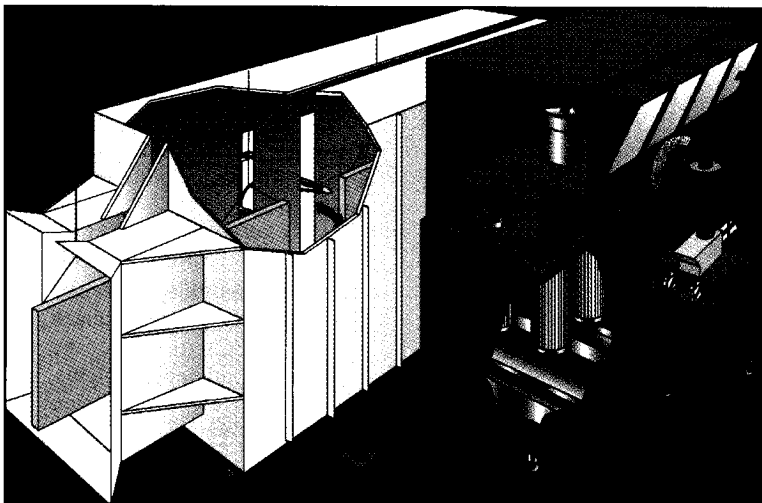


Figure 3: Powder system with side-draft powder recovery

These Horizon booths are characterized by the use of a patented powder recovery system, which is based on the down-draft principle and fully integrated in the booth base. (see figure 1 and 4)

The filter/collector module is projected below the automatic gun station(s), so that the downward airflow allows the oversprayed powder to naturally "wash down" over the part, resulting in a more consistent uniform coating and improved operating efficiency.

The down-draft design also provides more efficient use of the factory floor space and allow unlimited access to either side of the booth.

Its canopy is constructed of specially engineered PVC with anti-electrostatic properties. The low conductivity of this material minimizes the amount of overspray powder, that collects on the interior surface.

Quick color change.

Because the overspray powder isn't attracted to the PVC walls, the system provide not only an increased transfer efficiency, but also easier booth cleaning !

Analyses showed that coarse powder particles tend to lay on the booth base (due to their unfavorable surface/weight ratio and inability to be transported over a large horizontal distance by air), while a concentration of fines is usually found at the filter unit(s).

maintained.

Nordson's patented powder recovery system

The overspray enamel is automatically returned to the rotary sieve hopper, where it is mixed with virgin powder again.

Most powder enamel systems are nowadays equipped with a so-called side-draft powder recovery system (as shown on figure 3) in combination with scrapper/hopper constructions at the booth base.

Please note that a constant coating quality may only be obtained from your powder application process, if the ratio's of coarse and fine recycled powders are carefully balanced and

To simplify the powder recycling system and to overcome the risk of powder segregation related problems, like "gun spitting", Nordson Corporation designed a new generation of powder booths, named Horizon™

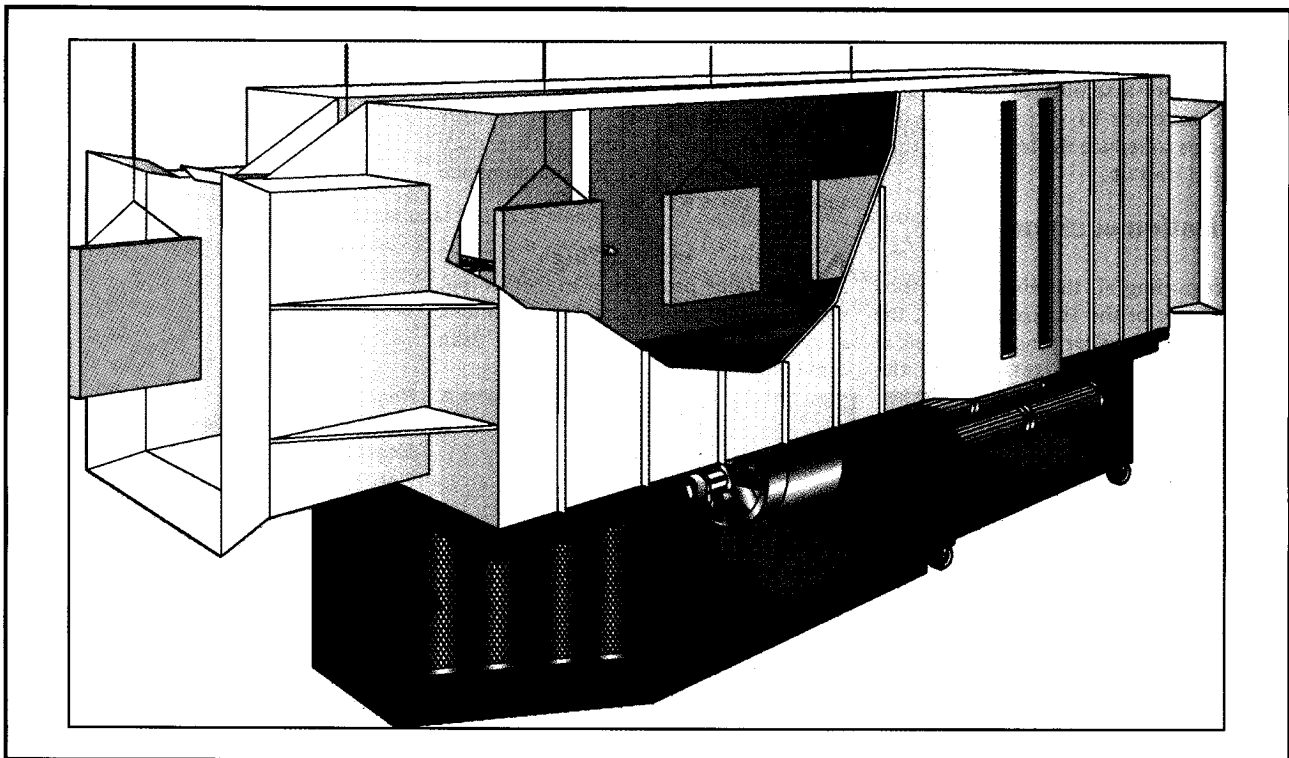


Figure 4: Horizon booth with down-draft recovery

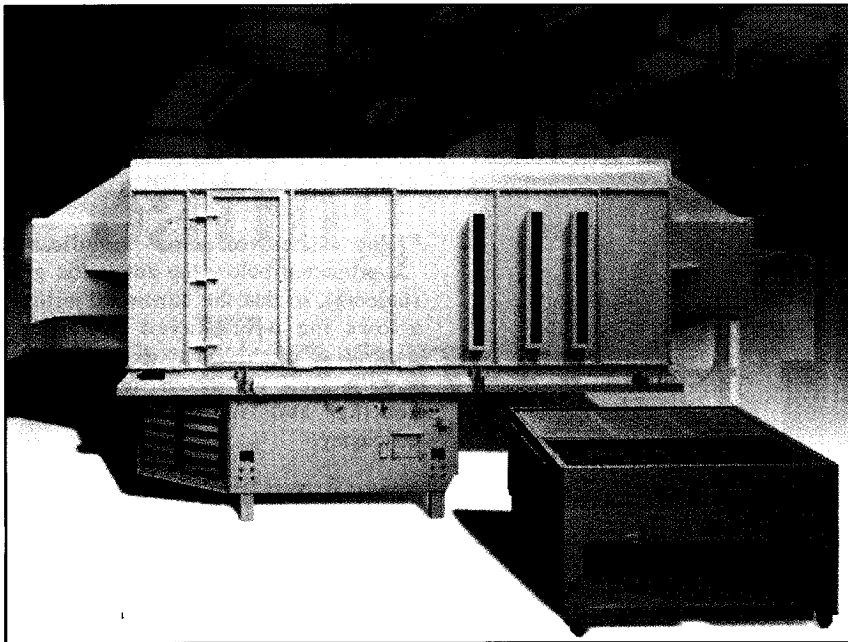


Figure 5: Nordson's Horizon PE 400

The Horizon booth, type PE 400, is in fact the first powder booth for the porcelain enameling industry, which is truly designed for quick color changing. For example :

Dedicated collector modules, which are executed with sinter plate filters, are easy removable (thanks to conveniently located quick disconnect plates serves as manifolds for all air tubing connections) to facilitate cleaning and ensure fast color change.

Shorter installation time

Factory pre-assembly of our Horizon booths prior to shipment to your plant helps to reduce the installation time and speed start up.

Application equipment

Disregarding all the above described benefits of the Horizon booths, the essence of the powder process remains at the selection and set-up of the

application equipment !

Because of the abrasive nature of porcelain enamel, Nordson specially designed its patented Versa Spray IPS guns for automatic and manual application of powder enamel. For example :

The gun's powder pathway module is easily removed, without special tools, for routine cleaning, while all powder contact parts are made of special engineered materials for maximum resistance against wear.

Experiences at a leading European major appliance manufacturer showed that such construction may reduce the direct cost for maintenance and spare parts with 60 - 70 % !

Nordson's integral high voltage generator provides a higher output voltage, under actual spraying conditions at typical gun-to-part distances, than conventional electrostatic spray guns.

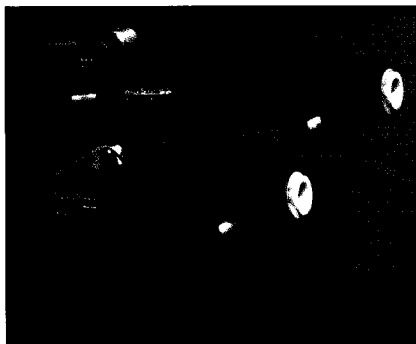


Figure 6: Versa Spray II powder guns with integral high voltage generator

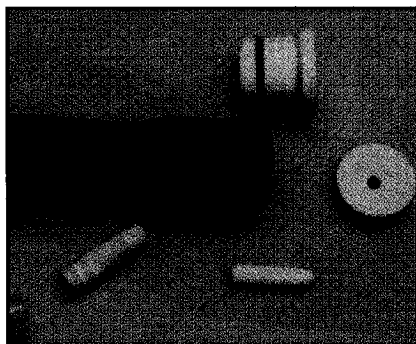


Figure 7: Powder pathway protected with ceramic inserts

The result is a higher first-pass transfer efficiency and dramatically improved coating coverage.

In other words, more m2 coated per gun and/or less guns required for a similar production.

All Nordson PE systems are delivered with Automatic Feedback Current control (AFC) to overcome typical electrostatic related problems, such as back-ionization, orange peel and/or Faraday cage areas.

In the AFC mode, the Versa Spray II controller automatically adjust the electrostatic voltage to maintain the optimum powder charge and external field strength regardless the gun -to-part distance.

Conclusions

The introduction of new technologies for booths and application equipment will stimulate a further growth of the environmental friendly powder coating process within the global porcelain enameling industry.

Today's availability of down-draft powder systems with quick color change capabilities, will enable enamelists to manufacture high quality products in various colors in a simple and cost effective way.

For more information about Nordson's equipment and/or the benefits of powder enameling, please contact :

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