Designing a powder-application room: Why? How?
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Isolating the powder-application process from the plant environment can make the difference between success and failure on a powder-coating line. The surrounding plant environment contains numerous contaminants that can adversely affect the coating operation. To keep airborne contaminants from being deposited on the parts being sprayed requires taking unique precautions. Probably the most important is designing an application room (also called a powder room or an environmental room) to house the application process.

Making the case for an application room
Powder coating booths have two purposes: to contain the oversprayed powder and to collect it for disposal or reuse as reclaimed material. The collection technology employed to accomplish these goals is borrowed from the dust filtration industry. As a result, powder booths not only collect the oversprayed powder but also collect the airborne dirt and contaminants present in the plant airstream. Contaminants at the point of powder application can be electrostatically charged with the powder and applied to the parts. In addition, on lines that collect oversprayed powder for reuse, contaminants get drawn into the powder collector and mixed with reclaimed material. Sieves remove contaminants larger than the average powder particle. They cannot distinguish between dirt and powder that are the same size, however, so they sieve the dirt along with the powder. (For more information on controlling airborne contamination, see “Housekeeping and finishing quality—there is a connection” in Powder Coating, December 1991.)

Furthermore, if other manufacturing operations occur adjacent to the booth that are incompatible with the powder-application process, they are certain to affect the process and the finish quality. In terms of the process, fire detectors at the booth often falsely detect nearby welding operations as fires, triggering shutdowns of the application system. Moisture from the washer and heat from the ovens can cause numerous powder application and recovery problems as well. Finish quality suffers in that vapors from degreasing or plating systems can create fisheyes in the coating. In addition, metal sanding or grinding can introduce dirt into the powder stream, and lubricants used to assemble products can cause surface defects in the coating.

Designing the application room
Considering these process and quality problems, the advantages of segregating the powder-application process from the plant environment are obvious. Three approaches are available for doing this. One involves constructing a room using common lumberyard materials. Another entails building a room using masonry—concrete blocks or bricks. The last requires buying a prefabricated room from a manufacturer that makes in-plant offices and rooms (see Figure 1 for an example). In all cases, the following ideas need to be incorporated into the room design:

• The room should be big enough to allow workers to operate, clean, and maintain the system easily. It's also important to consider how much room it takes to roll booths on and off line and to deliver powder by forklift. Moreover, the room must have enough space to store at least a 24-hour supply of powder (to bring powder to the correct temperature and humidity levels before applying it).

• If the environmental room won't be used for long-term powder storage, then an area for this purpose must be designed and located elsewhere in the plant.

• The interior walls and ceiling of the application room should be made of smooth, easy-to-clean materials. These should be sealed to assure that they do not leach
airborne contaminants. Unpainted plasterboard will shed fibers, for example, and so will the seams of unpainted wood paneling. If ceiling tile is used, it should be smooth so that powder will not cling to it and vinyl coated so that it will not leach airborne particulates.

- Features such as light fixtures, doors, windows, electrical boxes, and duct work should be located outside the room when possible. If they cannot be, they should be flush-mounted (not surface-mounted) to eliminate dirt traps. Horizontal ledges, such as exposed 2-by-4 bracing, have no place in an environmental room.

- Operators should be able to enter and leave the room easily. To keep unauthorized personnel out of the room, some doors can be operated by push bars. Locked from the inside to restrict access, these doors provide emergency exits for operators. At least one overhead, garage-type door should be incorporated into the design to facilitate system maintenance and powder delivery by forklift.

- For easy cleaning and maintenance, the floor should be sealed with paint or sealer and possibly tiled.

- Brooms are not sufficient to handle powder spills or routine equipment and room cleanup. A vacuum system is necessary and should be incorporated into the room design.

- The room must be positively pressurized to prevent airborne contaminants from entering through the part openings. The induction system that brings filtered air into the room should be sized to accommodate air velocity of approximately 120 fpm through the part openings. The discharge air vents must be uniformly distributed through the room and sized to prevent air velocity from exceeding 50 fpm. Under no circumstances should the air vents be positioned over the powder booth or next to booth openings.

- If the powder supplier suggests temperature and humidity control, then an air conditioning system is required. Environmental specifications should be confirmed with the powder supplier. (The typical specifications for the air conditioning system are 60-to-

80°F room temperature and 40-to-70 percent relative humidity.) The heat-load calculations must include lighting, people, part temperature and mass per hour, heat from electric motors, ambient plant temperature, heat loss through doors and windows, wall- and ceiling-insulation values, and anything else that affects room heat and humidity.

The return air velocity should be less than 50 fpm and should be filtered to prevent powder as small as 2 microns from entering the exchanger coil. The make-up air required for room pressurization must also be air conditioned. Air distribution throughout the room must be as discussed previously. The duct work should be insulated to prevent the accumulation of moisture.

**Conclusion**

As a process highly susceptible to contamination from the plant environment, powder application should be isolated from other plant processes. An application room provides the optimal condition for powder coating. The most functional room is one that is positively pressurized, environmentally controlled, and practical in terms of floor space, cleanliness, and maintenance.

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