



Powder Coating Technology for the 21st Century

In the 1960s, a new coating technology was developed called powder coating. Instead of wet paint, the coating as manufactured and applied is totally dry. Its constituents are practically identical to wet paint except for the absence of solvent. Like a liquid paint, powder coatings contain a resin, pigment (colorant), and additives. Upgrading to powder coating can improve safety as well as be environmentally beneficial, and reduce total operation costs.

Powder vs. liquid

As the name implies, powder coatings are composed of tiny, flowable, powder particles as compared to a pourable liquid. Nearly all resins used in liquid coatings can be used in powder coatings. Epoxies, acrylics, polyesters, and polyurethanes are used the most. Other materials, such as Teflon, nylon, and polypropylene, can be used in powder coatings, although they cannot be dissolved or readily dispersed in liquid systems. Resins used in powder coatings may be either thermoplastic (flow when heat is applied) or thermosetting (cross-linked and solidified when enough heat is applied). Thermoplastic coatings are used for functional purposes such as outdoor use; thermosettings are used for decorative applications, more for indoor use.

A potential drawback to powder coating can be the temperature required for the coating to be cured, and hence energy consumption. In addition, your emissions from combustion processes (ovens, etc.) should be calculated to determine you do not exceed regulatory levels that would require an air operating permit. Low cure temperature coatings and ultraviolet (UV) curable coatings are available for some applications.

Most powder manufacturers recommend their materials be stored in a refrigerator or an air-conditioned room, at a minimum. Failure to store materials properly may result in particles fusing together, which causes application problems.

Surface prep

Surface preparation requirements for powder coatings are generally the same as liquid coatings. The degree of pretreatment needs vary with end-use requirements. This is true for both powder and liquid. For severe end-use requirements, such as outdoor exposure in high humidity, maximum cleaning, a good conversion coating, and a quality sealer rinse are recommended. Because powder coatings tend to be thicker than liquid coatings, you can usually get by with less pretreatment. Some powder coating end-use requirements may just need grit blasting.

Application method

Electrostatic spraying is the most common method of applying powder coating. The part to be coated needs to be grounded, and this is accomplished by hanging the part on a properly grounded overhead conveyor. Powder in bulk form needs to be fluidized before it can be pumped to the spray gun. Fluidizing is accomplished by placing a quantity of powder into a container with many perforations in its bottom. Air at a controlled rate is forced up through the bottom, gently agitating (fluidizing) the powder. Powder exiting the gun tip is charged electrostatically in ways similar to charging atomized liquid paint. The charge hangs on and holds the particle to the part through electrostatic attraction. The attraction forces are suffi-

cient to hold the powder onto the part while it goes into the oven where the particles melt into a fused, continuous coating. With some powder coating systems, parts are preheated to help film buildup. Most electrostatic spray powder systems apply powder in a confined booth. Powder not attaching to the part accumulates on the booth bottom and is returned to the fluidized bed to go through the spray gun again.

Environment and safety

Since powder is 100% solid material, no solvent-type vapors are released into the atmosphere. It is more environmentally friendly to the people applying the material. Powder is classified as a non-flammable material, which may help reduce insurance premiums. Spills can be swept up or vacuumed. Cleaning clothes, skin, and equipment is greatly simplified with powder. Before disposing any of the unwanted powder into a landfill, operators should verify, through testing or from suppliers, the absence of hazardous ingredients in it.

Cost/savings analysis

Powder coating systems have three key advantages over traditional liquid-spray applications: material savings, lower operating costs, and reduced cost of environmental compliance. If powder coating appears attractive to you, perform a cost analysis to compare your current operation to a powder coating operation. The Powder Coating Institute (PCI) offers you an opportunity to use its work sheet entitled, "Powder vs. Liquid Operational Cost Analysis," to help identify potential sources of cost savings that can occur with a change to powder coating. The work sheet is available on its Web site at www.powder-coating.org or by calling 800-988-COAT for a copy of the computer disc. Thorough instructions are provided along with examples of completed cost analyses.



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Credits

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Where can I get more help?

If you would like to know more about Kansas air operating permits, please review the fact sheet *What is the Kansas Air Quality Act?* and *Here's how to figure your potential to emit* at www.sbeap.org.

The SBEAP operates a toll-free hotline you can call for additional technical assistance. SBEAP can also visit your facility to review current compliance needs and identify pollution prevention opportunities. Call SBEAP at 800-578-8898 or visit our Web site at www.sbeap.org for confidential, free, technical assistance.

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