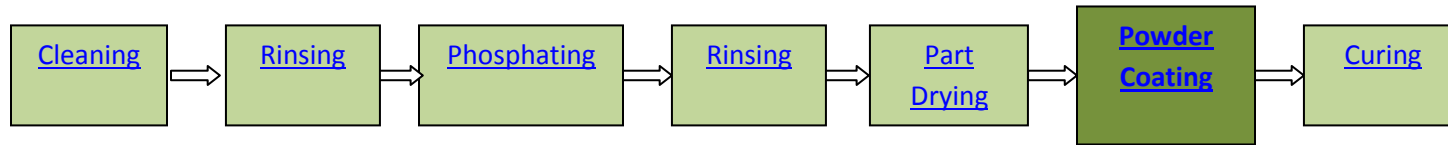


Powder Coating Process



Overview of Powder Coating

The powder coating process is very similar to a painting process except that the “paint” is a dry powder rather than a liquid. The powder sticks to the parts due to electrostatic charging of the powder and grounding of the parts. Any substrate can be used that can tolerate the heat of curing the powder and that can be electrically grounded to enhance charged particle attachment. The powder flows and cures during the application of heat.

Several advantages of powder coating over paints are:

- Powder recovery for reuse
- No VOC generation therefore no VOC destruction required
- Can be more durable than paints (powder chemistry dependent)

Several disadvantages of powder coating over paints are:

- Can have less leveling than paint (more orange peel)
- Curing is typically more energy intensive than paint drying due to higher temperature requirements

Surface preparation before powder coat application is still critical for adhesion and defect avoidance.

Typical steps in a powder coating process for metal parts:

1. [Cleaning](#) (typically an alkaline cleaner, but substrate dependent)
2. [Rinsing](#)
3. [Phosphating](#) (optional step to improve corrosion protection and adhesion)
4. [Drying](#)
5. Powder Coating
6. [Curing](#) (typically energy intensive since relatively high temperatures are required to get the powder to liquefy and flow*)

*Powder coating formulators have been working to reduce the cure temperatures to allow the process to be used on temperature sensitive materials.

Drying and Curing

The energy intensive operations in the powder coating operation are drying and curing. Typical drying and curing operations are with the use of convection ovens. The use of convection heating can be very slow and very costly if the parts are large and heavy since the evaporation or curing will be dependent on the bulk temperature of the part. Essentially the whole part must be hot enough to cause the part surface to either dry or the powder coat to cure. Therefore, large volumes of air need to be heated and exhausted from the convection oven to effectively dry or cure the parts.

This is much less of a problem for thin walled or low mass parts since the hot air can heat the parts relatively quickly with a resultant faster drying or curing process.

Depending on the part geometry, simple geometries can be dried and cured using infra red heating. The heating occurs at the part surface with little air heating or bulk heating of the part. Therefore the heat energy is going where it is needed, to the surface. It is also a very rapid heating process, again since there is instant infra red light absorption.

Another advantage of infra red heating is in the powder coat curing process. The rapid part surface heating results in better powder flow and less chance of dust or dirt defects since there is very little air flow to deposit particles compared to convection heating.

As a side note, the use of infra red curing for liquid paints has an interesting and helpful effect. The infrared light heats the part surface and not the paint, resulting in paint drying from the inside out. The paint does not skin over and trap solvent or water inside the paint as can sometimes happen with convection curing. All the volatiles are driven out of the paint, starting at the part surface and progressing to the paint surface. You might say that the paint dries backwards.

Example of an infra red panel, in this case a catalyzed natural gas unit



Catalyzed natural gas IR emitter made by CCI Thermal Technologies

Example of a powder coating booth



<http://www.therma-tron-x.com/powdercoating.html>

Example of hand application of powder



Partial list of infrared equipment manufacturers:

Casso-Solar

CCI Thermal Technologies

Fannon Industries

Fostoria Industries

Honesom

Infasource Inc.

Innovative Industries

ITW-BGK

Protherm

Solar Products

Thermal Designs and Manufacturing