

Advantages of Powder Coating vs. Wet Paint



First pioneered in the 1950s, powder coating has evolved as a popular dry finishing process used for functional (protective) and decorative finishes in manufacturing. Available in a wide range of colors and textures, powder coating is used on an increasing variety of products in nearly every major manufacturing industry today – from architecture and automotive to furniture and appliances.

Driven largely by the development of new materials, formulations and technological advancements, powder coating is fast becoming the preferred finishing process over wet paint.

The following information provides answers to some of the most *Frequently Asked Questions* (FAQs) about the advantages of powder coating treatments over wet paint. We hope that this set of FAQs will help manufacturers understand and gain confidence in choosing a provider of powder coating treatments.

The most frequently asked questions about powder coating include:

- What is powder coating and how does it work?
- What are the advantages of powder coating over wet paint?
- What are key criteria when considering powder coating services?

What is powder coating and how does it work?

To understand why powder coating's more advantageous than wet paint, it's important to first understand the process. Powder coating is the electrostatic application of organic powder to metal parts requiring protective or decorative coating. The powder is cured by heating or baking, resulting in a hard, continuous coating.

The powder coat process includes pretreatment, powder application and high-temperature powder curing.

The process begins with pretreatment/surface preparation of the substrate. Each part is cleaned, removing grease, dirt and anything else that might interfere with the painting process. This may include abrasive/mechanical or chemical cleaning, though it usually consists simply of cleaning the metal surface and etching it in some fashion to prepare the surface to bond well with the powder during the curing process that follows. Without proper pretreatment, the powder on a part will chip and corrode easily. Best results are achieved when any rust or existing coatings are removed.

Following pretreatment, the object must be completely dried before powder is applied. This can be accomplished using air-drying methods, such as hanging racks, or in an oven setting. If an oven is used for the drying process, the part usually must be cooled before the application of powder; the level of coolness varies depending on desired coating thickness.

Once completely dry, the part is ready to have powder applied using either fluidized-bed techniques or spray techniques. The powder is electrically charged as it is applied to the part, giving each particle of the powder a negative charge. The part being powder coated is electrically grounded as a means of attracting and attaching the powder to the part's surface. This electrostatic attraction is a key requirement of the process, aiding the coating evenness and the speed of applying the coating. The result is a uniform coating of dry powder clinging to the part.

After the part is coated with powder, it is moved into a curing oven. There the powder gels, flows and cures to produce a smooth, durable powder coat finish. During the curing process, a chemical reaction cross-linking between the particles of powder takes place. It is at this point that the part can be removed from the oven, cooled in ambient air, and put into service.



What are the advantages of powder coating over wet paint?

Wet painting is a traditional treatment method by which a pigment in any water-based or solvent-based paint is sprayed onto the surface of a part. Common applications of wet paint include automotive exteriors and extremely large or heavy items.

When superior performance is required, powder coating as a finishing process can replace traditional wet painting.

Many concerns or issues associated with wet paint finishing are eliminated or minimized with the powder coating process. The advantages of powder coating over wet paint are many, and they generally fall under four categories:

Performance – Powder coatings are more durable and more resistant to corrosion, chemicals and weather than liquid coatings. Powder-coated surfaces are more resistant to chipping, scratching and other such wear due to the thermal bonding process during curing. Unlike wet paint, powders also don't run or drip, providing a more uniform coating than liquid paint. Moreover, the vibrancy of the color of a powder-coated part tends to stay bright and fresh longer than its wet-painted counterpart. The result of using powder coating is that the product will have the most attractive, durable, high-quality finish available.

Operational Costs – Powder coatings are cheaper and can cover more area than most other organic finishes, translating to lower material costs than wet painting processes. Because they lend themselves well to automation, powder coatings can also reduce costs related to operational labor, as minimal operator training and supervision are required for a powder line. Compared to wet paint processes, operational cost savings using powder coatings can also be realized in less waste produced, lower energy costs, reduced disposal costs and less rework due to lower reject rates.

Safety – Wet paint is flammable, carcinogenic and full of volatile organic compounds (VOCs). These chemicals can be hazardous to plant/shop personnel if not handled properly. Powder coatings, on the other hand, are generally VOC-free materials and contain no solvents, meaning they do not involve the potentially harmful chemicals typically found in a wet spray project. Although powder coating materials can combust in a very narrow concentration of powder and air, their lack of solvents or VOCs means almost none of the short-term and long-term health or fire workplace threats associated with wet painting.

Environmental – VOCs in the wet painting process are also among industrial pollution concerns. Because powder coatings contain no solvents and emit negligible, if any, polluting VOCs into the atmosphere, they are more environmentally friendly than their wet paint counterparts. Moreover, powder coating is a clean process: powder overspray can be retrieved and reused, and unused powder can be reclaimed and returned to a hopper for recirculation through the system, with negligible waste. Plus, most powder coating materials are considered landfill/non-hazardous materials. Powder coatings meet all Environmental Protection Agency requirements for air and water pollution control.



What are key criteria when considering powder coating services?

When choosing a powder coating service provider, it's important to understand that not all powder coat shops are the same. A powder coat's performance is equally a function of the coating process, from surface preparation and pretreatment through curing and inspection.

Take Arnold Machine's powder coating department as an example. Our surface preparation includes immersion washing, cleaning/degreasing, sealing/adhesion promoter and chemical pre-treatment. Coatings are applied with an electrostatic sprayer on parts up to 15 ft. long, 12 ft. wide and 12 ft. tall, weighing up to 250 lbs. After curing, the thickness of the component's powder coat is tested to ensure the process has been successful.

Beyond the powder coating process, a number of other factors are equally as important to keep in mind. When choosing a powder coating services provider, the following questions should be answered satisfactorily:

What colors are available?

While virtually any variation of color on the spectrum can be found in powder form, it's important to keep in mind that not all brands of powder are alike. Our clients may opt for any color offered by Sherwin Williams Powder.

Will the provider meet your specific volume needs?

Arnold Machines powder coating staff can accommodate small, custom prototype jobs and/or large-volume production runs. Small and/or short-term jobs are handled with the same level of care and service as large and/or long-running jobs. Lead times are typically 24-48 hours.

Are their deliveries reliably on time?

The powder coating department of Arnold Machines consistently delivers on promised turnaround times with pickup and delivery within a 60-mile radius, although that may be negotiable.

Are their processes compliant with U.S. standards?

Arnold Machines is compliant with, and certified to, ISO 9001:2008.

Do they have a track record of providing superior service?

Can the provider offer examples of past successes? It is important to use a powder coat shop that you have confidence in. Arnold Machines created a powder coating division in 2006 to provide black oxide service for manufacturers. In 2011, that division acquired Tiffin Powder Coating Specialists, and began offering customers powder coating services with a core commitment to quality work and client convenience.



About Arnold Machine Inc. and Powder Coating

Arnold Machine is a full-service designer and manufacturer of high-quality industrial equipment and services. Our powder coating department provides superior custom powder coating treatment services to manufacturing and machine shops with a focus on tooling. Specializing in thermoplastic and thermoset polymer coatings and substrates, we can coat aluminum, stainless steel and steel to provide superior corrosion, abrasion and high-temperature resistance. Additional services include area masking, tapped hole clean out, custom packaging, machining, fabrication and more. Please visit our website for more on powder coating treatment capabilities, including examples of successful projects and/or to request a free quote.

Arnold Machine is pleased to share this information with you. Whether or not your powder coating search leads you to do business with us, we hope you'll find this whitepaper to be a valuable reference to turn to in the future.

RESOURCES:

Powder Coating Institute (powdercoating.org)

Powder Coating Magazine (pcoating.com)

