Electrocoat

PROSPECTUS

The Electrocoat Association

www.electrocoat.org

Discover more about the electrocoat process and how it might be the answer to your questions about

- coating performance
- applied cost reduction
- environmental compliance

Introduction

Today's competitive business environment requires that companies maximize efficiency and profit while they minimize cost, and finishing operations are no exception. Almost every Finishing Manager is challenged to decrease operating costs, improve performance and even lessen the impact that coating operations have on the environment. Not only do these challenges come from internal forces, but increasingly stringent environmental regulations continue to raise the cost of compliance from external entities. The demand for improved finish performance and durability adds another dimension for finishers attempting to satisfy customers' requirements and ensure business growth.

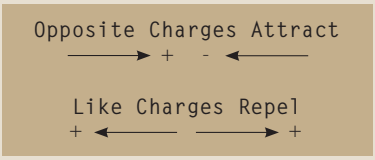
Electrocoating technology is continually relied upon to meet the challenges of today's competitive finishing marketplace. Electrocoating offers significant advantages over other finishes, including:

- The ability to coat complex surfaces evenly, allowing end users to maximize performance and minimize cost.
- Elimination of runs, drips and sags.
- Closed loop rinsing allows transfer efficiencies in excess of 95%, with dramatically reduced wastewater streams.
- Most electrocoat technologies are formulated to be heavy metal free, with little or no HAPS, and very low levels of organic solvents.

The following pages will help in understanding the technology and how it might benefit your operation.

Electrocoating is...

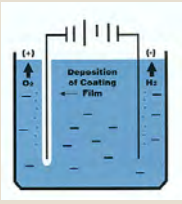
A technology used worldwide to achieve high quality, low cost finishes at a level of efficiency and environmental compliance no other finishing method approaches. It is a method of organic finishing that uses electrical current to deposit paint. The process works on the concept of "opposites attract"; the materials with opposite electrical charges attract. An electrocoat system applies a DC charge to a metal part immersed in a bath of oppositely charged paint particles. The paint particles are drawn to the metal part and paint is deposited on the part, forming an even, continuous film over the entire surface, until the coating reaches the desired film thickness. At that thickness, the film insulates the part, the attraction stops and electrocoating is complete. Depending on the polarity of the charge, electrocoating can be classified as either anodic or cathodic.



Types of Electrocoating

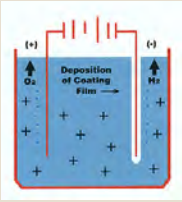
ANODIC

Anodic electrocoating involves the use of negatively charged paint particles that are deposited onto positively charged metal substrates. During the anodic process, small amounts of metal ions migrate into the paint film which tends to limit the performance properties of the system. The primary use for anodic products includes interior and moderately aggressive exterior environments. Anodic coatings are economical systems that offer excellent color and gloss control.



CATHODIC

Cathodic electrocoating involves the use of positively charged paint particles that are deposited onto negatively charged metal substrates. Reversing the polarity used in the anodic process greatly reduces the amount of iron entering the cured paint film and enhances the properties of cathodic products. Cathodic coatings are high-performance coatings with excellent corrosion resistance, and can be formulated for exterior durability.

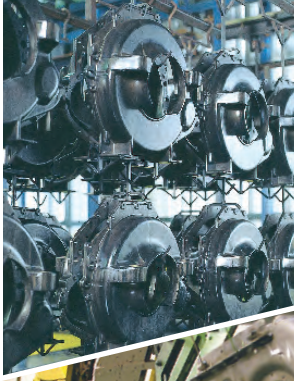


The Electrocoat Process

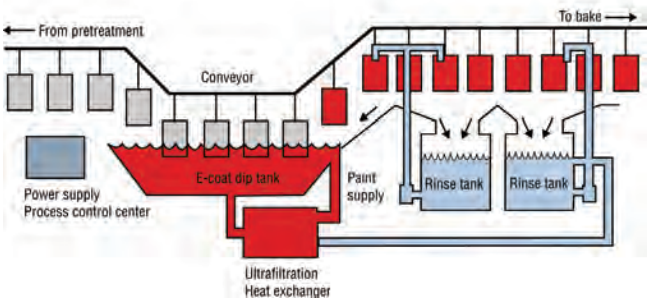
The Electrocoat Process can be viewed from four distinct sections:

- Pretreatment
- Electrocoat Bath and Ancillary Equipment
- Post Rinse
- Cure Oven

An overview of an electrocoat system is shown below. Parts are cleaned and pretreated with a phosphate conversion coating to prep the part for electrocoating. Parts are dipped into a paint bath where direct current is applied between the parts and a “counter” electrode. Paint is attracted by the electric field to the part and is deposited on the part. Parts are removed from the bath, rinsed to reclaim undeposited paint solids, and then baked to cure the paint.



Typical Electrocoat System

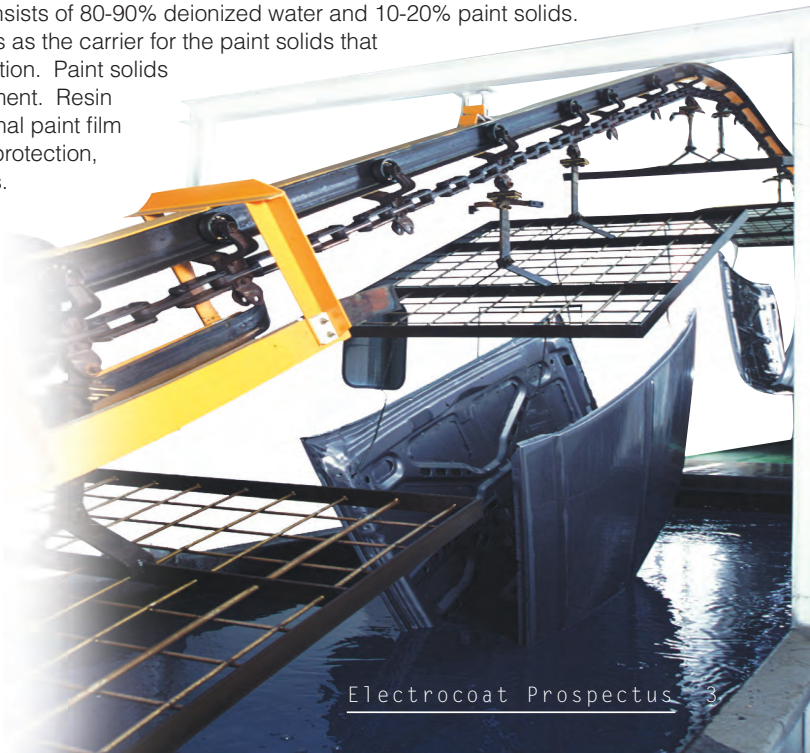


Pretreatment

Prior to film application, most metal surfaces receive a surface pretreatment that usually involves a conversion coating. The purpose of pretreatment before painting is to (1) clean the metal, (2) promote paint adhesion, (3) reduce metal paint reaction, particularly with galvanized surfaces, (4) improve corrosion resistance, and (5) increase blister resistance. Iron, Zinc and Zirconium phosphate are commonly used in pretreatment systems. Both spray and immersion stages can be utilized.

Electrocoat Bath

The electrocoat bath consists of 80-90% deionized water and 10-20% paint solids. The deionized water acts as the carrier for the paint solids that are under constant agitation. Paint solids consist of resin and pigment. Resin is the backbone of the final paint film and provides corrosion protection, durability and toughness. Pigments are used to provide color and gloss. During the electrocoat process, paint is applied to a part at a controlled film thickness, regulated by the amount of voltage applied. Once the coating reaches the desired film thickness, the part insulates and the coating process slows down.



Ancillary Equipment

The electrocoat process includes of a number of components that support the process.

RECTIFIER
The rectifier provides the electrical means to impart a charge on the paint particles in the electrocoat bath. These paint particles will seek a ground – namely, the parts to be painted.

CIRCULATION
Circulation pumps maintain proper paint mix uniformity throughout the electrocoat bath.

HEAT EXCHANGER / CHILLER
Temperature control of the paint bath is provided by a heat exchanger and chiller. It is critical to maintain a constant bath temperature in order to control the electrocoat paint film build, deposition rate, bath stability, and ultrafilter performance.

FILTER
Tank filters remove foreign material introduced into the paint system.

ULTRAFILTER
Ultrafilters control paint conductivity, produce permeate for rinsing, and allow for recovery of paint solids. Rinsing and recovery of the undeposited paint yields tremendous cost savings and minimizes hazardous waste disposal.

Post Rinse

As the part exits the electrocoat bath, paint solids cling to the surface of the part and require rinsing to maintain efficiency and aesthetics. Post rinsing removes the painted material that is clinging to the part. These excess paint solids are called “drag out”. The paint solids are returned to the paint tank allowing the electrocoat system to become extremely efficient in paint utilization, typically operating at greater than 95% transfer efficiency.

Cure Oven

The final step in the paint process is the curing of the coating. The purpose of the cure oven is to raise the product mass and the coated material to a specified temperature and hold this temperature for a set period of time.The cure oven crosslinks and cures the paint film to assure maximum performance properties. Cure schedules range from 180°F to 375°F for 20 – 35 minutes depending on the technology being utilized.

Electrocoating Advantages/Benefits

Electrocoat offers many environmental, economic and performance benefits that make it the environonomic solution for metal finishers.

ENVIRONMENTAL

VOC (Volatile Organic Compounds) – VOC's range from 0.1 pounds per gallon to 3.0 pounds per gallon with most products below 1.0 pounds per gallon. Most electrocoat products are water-based and very low in VOC.

HAPS (Hazardous Air Pollutants) – HAPS levels are also low with electrocoat technology. Many products are formulated to be HAPS-free in response to the Clean Air Act of 1990; several HAPS-free epoxy and acrylic products are available.

BOD/COD (Biochemical Oxygen Demand) – As solvent levels of electrocoat products have dropped over the years, so have BOD levels. Cathodic technology has the capability to be run without any waste water to drain via closed loop rinsing.

SOLID WASTE – There is a minimal amount of solid waste associated with a properly maintained electrocoat system. Most lines complete an annual system clean out where the average system yields a half drum or less of solid waste.

FIRE HAZARD – Most electrocoat materials are not considered "Red Label" because they are formulated as water-based materials. This simplifies shipping and storage and even lowers insurance rates.

CLEAN APPLICATION – Electrocoat systems are clean systems and do not require disposable suits, respirators and other protective gear to protect workers from airborne hazards that are a daily concern for spray painters.

ECONOMIC

TRANSFER EFFICIENCY – Electrocoat is the most efficient paint technology available. Transfer efficiencies approach 95 – 99% material utilization, resulting in the lowest possible operating costs for applicators.

AUTOMATION – A single employee can often manage an average electrocoat tank. Labor costs can be reduced by eliminating spray painters, mixers, and technicians.

TOTAL COVERAGE – Electrocoat products have excellent throwpower, meaning paint can cover even the most difficult to reach areas of complex parts. No other coating system can offer the corrosion protection of electrocoat as a result of its ability to offer total coverage.

HIGH PRODUCTIVITY – Electrocoating allows end users to densely rack parts while still achieving an even film build. Many users have eliminated multiple shifts because of the system's throughput capacity.

FILM UNIFORMITY AND CONTROL – Electrocoat films are controlled by voltage adjustments. Once the metal is insulated, deposition stops. No other paint method can be controlled with the uniformity of electrocoat as typical systems are applied with variances of only 0.1 – 0.2 mil over the entire part.

REJECTS – Electrocoat systems are automated, eliminating the human error factor that can cause rejects with other coating technologies.

PRE-ASSEMBLY – Pre-assembly of products is possible since total substrate coverage is accomplished during application. This often lowers reject rates by eliminating the need for duplicate and rehandling of parts.

MAINTENANCE – Daily spray booth maintenance is not necessary with electrocoat.

INSURANCE RATES – When converting from high solvent products, electrocoat can lower insurance rates since most products are non-flammable, water-based materials.

PERFORMANCE

Electrocoating performance characteristics that cannot be consistently achieved with other coating technologies:

- Throwpower for 100% coverage of even complex parts, recessed and interior surfaces.
- Uniform film thickness.
- Benchmark corrosion protection.
- Superior edge coverage.
- Dense line racking for coating large quantities quickly.
- Product and process consistency, allowing the same great results part after part.
- One or two-coat applications for optimized performance even under extreme performance conditions.
- Low-temperature cure in many applications.
- Excellent color and gloss control.
- Weatherability and UV durability with acrylic electrocoatings.
- Stain resistance.
- Chemical resistance.
- Detergent resistance.

Matching Electrocoat Technology to Your Product

Electrocoat is utilized in a variety of industrial market segments. Each of these markets has specific performance requirements, leading to a number of electrocoat technologies formulated to meet their needs. Electrocoat has also become an accepted finishing method for new applications such as specialty clear finishes over aluminum, brass and zinc plate; extremely low-gloss coatings for military and photographic applications; chemical-resistant coatings; and transparent, metallic-type finishes over nickel or zinc plating.

Electrocoat technology falls into two main categories: epoxies and acrylics. Both technologies are used extensively in anodic and cathodic systems.

End Uses	Properties	Technology
Agricultural Equipment Automotive Parts Structural Steel	Low Cure	Anodic Epoxy
Metal Office Furniture Air Diffusers Shelving Wire Screen & Hangers	Color Control Gloss Control Interior Use Economical	Anodic Acrylic
Automobiles & Parts Transformers Appliances	Corrosion Resistance Chemical Resistance	Cathodic Epoxy
Lawn & Garden Agricultural Equipment Automotive Wheels Trim Appliances	UV Durability Corrosion Resistance Color Control	Cathodic Acrylic

To find out more about why Electrocoat might be for you,

visit our web site at electrocoat.org.

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