If something is to be painted, the item is generally prepped in some way to enhance adhesion of the paint. Rendering an object clean and corrosion resistant before painting is very important.

Where an automobile is concerned, you absolutely demand a quality finish. Assume you’ve spent $20K+ on a car and by your fifty-third payment the paint begins to peel. As far as you’re concerned, something must be done to get it fixed — or else!

Where less expensive items are concerned, the impact may not be as crushing but the scenario is the same. Rendering an object clean and corrosion resistant before painting is a very important step.

Power washing and surface treatment are usually associated with metal substrates, but plastics need them as well. While corrosion is not an issue with plastics, cleanliness is required.

For example, auto body side panels that are attached to doors and fenders which enhance overall appearance. These parts are typically molded and painted in a facility remote from the assembly plants. They are attached to the body with adhesive strips during the final stages of the car assembly process.

Automakers specify stringent cleaning, prepping and quality testing steps to ensure color match and paint adhesion. Failure to comply can result in severe contractual penalties. If a prospective vendor doesn’t appear to be fully equipped to meet the specifications, a contract will not be awarded.

**Plastic Wash**

Physically, the power washer is no more than a long tunnel large enough to permit passage of the conveyorized product. With plastics, a typical washer has four stages, each long enough to provide specified wash and rinse times.

The first three stages have solution and rinse water tanks with pumps and spray nozzles impinging directly on the product. Spacing between the tanks is sufficient to allow drainage of the wash solution and rinse water. The tunnel floors in these areas slope backward to the tanks to collect the drainage. This conserves solution and rinse water, and reduces contaminating “carry over” from one stage to another.

Wash solution is heated to 150°F and is usually a 2% soap solution, which is mildly acidic. This is sufficient to remove light molding soil and fingerprints.
There are three rinses:
- recirculated tap water
- recirculated deionized water (D.I.)
- halo of freshly produced D.I. water (virgin D.I.)

This ensures complete removal of all dissolved solids from the surface of the parts.

**Drying Process**

Some types of drying processes are used following the washer. The first step is typically a high-pressure blow-off station very similar to those found in a car wash. This is followed by a 15-minute convection dry-off oven operating at approximately 180°F. Most specifications require that there be no physical handling after the wash and dry, so parts go directly to the painting processes.

Some plastic substrates similar to polypropylene resist paint adhesion because the molecular interface between the polyolfin and the paint is incompatible. A thin film (.3 to .5 mils) of some surface conditioner is always applied prior to painting. Where electrostatic application is employed, the adhesion promoter (Ad Pro) is pigmented with carbon black, rendering the plastic part electrically conductive. Other plastics, similar to the acrylics, won’t require the Ad Pro, but if painted electrostatically, will still be coated for the purpose of conductivity.

**Metal Wash**

With metals — particularly iron and steel — obtaining a clean and corrosion-resistant substrate requires a vastly different process. Metals corrode because of two distinct processes, or a combination of both. One is chemical, while the other is electrochemical.

The first process involves oxygen in the air, which chemically combines with an active metal ion. The result in steel is iron-oxide rust. The oxide produced here is soft, porous and crumbles easily, allowing oxygen to permeate to the fresh metal ions below the oxide layer. This oxidation continues until the metal ions are used up.

Other metal oxides (aluminum, titanium, copper, and chromium) are far more dense and tightly seal off the base metal from oxygen. alloying, with chromium and iron, renders the resulting stainless steel impervious as well.

Electrochemical corrosion is somewhat more complicated. Steel always contains carbon in greater or lesser amounts in the form of graphite particles, or in combination with the iron. Apart from carbon, there are also small amounts of other metals, residual quantities of slag, sulphur, phosphorus and so forth.

These foreign materials, in combination with the iron, form a mosaic surface of anodes and cathodes, each with the potential of becoming a tiny electrochemical cell.

In the presence of a layer of water (which becomes the electrolyte), ion exchanges occur in the presence of oxygen, forming a kind of rust-hydrated ferric oxide. If either the water or the oxygen (or both) are kept from the mosaic, the reaction does not occur. This type of corrosion can be prevented.

Before steel is fabricated into product, foundry slag, smut, and various oxides are removed by "pickling" or reacting the sheet or roll in a hot bath of diluted sulphuric acid. Following is a final rinse with a mild solution of caustic soda. After drying, the application of an oil coating protects the steel during transport and/or storage. An alternative to the oil coating is a non-pigmented, "varnish-like" rust preventive* which can be applied with a flow coater or manual airless spray. This kind of coating offers much better resistance to weathering than the oil films. In certain processes the material can be applied without pre-cleaning. Furthermore, any stenciling for identification of the steel is readily visible through the coating.

**Final Process**

After fabrication, the product is washed again in the manner similar to that used in plastics. The last stage, however, involves a solution of iron or zinc phosphate called a conversion coating. During this process a chemical reaction occurs, depositing a thin film of tightly adhered phosphate on the surface of the steel. After rinsing and drying, this film provides the “tooth” for the paint to adhere to the substrate surface. In practice, the deposition of zinc phosphate is preferred because it forms a fine crystalline lattice through which the freshly applied paint film permeates. This provides greater “tooth” and a superior barrier to moisture and oxygen.

*Information available on request from Nordson Liquid Finishing Systems.