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Match the Function of the Finish To Preparation of the Substrate

When designers plan the appearance of finished products or components, they are usually working with the full picture of how they should look and how they will be used. Who determines the color? Is it the designer, sales department or customer?

Henry Ford is quoted as offering the original Ford automobiles in any color, as long as it was "a shade of black."

The appearance of a product does make a difference. Studies have shown there are many preferences that determine color. Fire engine red was the standard color for many years on emergency vehicles. Then, bright yellow became the standard color. A number of communities are now returning to the fire engine red color, because of tradition, people's expectations and preferences. Impulse acceptance of a product, such as white for stoves, refrigerators, washers and dryers, can also be purchased in different designer colors.

The advertising industry suggests that yellow creates a longer-lasting impression and, when combined with black, provides a quicker impulse desire. While one color may produce an impulse response in you, it may be completely different colors, or combinations, that create an impulse response for me and others.

The real question is: Can the many different colors desired by the public be applied economically with our process systems? Color may be a subjective quality that our brain interprets through the light source. To be the most effective, color will have to cover such things as welding spots, overlaps and edges, so that appearance and safety considerations are addressed.

When the desired corrosion protection level is considered, the surface and surface preparation comes into play. Most products used commercially and domestically are made of steel. A simplistic definition of corrosion of metal, therefore, is "metallurgy in reverse." That is, corrosion returns the metal to its original state in nature. Corrosion or oxidation of metals can affect the adhesion of paints. It has been found that the use of inhibitors, protective barriers, and sometimes design and color, can reduce or eliminate corrosion under the coating films.

Test	Cleaning only	Iron phosphate	Zinc phosphate
Pencil test (HB pencils)	Fair-flaky	Fair to good	Good
Adhesion test (tape)	Poor	Excellent	Excellent
Impact—face & back (in./lb)	64	75	75
Bend (mandrel)	Fair	Excellent	Excellent
Crimp	100% failure	Excellent	Excellent
100% humidity (hr to failure)	300	1000	1000
5% sale spray (to 65 mm creepage ASL)	72 max	200–300	750–1000+

Corrosion Inhibitors Give Added Protection

Inhibitors, such as chromates, phosphates, silicates and some oils, are used to provide additional protection to metal surfaces. Some can be combined with paint to make a primer for providing extra protection under a top coat of paint. Cleaning, iron phosphate conversion and zinc phosphate conversion are compared in the accompanying table.

This comparison leads to the conclusion that phosphate conversions under paint improve the adhesion and corrosion protection, but not always the impact or marring properties. The driving force between the metal and its environment determines the tendency to corrode, while the resistance of the metal to corrode determines the rate of corrosion. The retarding rate of corrosion, therefore, can be accomplished by proper metal pretreatment during or after cleaning.

Protective barriers, such as primers, can improve the adhesion and corrosion protection of the top coating on metals. Wash primers can substitute for some cleaning and phosphating. Rust inhibitor primers can even be used over light rust on steel to help improve corrosion resistance, especially where wrinkle finishes are used and some quality can be compromised. There are many variables in the preparation of metals for coatings to retard corrosion and protect the surfaces. Do not be misled that any one system fills the requirements—investigate, evaluate and then decide.

When color, surface preparation and type of finish have been established, impact resistance, flexibility, elongation, and other properties should be considered when durability of the finish is important.

Pre-painted metal surfaces that are finished in production strip mills usually have good adhesion, flexibility and elongation, because they are subject to additional stresses, even during fabrication. Pre-painted home siding is an example of an application where the fabrication demands adhesion, corrosion resistance, impact properties (measured by hardness) and flexibility. Add to these what the buyer is looking for—a high quality appearance with long-lasting color. From a buyer's prospective, we are all looking for the perfect finish. ***P&SF***

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