MILANCO CHEMICALS

IRON PHOSPHATE COATINGS

The first question you might ask is "Why Phosphate?" There are three major reasons why phosphating can be beneficial to your operation:

1. Form a stable inert coating on the metal surface
2. Provide excellent paint adhesion
3. Inhibit the spread of corrosion from a damaged area

Phosphate chemicals are mildly acidic solutions containing accelerators and surfactants. They can be applied over a wide temperature and pH range. The coating weight of phosphate can vary from 15 milligrams per square foot to 100 milligrams per square foot depending on the process used.

The process of choosing a phosphate for a specific use is based on the following considerations:

1. Type of metals or plastics to be prepared, cold rolled steel, hot rolled steel or aluminum.
2. Cleaning requirements: type of oils or soils and amounts present on the surface.
3. Type of coating to be applied and method of application:
   a) Solvent based paint
   b) Powder application
   c) Electrodeposition
4. Temperature availability

The method of application is a key factor in determining what type of phosphate will provide the best results.

In a five-stage washer, the phosphate will normally be applied in the third stage. It is preceded by an alkaline cleaner in the first stage to remove all the contaminants from the surface. The second stage would be an overflowing fresh water rinse.

Rinsing is very important for two reasons. First, you want to make sure all the contaminants are removed from the surface. You can't get a good phosphate, unless you have a clean surface. Secondly, you want to make sure the chemical from stage one has been removed. This will prevent cross-contamination and eliminate chemical carry-over from one tank to the next. Stage four would be a fresh water rinse and stage five would be a water rinse or seal, preferably a seal. This final seal will give you even greater corrosion protection.

In a three-stage washer, the phosphate will be applied in the first stage. Since the phosphate will be responsible for both cleaning and phosphating the part, the phosphate used would have an enhanced surfactant package. It would also have additional accelerators, which would increase the performance of the phosphate. Stage two would be an overflowing fresh water rinse and then a seal in the third stage.

Two other methods of application are dip tanks and steam cleaning. In a dip tank operation, the parts are placed in a basket and lowered into the solution for a pre-determined amount of time. The biggest advantages of a dip tank operation are that you are able to run larger and more complex-shaped parts that you normally might not fit in a spray washer. The second advantage is the lower start up costs, as compared to a spray washer.

Steam cleaning is good for small volume manufacturers and large parts that might be hard to handle. A steam jenny normally can be adjusted to provide the right concentration of chemical. You spray the part from the bottom to the top. This will help eliminate streaking and give you a better appearance. This process would be followed by a fresh water rinse.

There are several ways to phosphate a part. The type of equipment you need will depend on the volume of work you are processing, the size of the parts you are producing, and the space constraints of your facility.

The next step is determining the quality of the phosphate on the part. There are several ways to do this. The least scientific of which is by looking at the color of the part. The chart below gives a comparison of color and how that relates to coating weight.

COLOR	COATING WEIGHT (MG/FT^2)
Pale blue	10-15
Medium blue	15-35
Blue/light gold	25-35
Blue/rose gold	35-50
Rose gold	50-75
Violet gold	75-90
Gray	90+

The next two procedures are tests that can be perform after the parts have been painted. The first test is a "cross-hatch" test. This test involves scribing eleven lines up and down and side to side to creating a small grid that has 100 squares. You then take a piece of clear tape and apply to the grid. Remove the tape and see if any paint comes off on the tape. This will give you a good indication of what kind of paint adhesion you have on your parts.

The next test procedure is salt spray test. The test can be performed in an independent laboratory. You can run the test for any number of hours you want. This would depend on what specifications you have to meet. The standard length of the test is 96 hours. These tests are usually performed on small test panels. The parts are scribed down the middle so you can check for blistering from the scribe and along the edges. Coating weights are not directly proportional to salt spray results. The purpose of this test is to check for paint adhesion and the amount of corrosion protection.

In order to get the best possible phosphate, you need to be able to control the phosphate bath. The washer operator has the responsibility of maintaining several things. Some of these are concentration, tank levels, pH and temperature, spray pressure, nozzles, risers, and screens.

The concentration of the phosphate bath is the percentage of chemical in the tank, The concentration can be affected by a couple of factors. The two main reasons are chemical carry out

and loss of water due to evaporation. The phosphate can be added manually by the operator or a small diaphragm pump can be installed to automatically add small amounts of chemical throughout the day.

The tank levels are usually maintained automatically by low level and high level switches. When the water level gets to a certain point, a level control switch will activate a pump that will add fresh water. The pump will add water until it reaches the normal operating level.

The pH of the phosphate needs to be maintained between certain parameters. This depends on what type of metals you are phosphating. Generally lower pH materials are used on hot rolled steel and weldments, middle range (pH 4.5 to 5.2) on cold rolled steel and higher pH ranges (5.4-5.8) afford maximum coating deposition in ranges of 70 to 80 milligrams per square foot. The ideal temperature range for a phosphate bath is between 110-140°F.

The type of spray nozzles used effects the performance of the phosphate bath, For the phosphate stage, flat fan nozzles with a capacity of 5 gallons per minute at 20 psi are recommended, since they have less of a tendency to clog. Never use nozzles smaller than 2 gallons per minute at 20 psi unless your pump capacity is too small to support them.

The phosphate bath will have to be dumped on occasion. The frequency of these dumps depends on several factors. The amount of work sent through the phosphate bath and the contamination on the parts.

When you phosphate a part, you are slightly etching the surface. This means you are removing metal from the surface of the part. These small particles that are removed are then re-deposited on the part in an irregular fashion. This provides a surface that the paint will better adhere to. The side effect of this is that some of the metal that is etched off will not be re-deposited. Therefore, these particles will remain in the tank in the form of phosphate sludge. As this sludge accumulates in the bottom of the tank, it will become necessary to dump the tank and remove this sludge build-up. Equipment can be installed on the phosphate bath that will help extend the intervals between tank dumps. For example, a filter press can be very useful in extending the bath life of the phosphate.

The contamination issue is less of a factor in a five-stage washer than in a three-stage washer. In a three-stage washer, the phosphate is performing both the cleaning and phosphating. Therefore, the contaminants that are washed off will be held in solution. An oil/water separator is a good way to remove contaminants that are held in solution. If the phosphate is designed to kick out the contaminants to the top, an oil skimmer would be an effective way to remove them.

Iron phosphate coating processes are the most widely used method of pretreatment prior to organic coatings. High solids liquid coatings and powder coatings require close control of the iron phosphate process to minimize paint rejects.