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PLASTISOL – Coating-soaking process guide

Plenty of applications can be done with Plastisol with the coating-soaking. Synthene materials are recommended for protective coatings or an overlayers.

Parts processing before coating

The part to overlay has to be a good heat conductor, this is why metal is mostly used.

Before soaking, the metal must be totally dry, free from any grease, filings, or any kind of substance that presents a bad adhesion to surface, and that risks to pollute the Plastisol bath. If a bonding overlayer is required, an adhesion primer is necessary.

Plastisol bath

The soaking baths are constituted by sheet steel tank in stainless steel or aluminum alloy. The Plastisol temperature has to be kept around 20°C or 30°C, and not exceed 30°C over a long time.

Various systems of temperature regulation can be used :

- The Plastisol container is immersed in a higher dimension tank, containing thermally regulated water.
- A Plastisol flow can be done : pumping from the bottom of the tank, passing through a heat exchanger and temperate Plastisol supply on the top of the tank, on the opposite corner of the pumping point, avoiding the creation of air bubbles.

A lid has to be used (metal plate) to cover the tank during long production stops and during the night. As Plastisol does not contain volatile products, nor components that react with oxygen or moisture, it is not sensitive to air contact. However, dust, grease, or water that could drop into the tank have to be avoided.

As a complementary quantity of Plastisol is added, in order to homogenise the bath composition, a turbine is usually used (Bicone or Rayneri Ø 150 to 250 mm for instance), placed on a shaft that is long enough to reach the bottom of the tank. The drive is done by a big engine such as hand drill. In order to avoid air emulsion in the bath, the turbine is immersed in a very slow manner. The turbine should start its work only once it is close to the bottom of the tank. Then it can be shifted and moved up in the whole volume of the tank, but with caution to avoid to get too close to the bath surface, which could create cavities likely to bring air in the Plastisol.

Overlaying with Plastisol

The process can be divided in 4 steps :

- Pre-heating the part
- Immersion and removal from the bath
- Gellation of the overlayer
- Cooling

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I) PRE-HEATING

The goal of this step is to make the metal store calories, which will allow the thickness adjustment of the layer when the metal is in contact with the Plastisol.

The pre-heating is usually done in the oven that is used for the gelation, at a temperature of 180/200° C.

Depending on the metal, its dimensions, and the thickness to lay, the pre-heating time can vary from 5 to 30 minutes. The higher the thermal inertia in the room, the longer the pre-heating time. When an adhesion primer is used, the pre-heating time allows the pre-heating of the primer too.

2) IMMERSION AND REMOVAL FROM THE BATH

After pre-heating the hot part is drowned in the Plastisol.

In order to ensure a replicable layer, the metal temperature before immersion should be measured.

The immersion has to be quick on the vertical part. Most of the time it is done manually, however the incorporation of air in the Plastisol has to be avoided, so the part has to be immersed slowlier on the horizontal sides or the complex shapes, with a slight inclination.

Once the part is immersed, it has to stay in the bath during a defined time, from 30 seconds to several minutes, depending on the requested thickness of the overlayer.

The removal from the bath is done with a hoist or a hydraulic lifting system. The removal speed varies from 1 to 10cm/minute, depending on the complexity of the part, and will be low for a part that has horizontal sides (1 to 3 cm/min).

It has to be done in such a manner that the bath surface "wipes" the part without having Plastisol drops after removal.

A more or less long waiting time will be done before putting the parts in the oven, according to its availability.

3) GELATION OF THE OVERLAYER

The parts are cured at 180-200° C. The aim of this step is to achieve the gelation of the overlayer, that has been started during the soaking.

When the Plastisol is geled enough,its surface has a shiny aspect, such as all the mass (we can check the curing on the core by cutting the overlayer with a sharp knife, on a test specimen).

The product is resistant to abrasion and to bending.

If an adhesion primer has been used, unsticking it from the material will not be possible.

A Plastisol that is not geled enough will be dull and fragile. Increasing the curing time will then be necessary.
An over-gelation will be visible with a browning of the Plastisol colour, and a possible fusion of the overlayer

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that can even sink in the oven. This can be caused by a too high oven temperature, so it has to be lowered below "real" 180°C (be careful of the indications of some thermometers).

In an oven, it is also possible that significant gelation differences appear, for example between the top and the bottom of a part. In that case, the air circulation system has to be reviewed.

4) COOLING

As Plastisol is a thermoplastic, the overlayer must not be touched as long as it is still warm. One has to wait until the cooling of the part, below 30-40°C, to handle and store the parts. If there is no adhesion primer, the cooling time can be done by immersion or water spraying. Contrary, if an adhesion primer is used, it can only be an air cooling.

COMMENT: The conditions of use (thickness of the layers, type of parts to overlay, type of oven...) are various, so it is difficult to give some precise indications regarding the times to respect and temperatures. As a consequence, it is necessary to conduct tests on metallic specimens.