

Surface treatment

SECTION 2.7

Surface finishes involve changing the surface of a part or product in a useful way such as:

- Improving the material's resistance to corrosion
- Increasing the material's ability to resist scratches and damage
- Improving the material's appearance, making it more attractive to the end user.

For some products this means that a lower cost material can be used with a coating rather than using a more expensive material. It can also mean that different properties can be combined such as the strength and stiffness of steel with the corrosion resistance of Zinc.

When using a surface finish the part needs to be cleaned fully removing all rust, dirt and grease otherwise the surface finish will not attach and could flake off.



Painting

The most common surface treatment, it is used to increase corrosion resistance and helps to improve the visual appearance of the metal surface. Compared to other surface treatments it is relatively quick to carry out and low cost.

Paints consist of three parts:

- Pigment – provides the colour
- Vehicle – makes the paint adhere to the surface and forms a film as the paint dries
- Solvent – which evaporates as the paint dries and controls how easy the paint is to apply.

When only a small number of parts need to be finished, paints can be applied manually by brushing. When larger quantities of products are needed, paints can be sprayed, either by hand or by robots or applied by dipping.



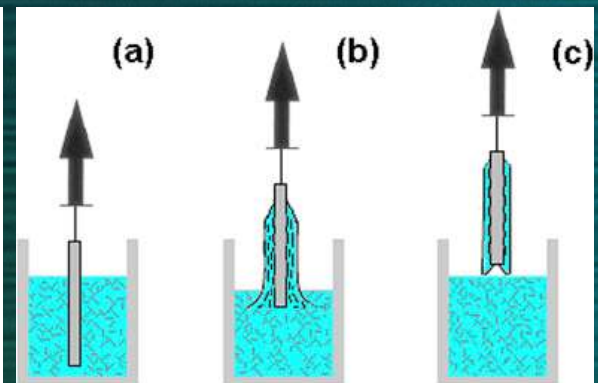
Dip coating

Dip coating it used to apply a polymer such as PVC, nylon, polyethylene to metal parts. It provides a thick, wear resistant layer that keeps water and air away from the metal preventing corrosion.

The process of Dip coating involves the following steps:

- The metal part is cleaned to remove oil, rust or dirt
- It is then heated in an oven typically to 250 – 400 degree Celcius
- When hot enough, it is dipped in a fluidised bed of polymer particles.
- The part is held in the tank as the polymer particles stick to its surface and melt
- Part is removed from the tank
- The part is reheated ensuring all polymer has melted to the metal
- The coated part should be even and shiney, any pin holes then piece needs another coat.

A fluidised bed is a tank of polymer powder through which air is blown making the polymer rise and bubble.



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Electroplating

This process involves using electricity or chemicals to create a coating on a metal part.

Electrolysis

This is the most common form of Electroplating, it involves using an electric current to coat a base metal with a coating of rather nickel, zinc or tin.

- The process works by putting the piece to be coated into a bath or tank containing a solution of chemical salts.
- A piece of metal to be used as the coating is put in the tank and connected to the positive side of the electric current, this is called the anode.
- The part to be coated is attached to the negative side and is the cathode and this creates a circuit as the circuit can flow through the solution.
- As the current flows, the anode gradually disappears and the part slowly builds up a layer of coating.
- The amount of metal depositing on the part depends on the strength of the current and concentration of the solution.

Other forms of electroplating do not dissolve the anode but take the metal for the coating from the chemical solution. In this case the concentration of the metal in the solution needs to be topped up otherwise there is no metal to deposit. Chromium plating is completed this way. The part to be coated is covered in nickel plate first before the chrome is applied and this creates a shiny attractive finish.

Anodising

This is a form of electroplating process used on aluminium and titanium and is carried out in an acid solution. This results in a relatively thick oxide layer which provides corrosion resistance, a durable finish and colour can be added to tint the coating making it more attractive.

This process is used to make Dielectric films, dental implants and coloured jewellery.

Galvanising

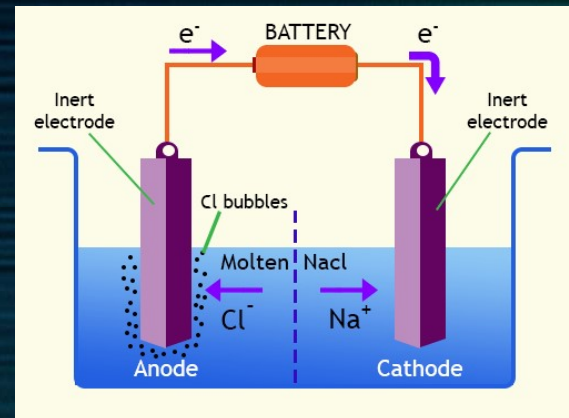
This is an industrial process which involves dipping steel in a bath of molten zinc. The liquid zinc sticks to the steel forming a coating. The zinc provides good corrosion resistance, although the coated part is not visually attractive. Galvanised steel is used to make metal dustbins and buckets. It is often painted to improve its appearance before it is used in commercial products such as car body panels.

Polishing

This is a physical process that gives a shiner appearance. It also makes the surface smoother, reducing friction.

Polishing involves removing tiny amounts of material of the surface part. This can be carried out using a buffing wheel or a non abrasive cloth. It is used for both metal and when needed the edges of polymers.

Polishing is the only surface finish used for polymers as Plastics are thought to be Self Finishing.



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1, name the explain the three reasons why a surface finish is applied to metal pieces

1,

2,

3,

What is a cost advantage to the company of using a surface finish

Before a surface finish is applied, what needs to happen to the part before the finish is applied?

Name the three parts that make up a paint

-
-
-

Name the two ways paint can be applied to a metal part

-
-

How can the paint finish be applied on a larger volume of products?

Why is paint used so extensively on metal components?

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Below draw a diagram to explain the dip coating process

What types of polymers are used in the dip coating process?

What advantage does this process have when protecting metal?

Explain the two ways Electroplating can work

Explain what electrolysis does to a metal part

Draw and annotate a diagram to explain this process

How can the layer of deposited metal be made thicker on the item being coated?

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Explain how Anodising is different from Electrolysis

What aesthetic feature can be added using Anodizing?

Explain the process of Galvanising

What needs to be done with the surface of the metal part before galvanising is completed?

What advantage does using this process have on the product over an extended period of time?

Explain how a metal part can be polished

What advantages does polish give a product?
