

Painting injection-moulded parts



If your injection-moulded part and your mould have not been designed well, do not expect painting to correct this.

The need for a good protective layer

What injection-moulded parts demand good protection?

Equipment used in hospitals and laboratories are exposed to chemical cleaning agents. They must be impact-resistant. Of course, a high-quality look is also expected. In outdoor applications, such as toll control systems and parking terminals, the housings are exposed to the weather: wind, hail, snow, ice and ultraviolet radiation. Moreover, many devices also have requirements in terms of fire safety or electronic shielding.

Good painting cannot hide injection moulding imperfections

It is sometimes said that flawless injection is not necessary, as a paint will mask any errors. This is not entirely true. Accounting for the post-processing of the plastic parts during the design and manufacturing phase will usually avoid high costs later.

A plastic injection-moulded component must be prepared according to the customer's requirements before painting can start. Seams and spurs that are unavoidable can be ground down and other irregularities can be filled in.

Housings of devices, such as measuring and analysis systems, are often made of plastic. Various techniques are available for this, including compact injection moulding and thermoplastic foam casting (TFC).

TFC is a modified form of injection moulding in which a foaming agent is added to create very robust, nice-looking plastic components. This is often an attractive alternative to metal housings and frames.

However, this preparation requires expertise and is labour intensive and therefore costly.

Choice of plastic painting system

Applying paint and primer is an essential part of the manufacturing process and crucial in ensuring high quality

Choosing the right paint and primer is an art in itself. A wide range of painting systems are available, and the most expensive one is not necessarily the best. Important points to consider when choosing a painting system are:

- The primer. Which plastic is used and which fillers (e.g. glass) or foaming agents are envisaged?
- The desired effect. Do you want a splash effect or a coarse or fine structured finish? Of course, the various painting options each influence the price differently. Although some paints partially 'cover up' surface defects in the plastic component, they do require a longer painting time.
- The application: indoor or outdoor use, chemical resistance, hygiene requirements, surface cleanability, etc.



Wet painting in a professional painting cabin

Draw up a list of requirements and wishes for the painter. This will make choosing the right paint a lot easier.

Designs for painted injection-moulding and TFC housings

Attention to post-processing pays for itself

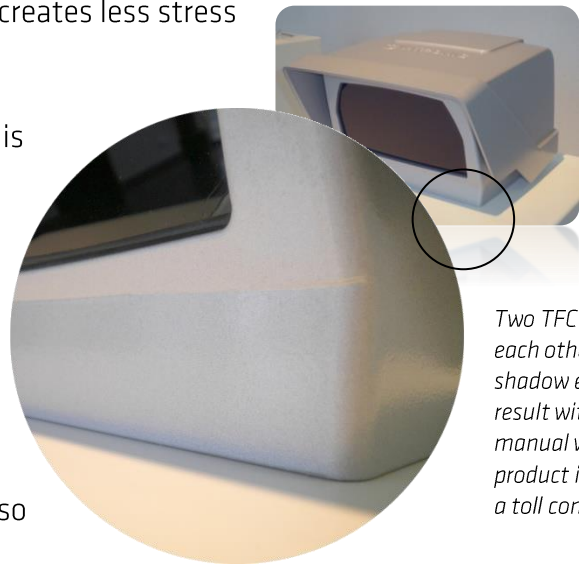
Costly manual work can be avoided by taking the surface requirements into account as early as the design phase. Here are a few tips:

- *Choose the right plastic.* A wide range of plastics are available, which makes it difficult to determine which plastic would be the most suitable for the product to be painted. The material must meet the requirements of rigidity, dimensional stability, fire resistance, UV resistance and so on. Taking 'paintability' into account when making

one's choice is advisable. For example, polyamide, polyethylene and polypropylene are materials that require special (and therefore expensive) preparation. Furthermore, additives that are added to the plastic to influence its properties (such as glass and talc) also often influence the 'paintability' of the plastic part.

- *Also ensure optimal wall thickness distribution in TFC products.*
Although foam reduces the risk of collapse, a better wall thickness ratio reduces the cycle time and creates less stress in the product.

- *Equal = unequal.* A joint or seam is inevitable when two parts, such as the top and bottom of a housing, are mounted on top of each other, or if a housing comprises several parts. It takes a lot of work to get a good finish. The simplest solution is to use a shadow edge, but clever moulding can also help.



Two TFC parts glued to each other without a shadow edge: a good result with much manual work. The product is a housing for a toll control system.

- If a component is painted in two colours or if a part must not be painted, the joint between these is always a point of discussion. A clear transition in the product geometry, i.e. a transition that is already built into the plastic part, helps. A 'gutter' is not recommended. High costs resulting from masking work (and that takes craftsmanship!) are consequently avoided. Also bear in mind that each paint has a certain thickness, which will increase the product's height. Always have these points assessed by the painting specialist.



This housing has an EMC paint on the inside. The outside was painted with a wear-resistant paint. Masking was not required for this client, as this produced a beautiful external finish.

- Also account for spray mist and smart features that have been incorporated into the product design, such as mounting points.

- Sharp edges in your product design look good, but the paint can often break off from such edges. A little more rounding works wonders.

Which paint is used?

There are many different painting systems, but assume a polyurethane-based paint

Polyurethane-based paints are preferred: they are resistant to chemicals, they work well and the end result is impressive. PU paints are available as solvent-based and water-based paints. They are suitable for indoor and outdoor applications (where the hardening agent used depends on the environment). An indoor or outdoor application does not affect the primer that is required. A primer is not always necessary, as this depends on the surface to be painted. A primer is needed for TFC, especially to fill the structure properly.

The paint can be given various properties, for example:

- Gloss. The gloss level can be measured using a gloss meter.
- Wear resistance. If wear is a concern, an additional transparent layer of wear-resistant paint can be applied in many cases.
- UV resistance. Especially for outdoor applications, a UV-resistant paint is a must.
- Fire, smoke and toxicity. If special requirements are stipulated regarding one or more of these hazards, special FST (fire, smoke, toxicity) paints can be used.
- Electromagnetic shielding. A so-called EMC paint can be used.
- Antibacterial additives.

This product has a high gloss level and no texture. Unevenness can be seen in oblique light. The button in the middle was deliberately incorporated into the mould.



What steps does the painting process involve?

Ideally, you should take as few steps as possible. Each step is an operation that involves costs. We generally perform the following steps:

- Degreasing the surface (cleaning and removing any grease from the parts used in the injection-moulding process). Using silicone in the same room should be avoided. Silicone has a disastrous effect on the adhesion of paint to plastic. In many cases, pre-treatment with isopropyl alcohol is required (sometimes by the client).
- Applying a primer.

- Levelling the surface by sanding with a fine grain.
- Painting.
- Optional: spray on an extra layer of paint. The trick here is to use the same paint as that used for the underlying layer of paint, and to spray it on under low pressure. This gives a nice effect: the surface feels smooth and slightly bumpy. This surface masks any irregularities and is easy to clean.
- Optional: apply a transparent UV-resistant and/or wear-resistant paint.

A layer of granular paint can also be applied. In this case, a powder is mixed into the paint to produce a rough surface. The disadvantage of a granular paint is that it gets dirty more easily than a spray paint. A spray paint can be adjusted during the process (coarser, finer) and is slightly cheaper.

Drying layers of primer and paint takes time. Water-based paint dries somewhat faster than solvent-based paint, but take care with paint layers that are too thick. Water can become trapped, as the outer layer dries faster than the undercoat.

Masking

Masking is necessary if a component must be painted in several colours or must not be painted. Sometimes dividing a product into several injection-moulded parts and assembling them after painting is advisable. This can save costs.

Masking is manual work and not everyone can do it well. A lot can be done in the product design phase to make it easier for the preparer and reduce the risk of errors. Discussing this with the engineers and work planners is more than worth it.

The masking itself can be done using simple masking tape, but also using pre-punched stencils that follow the precise geometry of the product. A paint mist is inevitable, so everything that should not be painted should be masked.



The edge of this white product is painted with a metallic-coloured paint. Pre-punched stencils are used to mask the plastic properly.

Injection moulds

Development of production tools with a focus on painting

In addition to the issues that directly affect product design, mould structure, cooling, nozzle type and injection point are also of great importance. A well-chosen injection point can prevent undesired swirls, flow disturbances and collapse. The fewer the imperfections, the more attractive the painted product will be!

The final fine-tuning is performed during the test spray. The shortest possible cycle time is usually chosen to deliver a part as cheaply as possible. However, the result of this is that the painter has to deal with a more cumbersome product than is strictly necessary. Sometimes, letting the part foam just a little bit longer in the mould or managing the injection process just a little bit differently is preferable. This is always cheaper than having to sand or fill the part by hand afterwards.

Assessing the paint quality

The devil is in the detail

Describing a desired paint finish on a drawing is very difficult. So we recommend demonstrating the finish of the finished product by providing a sample plate (on a plastic surface). Such a sample plate shows the exact colour, gloss, structure and finish required for the finished product. However, to create a workable situation for both parties, joint samples will also have to be made in many cases. Judging between right and wrong is often a personal interpretation.

The paint can be checked during production by providing a sample finished product, joint samples and by using a gloss meter. Paint adhesion can be measured using, for example, the tape test.



The best solution for your injection-moulded housing or technical component

The production of plastic injection-moulding or TFC housings and the painting of plastic are both disciplines apart. A lot can be gained in terms of

your technology covered in plastics

quality, costs and turnaround time if the right choices are already made in the development phase of the injection-moulded part and if both techniques are properly geared to each other. The risk of making the wrong choices in the preliminary phase is reduced when a supplier has both processes under one roof.

About Pekago

Pekago Covering Technology is an injection-moulding company that manufactures plastic housings and technical injection-moulded components on behalf of its customers. In addition to injection moulding and TFC, products are also painted, assembled and provided with print.



We develop our own injection moulds and advise our customers on the manufacturability of plastic products. Our markets include medical devices, aircraft interiors, analytical devices and imaging systems.

More information on Pekago can be found on our website: www.pekago.com.