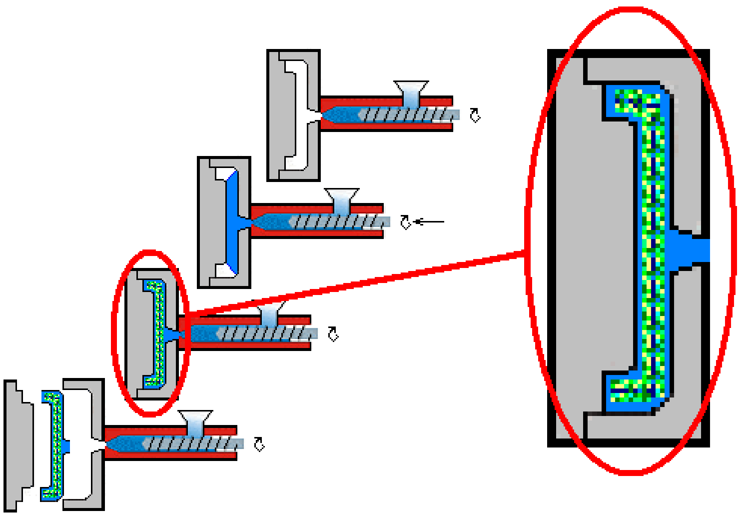
White paper

Saving on housings?

TFC offers solutions

In the equipment manufacturing industry, metal enclosures are still widely used. Increasingly, companies seek alternatives to save on assembly costs and enclosure weight, among other factors. This solution can be found in plastic, especially when using the so-called 'Thermoplastic Foam Casting' (TFC) technique.

Thermoplastic Foam Casting, also known as Structural Foam Moulding (SFM), is an alternative injection moulding method. An additive in the form of a foaming agent is added to the plastic granulate. This foaming agent vaporizes during injection into the mould. The expanding gas provides "internal pressure" that ensures the mould is fully filled.



1. Add granulate and foaming agent
2. Inject
3. Foam
4. Eject

The technical properties of the plastic remain largely unchanged. Visible parts are painted after production, allowing for various colours and textures, even for very small series. Inserts can be mounted in the plastic for attaching parts to a device or to other enclosure parts, or screws can be directly inserted into the plastic.

Coating plastic is a profession in itself.

In a blog our colleague Erik Janssens shared insights on the do's and don'ts.

Want to learn more about mounting inserts in plastic?

Our colleague Jan Rijpert shared his expertise in a blog.

ADVANTAGES AND DIFFERENCES

Stiffness of injection moulded products

A plastic product made with TSG is stiffer (less flexible) than the same product made with compact injection moulding using the same material. In compact injection moulding, additional ribs (reinforcements) can be added to the design for greater stiffness. With TSG, however, this is not necessary, and the design (and mould) can be simpler.

Greater Wall Thickness

In injection moulding, product wall thickness is subject to a maximum limit. If a product is 'too thick,' there is a risk of air entrapment, meaning the mould may not fill completely, creating air bubbles that form weak spots in the plastic.

With TSG, the expanding plastic reduces this risk, enabling thicker products (5–35 mm). In compact injection moulding, wall thicknesses are typically 1–3 mm.

Variation in wall thickness

If varying wall thicknesses occur within the same product, this can lead to warping. Thicker areas cool differently (e.g., more slowly) and solidify differently than thinner ones, creating stress in the product. This may cause warpage or sinkmarks once removed from the mould.

These issues are rare with TSG, making additional design and mould adjustments unnecessary, which allows for simpler designs.

Lower mould pressure - lower mould costs?

Another advantage of TSG is lower investment costs compared to compact injection moulding, partly due to lower internal mould pressure. This allows for lighter mould construction and simpler processes.

This also means that TSG can be an economically viable technology even for small to medium production runs (starting at an annual requirement of around 250 units).

Materials

Unlike a technique like RIM (Reaction Injection Moulding), TSG places no restrictions on the materials used to develop a new product. In principle, all technical and high-performance (thermoplastic) plastics are suitable.

Typical examples include ABS, HIPS, and PA. Additives to improve stiffness, flatness, or flame resistance are also possible, such as silicones (to enhance tribological properties such as friction) and glass (to improve stiffness). In the medical sector, UL 94D V0 is often a requirement to ensure flame resistance.

RIM (Reaction Injection Moulding) is an alternative technique of injection moulding, involving so called thermos hardening materials. This results in different product properties than TSG.

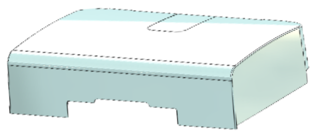
Our website provides information on when each technique might be preferred.

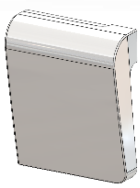
TSG application areas

TSG is ideally suited for larger enclosures, panels, covers, frames, and technical parts– constructions that couldn't be produced as a single piece with compact injection moulding. Since the material properties are comparable to unfoamed thermoplastics, its application range is nearly identical. For example, TSG is already widely used in housings for medical devices.

Analysis of a medical device

A good example is this benchtop analysis device for which we produce many enclosure parts. This device efficiently and routinely diagnoses medical samples in laboratories. Naturally, the analysis device contains sensitive equipment, which is optimally protected by the enclosure parts. The plastics and paints used ensure that the device can undergo the required intensive cleaning and withstand impacts and scratches.



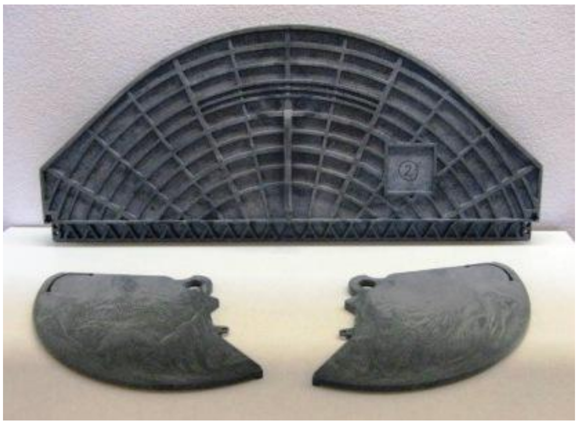


Smooth baggage handling

Another example from industrial equipment manufacturing is an integrated baggage handling and sorting system for small to medium-sized airports. The load-bearing parts of the carriers in this system, which support and move baggage, were initially milled from (wooden) sheet material.

Given the heavy demands on these parts, high standards were set in areas such as strength, stiffness, and wear resistance. Facing rising market demand, the system supplier sought an alternative technology that met these high standards at a lower cost. This alternative was found in TSG. These parts are approximately 1.15 m in length and weigh about 7 kg each, produced on a 1,500-ton injection moulding machine.

Load-bearing components of a baggage handling system, initially made from wood, are now manufactured using TFC.



Alternative to metal constructions

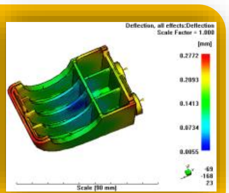
TFC offers greater design freedom for plastic parts than traditional injection moulding. This often allows multiple parts to be integrated into one larger, self-supporting part, avoiding unnecessary assembly costs. And if assembly is required, TFC parts offer ample room for it. Combined with the greater stiffness of TFC-produced parts, TFC can be an attractive alternative to metal enclosures and frames, with significant cost savings on weight.

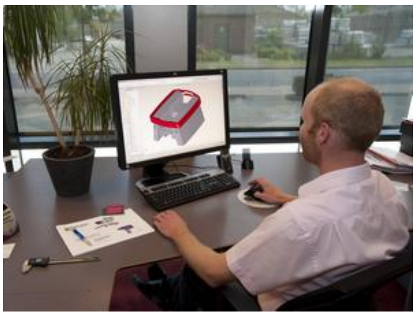
Designing for plastics

Directly translating metal into plastic does not always yield immediate cost savings. To gain these advantages, it is essential to optimize the design by leveraging the properties of plastic. This requires substantial knowledge of materials and plastic design.

Want to learn more about designing plastic parts?

Our design guide outlines the key principles.





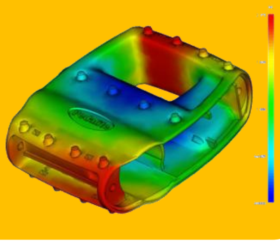
Early Stage Involvement

The challenge is to consider TSG options early on during design or concept engineering. This allows for optimal decision-making during the design phase and maximizes the benefits this technique offers.

Our engineers are experienced and happy to work with clients to contribute to an optimal product design with minimal costs.

Predicting mould performance
Through a mould flow analysis, it is possible to predict mould performance even during the design phase, before the mould is built.

You can read more about this process here.



About Pekago

Since 1983, Pekago Covering Technology has specialized as a system supplier in the development, engineering, mould construction, production, and assembly of plastic enclosure parts and technical components for industrial equipment manufacturing. Our specialty lies in the successful integration of design, function, and manufacturability, meeting cost targets.

More information

For more information about Pekago, visit www.pekago.com.

Questions?

Call our sales director Jeroen van Dijk directly at +31 (0)6 – 29506738
or email info@pekago.nl.