



E-book for the selection of plastics

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Introduction

With this E-Book we want to give you a small insight into our world of plastics. Plastics are used in all areas of our daily life and serve many different purposes.

In this E-Book we will show you what you need to consider when choosing a material and how to optimize the total costs.

Enjoy your read.

Plastic is not just plastic

There are many different types of plastic for many different tasks. In addition, it's possible to modify standard types, for example: adding UV protection for outdoor use, increasing impact resistance or improving the slide properties. Various fibres or other additives can also be added to significantly increase strength.

In this e-book we will highlight different plastic groups. At the end we will create a small checklist that will help you ask the right questions when conversing with your plastic article manufacturer.

In principle, plastics are divided into 3 main groups:

- Thermoplastics
- Thermosets
- Elastomers



Thermoplastics:

Thermoplastics are plastics that become malleable during heating and become hard again when cooled. There are lots of items where this property can be used and the plastic mass warmed to be formed into the desired shape. Most food packaging plastics are made of thermoplastics. If you heat them, for example in the microwave, they can become completely deformed. This is not a sign of bad plastics, but only that the temperature that the specific plastics can withstand without deforming, has been exceeded.

Therefore, temperature is always an important parameter when choosing the right type of plastic.

Thermosets:

Thermosets are plastics that remain in their form after polymerizing, even at higher temperatures. Therefore, it's not possible to reheat and reshape these parts. A good example of thermosets are the wings of a wind turbine. Thermoset plastics are less common than thermoplastics but nevertheless have clear justifications for use in many large and small tasks.

Elastomers:

Elastomers are commonly referred to as rubber and silicone. Elastomers are, as the name implies, elastic. They can change shape under mechanical stress and return to their original shape when the load is removed. Elastomers are often used as sealants.

There are also plastic types which have their origin, for example, in thermoplastics, but have elastic properties or – after further treatment (cross linking of polymer chains) – thermoset properties.

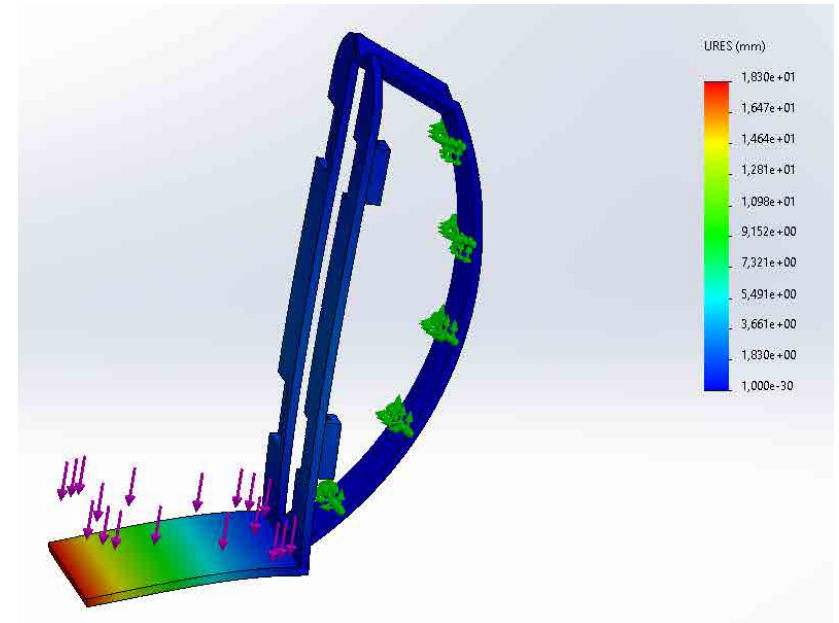
Which factors are important when choosing a plastic material?

There are many factors that play a role in choosing the right material. Here we'll address the most important ones, so that you can make the right requests of your project supplier.

Mechanical load

It's very important to know/estimate the expected mechanical load and to know whether the load is static or dynamic. A good example is a bungee jumper. When he first jumps from the tower there is no load on the rope. As he approaches the lowest point, there will be an increase in the dynamic load on the rope. This is also much higher than the pure body weight (the drop speed must also be absorbed). When the bungee jumper finally reaches the hanging point without extra movement, then only the static load will affect the rope.

In practice, you choose a material and then you work on the structure of the item. You can add different types of reinforcements to the material to achieve the desired effect. You can also insert specific break points into your design to control, for example, how an item should break when it's overloaded.



Thermal load

Another important aspect is thermal stress. The properties of your material change depending on its temperature. It's therefore important to set minimum and maximum temperatures for both long-term and short-term applications. Some plastics break in frosty weather even under relatively low mechanical loads, and others are still stable at minus 200 degrees Celsius. The same applies to high temperatures, which occur in sunshine, friction (for example a bearing with a fast-moving shaft) or during the normal operating environment.

It also plays a role if whether or not the heat load is affected by other factors such as: chemicals, mechanical stress or environmental humidity.

Chemicals

It's very important to investigate which chemicals come into contact with the component. If your item comes into contact with a chemical mix (and especially at high temperatures), it's always a good idea to ask the raw material manufacturer about it and also to take a practical test.

UV and sunlight

If your component is in the field, it's important to check how the plastic will behave. Some plastic types such as acrylic and SAN – but also many thermoset types – can be used outdoors for a long time without major changes occurring in their material properties. Other plastics crumble after a few months in the sunshine – just think of older clothes pegs.

UV protection can be added in several processes in very different ways.

Friction

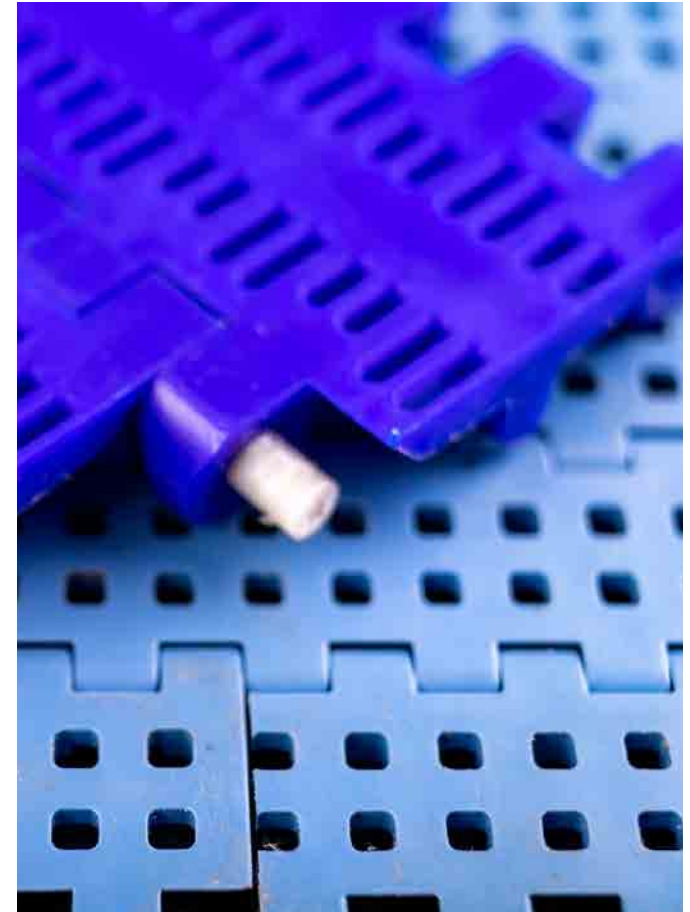
In some applications, you want a specific coefficient of friction. This can be very different depending on whether you are producing a sliding bearing or a brake.

Contact with food, toys and medical applications

Your product may need to meet certain market standards domestically and internationally. Therefore, it's important to clarify whether the selected type of plastic is able to meet these standards, or if further testing is required before your product can be legally put on the market. There can be plenty more requirements for your product; consider this a small reminder to thoroughly examine all the facts about your product. In case of direct food contact, your component must absolutely comply with EN 1935:2004 with all subsequent standards (related to the finished part). A material certificate from the granulate manufacturer is not sufficient. There may also be special requirements for toys and medical applications.

Traceability

Some customers require that material flow be documented throughout the complete value chain. Observe the requirements for your product. It's not always possible to obtain certificates after delivery – it must be agreed from the beginning.



Environment and bioplastics

Today focus is on the environment, bioplastics and recycling. But there's also just as much confusion about concepts. At the end of the day it's all about your product and what you (and your customers) expect. On this basis, no materials can be excluded from the beginning.

We always recommend that the subsequent disposal process (?) is taken into account during the design phase. Therefore, avoid non-essential material mixtures and label the items with a recycling code.

Price

Material price per kg is a good indicator of the price your item will cost, but remember to take account of all your factors. If you use a material that costs a little more, but which is able to save more money at another point during the manufacturing process, the fact that this material has better properties (for example thinner wall thicknesses and thus less item weight), is good for business. Always remember to compare the cost of the entire product.



Refinement of plastic

If the selected plastic type cannot fully meet the desired requirements, it's possible to work with different types of finishing. In this way, more scratch-resistant, electrically conductive or antistatic surfaces can be produced.

Also a cross-linking of the polymer chains can significantly change the properties of the plastic. This requires much more insight into final applications, processing and special materials. By cross-linking, the finished component can achieve a much higher temperature resistance, have less wear/friction in plain bearings and have a higher chemical resistance.





How do I get the desired properties in my product?

For many production processes, it's possible to design the material for the task by adding or leaving out certain ingredients. It's not possible to add the same additives in all production processes. However, the basic material always has a big influence on the final properties of your product. The best way forward here is to get good advice from relevant partners.

• Questionnaire for the selection of plastics

What mechanical loads should the item be able to withstand?	Static:	Dynamic:		
What temperatures should the component be able to withstand?	Long-term use	min. degrees :	max. degrees Celsius	
	Short-term application	min. degrees Celsius:	max. degrees Celsius	
	Luftfugtighed ved høje temperatur:			
	Kemikaliepåvirkning ved høje temperatur:			
	Kontakt med kogende vand:			
Which chemicals can your component come into contact with?	Chemical:	concentration:	time:	temperature:
	Chemical:	concentration:	time:	temperature:
	Chemical:	concentration:	time:	temperature:
	Chemical:	concentration:	time:	temperature:
	Chemical:	concentration:	time:	temperature:
Indoor/outdoor use?	Outdoor application: How long and where in the world?			
Friction requirements	Material of the opposite part:			
	Desired friction:	high:	low:	
	External lubrication / self-lubrication / no lubrication:			
	Special requirements: wet, dirty, very dry, very hot, dusty, other use:			

Direct contact with food	Which food?
	How long is the contact time?
	At what temperature?
	Exports outside Europe?
	Where?
Toys	Do you need EN 71?
Medical classes like USP	
Cleanroom production	
Other requirements	
If traceability is required for each batch	
Specific environmental requirements	Recycled materiale:
	Bio-based:
	Biodegradable (and how fast):
Surface	
Coating	Coatning
	Cross linking

Our possibilities

Although A Tech Supply is relatively new on the market, we have many years of experience in the plastic production branch. In recent years, we have worked on many different processes and projects for different industries, putting us in a great position to help you with all your plastic production needs. You are always welcome to send us an enquiry or contact us for further information.



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FACTLINE**Quick Tool Insert Tools**

- 34 different standard sizes
- 13 different sizes of mother tools
- Over 30 mother tools
- All mother moulds can be installed on different injection moulding machines to ensure sufficient capacity

FACTLINE**Our capacity**

- 50+ injection moulding machines (electric + hydraulic)
- Handling robots on many machines
- 2 fully automatic packaging machines
- 15+ eroding Machines
- 15+ turning/milling machines with up to 9 axes
- Various grinding machines
- Various welding and engraving equipment

FACTLINE**In-house competences and production**

- DFM and product optimization
- Construction and manufacture of injection moulds
- Design and manufacture of Quick Mould Tools
- Design and production of Real Micro Moulding tools
- Injection moulding, also as 2K and with inserts
- Real micro moulding
- 3d print
- CNC machining of demanding plastic workpieces
- Fully automatic bag pack

Om A Tech Supply ApS, Trend Mould ApS og Dencker A/S

We are the export-oriented sales organization for Dencker A/S (www.dencker.net) and Trend Mould ApS (www.trendmould.dk), which sells injection moulded plastic solutions and tools.

A Tech Supply is responsible for technical sales and product optimization (DFM); Dencker A/S and Trend Mould ApS are responsible for the production of tools and items. In this way we create optimal solutions for customer-specific parts and system deliveries.

In our state-of-the-art production in Skals and Nyköbing / Mors in Denmark, we produce both injection moulds and prototypes (3D printet, injection moulded or CNC machined). We produce the injection moulded parts in various sizes, from real micro moulding processes to parts in a size of approximately 1 x 1 meter.

Depending on the customers' requirements, we work with tolerances from a few micrometers to simple form fit and function tolerances. Due to the long-standing focus on automation, optimization and efficiency, as well as the primary use of mould inserts, we can offer solutions at very short notice and – even in a worldwide comparison – at extremely competitive prices.

