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MULTICOMPONENT PLASTIC PARTS

Exploring Possibilities: Benefits and Drawbacks Unveiled.

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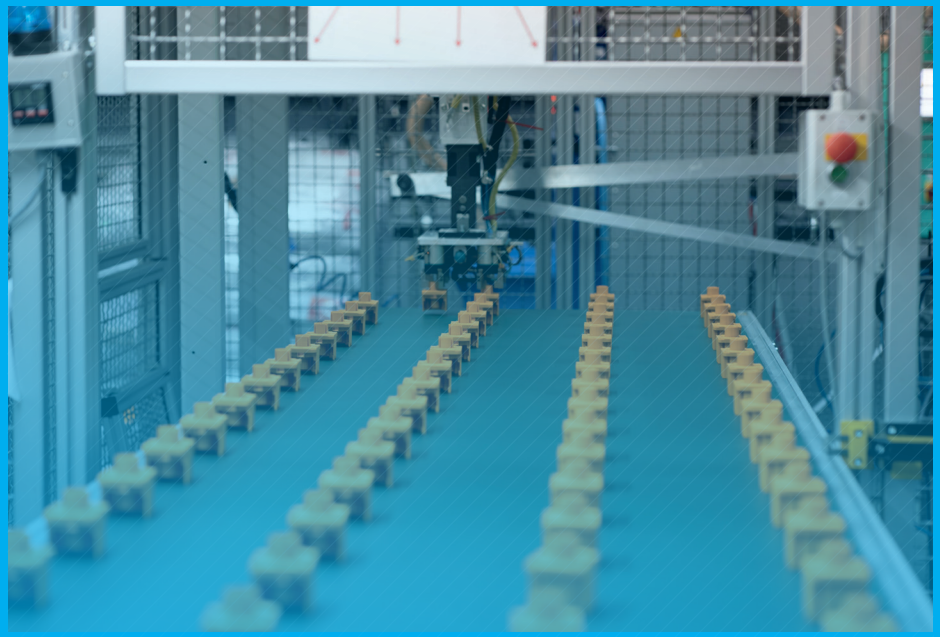

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INTRODUCTION

The production of plastic parts offers a wide range of different options that depend heavily on the materials selected, the molds used and the production technologies in place. The possibilities are almost unlimited when it comes to developing innovative solutions. In plastics production, combining multiple components into a single product is a common approach. This necessity results of various reasons, including the creation of multicolors, the marriage of hard and soft plastics, or the integration of flexible joints. Multicomponent injection molding is the most commonly used technology for these requirements because of its flexibility and efficiency.

But what is the perfect concept for the individual project and its specific challenges?

The following pages provide a compact overview and orientation on the way to the perfect multicomponent plastic part.

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WHY MULTIPLE COMPONENTS?

It is often simpler, cheaper and faster to produce a plastic part from a single component. When developing high-performance solutions, certain product requirements call for the use of a combination of materials in order to achieve functionality that goes beyond the capabilities of individual materials.

Multicomponent technology has gained significant importance recently, unlocking versatile application possibilities across various industries and driving innovation forward. Innovative tool solutions make multicomponent injection molding a dynamic growing market. The technology offers potential savings through reduced production steps and integrated assembly processes, while at the same time improving design aspects and haptics. Below you will find an overview of the areas in which multicomponent injection molding offers advantages and is used.

HAPTICS

Haptics play a significant role in the user experience, as it influences the perception and evaluation of a product. While developing plastic parts, it is therefore essential to take physical properties and textures into account. If, for example, a certain grip feel is required, a combination of different surface structures and materials is recommended. Multicomponent injection molding is an effective approach since it allows the required haptics to be integrated during the production process. This ensures that the finished part has the required texture without the need to apply an extra process such as painting.

FLEXIBILITY

Multicomponent technology can also be recommended to produce so-called hard-soft combination. If, for example looking at a tooth-brush, a fixed grip area and a brush head are required which needs to be flexible via a intermediate element, it is referred to as a hard-soft compound. For optimal function, the choice of materials is of the utmost importance.

MOVABILITY

The challenge is to combine the various components inseparably in the end product, in most multicomponent injection molding projects. In other cases, the opposite is desired: components can be produced that appear to be a single part but give the impression that they are two separate parts that can be moved against each other. The targeted adhesion or separation of components is one of the key issues in multicomponent injection molding.

VIBRATION DAMPING

For components that are exposed to vibrations, especially considering a tool handle, a combination of more rigid and damping materials can be choosen in a multicomponent injection molding process. Take for example a tool handle for an angle grinder which combines hard plastic for stability with a damping material to minimize vibrations and increase comfort.

SEALING

Sealing demands at the interfaces in a media tight application can be handled, such as for a waterproof requirement. In this example, the multicomponent injection molding process can be used to produce a part on one hand in combination with a sealing feature on the other hand from a single component - each element is made from the dedicated material.

DESIGN

Multicomponent technology not only opens up significantly more design freedom for engineers, but also for product designers. If, for example, different surface textures - such as glossy and matt - or different color highlights are desired in a component, can this be elegantly achieved through the multicomponent injection molded process.

TECHNOLOGY HIGHLIGHTS

HANDLE INTELLIVUE IN 3C INJECTION MOLDING

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THE OPTIONS IN PRODUCTION

It is important to plan the realization of a product carefully once the decision has been taken to produce a part in the multiple component process. Initially the geometry of the product takes a critical role in the choice of suitable tool technology. At the same time, specific customer requirements, such as quality and functionality, as well as the economic aspect, have to be considered.

Multicomponent injection molding refers to a combined process of two or more plastics likely in different colors or mechanical properties. 2C injection moulding describes the use of two components that are combined in the injection mold. The combination of three materials is referred to as 3C injection molding and, accordingly, further combinations.

1. THE TOOL TECHNOLOGIES

The tool technology is basically defined by the product design. The higher the complexity of the product design is, the fewer tool technologies are available. The individual technologies can be categorized differently. We present the most common ones below.

TRANSFER TECHNOLOGY

The most complex geometries can be realized with transfer technology tools. In addition to parallel and sequential processes, several molds can also be used. The preceding geometries are completely removed from the mold and reinserted into a mold or a new cavity and overmolded.

INDEXING PLATE MOLDS

Indexing plate molds can be used to produce partially overmolded geometry on both sides. Some of the previous components remain in the mold and are transported to another mold cavity, which optimizes process reliability.

TURNTABEL TECHNOLOGY

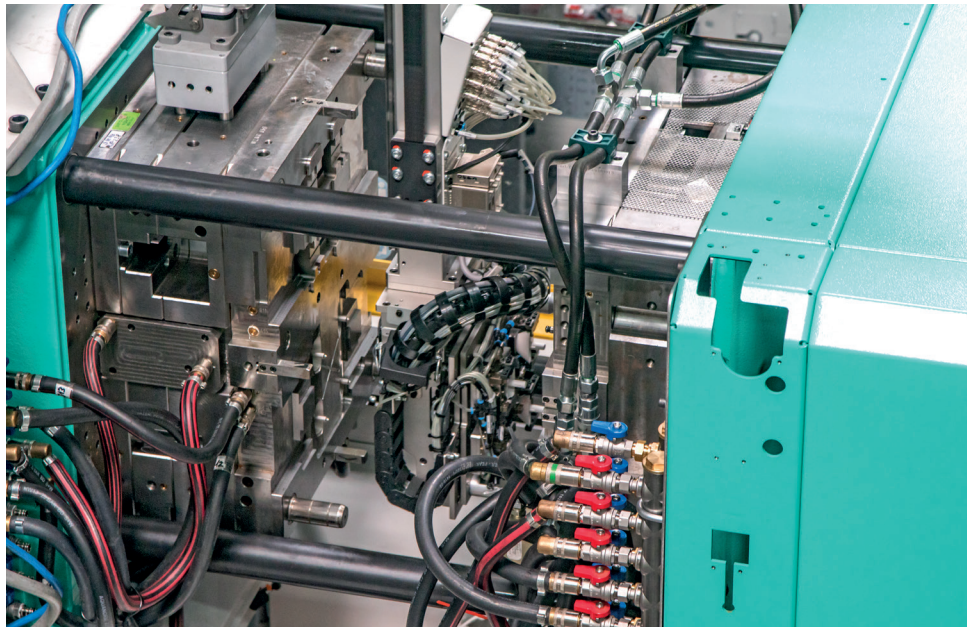
Turntable molds can be used to produce plastic parts in single-sided overmolded geometries. Some of the previously produced components remain in the mold and are transported to another mold cavity, which significantly improves process reliability. The turntable allows the first component to be transported to the next cavity, where it is overmoulded with another component. The turning of the mold is transferred to the turntable, which makes the injection mold much simpler.

FURTHER TOOL TECHNOLOGIES

Geometries with partial restrictions can be implemented using Core-Back technology.

Through the use of sliding or rotary table technology, partial one-sided geometries can be produced.

Swivel plate technology, spinform technology with cube or double cube molds should also be considered for special geometries and large quantities.



2. MATERIAL SELECTION

The selection of materials is crucial to the success of a project. The choice of material is essential to achieve the desired function, safety and service life. The selection of the plastic raisin is extremely important for the successful design of a components. The material's suitability is primarily determined by the application conditions. In the case of multicomponent parts, it is also necessary to plan exactly how the various components should interact with each other.

An important factor to consider is the influence of chemicals on the resistance of a material. Insufficient chemical resistance often manifests itself in swelling or softening of the material, which can result in a loss of mechanical characteristics and general serviceability. The following influences must therefore be carefully considered and identified.

- **+ Electrical requirements**
- **+ Chemical stress**
- **+ Mechanical stress**
- **+ Tribological stress**
- **+ Thermal stress**
- **+ Requirements imposed on radiation / weather resistance**

The proper selection of the material for the processing and the production technology play a decisive role in order to fulfill your individual requirements for your finished product.

A further aspect in the selection of a qualified substance is the industrial sector in which the product is to be used, as well as the required regulatory approvals for safety standards. These industrial sectors include, for example:

- **+ Aerospace & Defense**
- **+ Mechanical engineering**
- **+ Biopharma & Medical Technology**
- **+ Oil & Gas**
- **+ Food technology**
- **+ Semiconductor & Electronics**

TRANSPORT VENTILATOR
Consisting of one- and two-component thermoplastic injection molded parts as well as sheetmetals, which are mounted as mechanical sub assemblies.

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CONCEPT PHASE

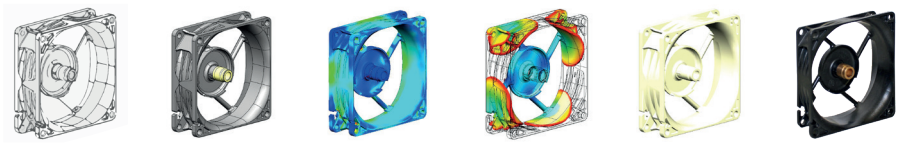
The wide range of possibilities and variables in the production process requires a well-thought-out design concept taking all aspects of part design and geometry into consideration. Precise geometry is essential to ensure that the parts can be produced in the most efficient way.

Material costs, production processes and the planned quantity are important factors looking for target prices. It is important to find a balance between quality and costs in order to remain competitive.

In addition, the requirements for the end product must be precisely defined. These include not only functional properties, but also aspects such as sustainability and manufacturability. Prototyping will grant the possibility to test initial models and make adjustments at an early stage while filling simulations and warpage analyses help to identify and eliminate potential problems in the production process.

Taking all of the aforementioned into account ensures that the production process is efficiently designed and ultimately meets the desired quality standards. An interdisciplinary approach is mandatory in order to develope the best possible process.

An experienced partner will assist with the focus on the right issues and draws the right conclusions from the answers to the key questions.



SCRIBBLE → CAD-MODEL → FEM CALCULATION → FILLING SIMULATION → PROTOTYPE → SERIES PRODUCTION

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CONCLUSION

Multicomponent technology in plastic injection molding offers almost limitless possibilities due to its complexity and diversity, but also requires a challenging project concept. It is therefore essential to take special attention to the development process right from the start and to use all the possibilities of virtual product development. Combined comprehensive advice from experienced partners in the areas of toolmaking, injection moulding and materials is essential in order to identify and eliminate potential sources of problems in good time.

Are you considering a new project? We invite you to a non-binding and free initial consultation to discuss your ideas!

Our plastics technology experts look forward to talking to you.

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