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Technical Information No. 5

Rapid Prototyping

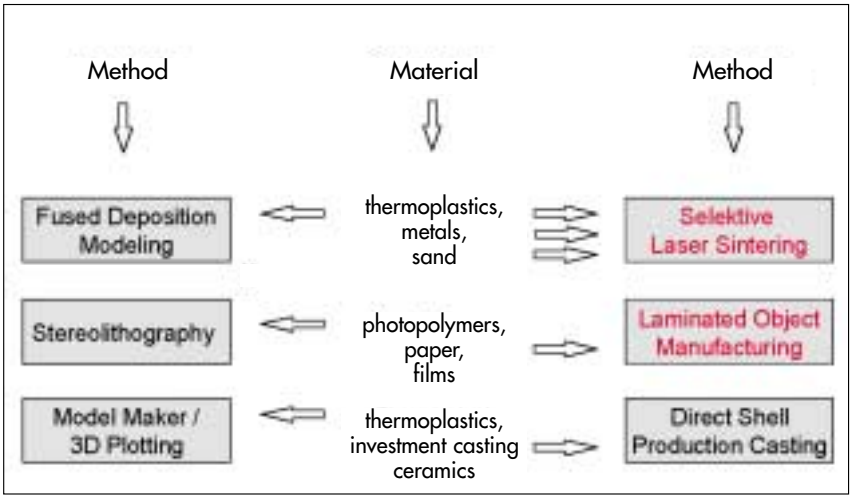
The development period nowadays has become a decisive aspect for successful products. In this context rapid prototyping methods are of great importance. They offer concepts to turn designs into prototype parts as fast as possible - already during the product development process. These prototypes can be used to check the fulfilment of a function as well as to prepare in advance the different successive process steps of fabrication. Even complex shaped parts, that include backdrafts and complex inner shapes, can be produced at short notice.

Mould and core for hydraulic casting made by SLS

The basis for all rapid prototype methods is the three dimensional definition of the geometry as a CAD data set. The production of expensive and time consuming pattern equipment is no longer necessary to produce a small amount of prototypes. Nowadays it is not just possible to produce prototypes from polymers, paper or wax materials. Prototypes can even be made of the same material as serially-produced components.
Depending on the function of the prototype – geometrical or functional – and on the amount of necessary parts a suitable rapid prototyping method has to be chosen from a variety of different possibilities. In the following two methods will be presented that are frequently used to produce rapid prototypes of cast parts. Selective laser sintering and direct mould milling both do not directly result in parts but in sand moulds and cores. These moulds can be poured with all typical cast materials. Thereby prototypes can be produced that are identical to the final serially-produced component with respect to geometry and material.

Both are based on the three dimensional description of the geometry by a CAD data set. This virtual geometry is then divided into layers with a thickness of 0.2 mm.

By the selective laser sintering method (SLS) moulds and cores are directly made from mould sand. On a pre-sintered plate, fixed on a vertically movable table, a layer of lose, flowable resin coated moulding sand is put on. By a laser beam this sand is locally heated up to temperatures where a sintering process is initiated. Thereby – layer by layer – a solid body is produced. The non-reacted lose sand can easily be removed.
Moulds manufactured by SLS can be poured with all common casting materials. Due to mould and casting materials the resulting castings are, to a large extent, comparable to the final serially-produced castings.



Survey on rapid prototype methods

Due to cost reasons – for larger parts the moulds are often not built up layer by layer but the geometry of the contour of the mould is directly milled from a block of chemically bond moulding sand. In general this is done by 5-axis CNC milling machine. The machining data are directly prepared from the three dimensional CAD data that define the part's geometry.

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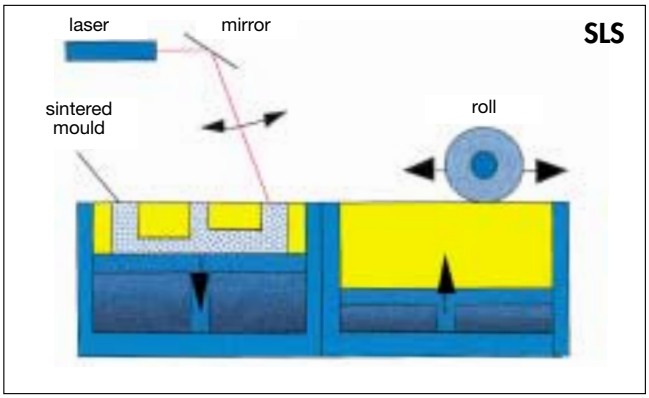
With respect to costs a combination of rapid prototype methods with conventional CAM methods can be advantageous. If, for example, the design of the outer geometry is already fixed but the ideal inner contour is not yet found, different solutions can be realised by producing differently shaped cores by rapid prototyping whereas for the outer geometry the final series pattern equipment can already be used. Thereby unnecessary double costs for the outer geometry can be avoided.

Rapid prototyping methods have become well established tools as they are the key to rapid success of products on the market.
By hardly any other means more money can be gained or lost than by the time to market. CLAAS GUSS will be pleased to help you and to consult you as a competent partner to find the ideal method or combination of methods for your products.



Principle scheme of selective laser sintering


direct mould milling