Expert Article October 2017

Layer-by-layer: Additive manufacturing in the service of the pressure die-casting industry

The EUROGUSS 2018 – International Trade Fair for Die Casting will show innovative solutions for the production and application of die-cast components.

By using additive manufacturing processes, enterprises of the pressure die-casting industry can expand their range of products and services, open up new fields of business and develop new business models.

The number of enterprises and research institutes which are engaged with the manifold application and development opportunities of 3D printing processes is growing. These processes, also called additive respectively generative manufacturing processes, can be applied to produce parts which cannot be manufactured in a conventional way [1]. Up to now, 3D printing processes do not compete with pressure die-casting. They are, however, suitable to enhance the performance capabilities of enterprises in this industry [2].

Layer by layer

One of the 3D printing processes is “Selective Laser Melting” (SLM). The principle is that the CAD data of a virtual workpiece is transferred to a 3D printer where it is converted into a real workpiece. This is done by applying a 20 to 40 µm thick layer of metal powder on a lowerable plate and melting the powder by a laser under protective gas at certain positions which correspond to the contours of the workpiece. During cooling, these positions become solid. The process is repeated many times. After each process step the plate is further lowered and simultaneously the workpiece is generated layer by layer.

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Models and pressure die-casting tools

Through 3D printing it is possible to produce parts with complex geometry, internal structures and cavities, variable wall thicknesses and undercuts. Furthermore, different metals can be combined with one another. Also other materials can be processed in a similar way. Some pressure die-casting foundries use 3D printing in order to be able to submit quickly to their customers' models of the die-castings which are to be manufactured. Pressure die-casting tools can also be manufactured with 3D printing processes [3]. The special benefit of this application is that, e.g., cooling circuits can be integrated. Such tools are more wear-resistant than tools which are manufactured conventionally and enable the production of a higher number of pieces.

Oskar Frech GmbH & Co. KG, a manufacturer of die casting machines, started dealing with industrial 3D printing more than ten years ago and has been operating their own SLM facility for two years. Dr. Waldemar Sokolowski, product manager for product and business segment planning at the company, says that the additive manufacturing processes open new possibilities in view of an increased performance and designing flexibility of pressure die-casting moulds for processing non-ferrous metals. The facility is used to realize prototypes made from an aluminium alloy as well as inlets for pressure die-casting moulds with optimized, near-surface tempering channels (Fig.). According to the company, the process and cooling times can thus be reduced by up to 50 % with enhanced product quality [4 and 5].

Strengths and limitations

The strengths of 3D printing processes become apparent when it comes down to the manufacturing of single parts, individually shaped parts, complex parts or small batches with low material usage. The processes, however, reach their limits when parts should be produced in a matter of seconds and

additionally elevated demands concerning surface quality should be fulfilled. These characteristics rank among the strengths of pressure die-casting. Additive manufacturing processes, however, should gain importance also in the pressure die-casting industry as they help the users to enlarge their

Manufacturing program, to enter new fields of business and to develop new business models.

The trade fair EUROGUSS 2018

An insight into the state-of-the-art in pressure die-casting and suggestions as to how die-casting foundries can strengthen and expand their market position will be provided at EUROGUSS 2018 – International Trade Fair for Die-Casting: Technology, Processes, Products in Nuremberg, Germany, 16 – 18 January 2018.

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