



EXPERT ARTICLE

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Energy, costs and environment in mind. Resource efficiency and environmental protection in the die casting industry

High energy costs, environmental impact and political targets are essential issues that lead die casting foundries to implement measures concerning resource efficiency and environmental protection.

Die casting foundries are energy-intensive enterprises that have to deal with the complex issues of “resource efficiency” and “environmental protection”. Legal requirements, economic factors and, not least, ethical criteria must be taken into consideration. An intelligent implementation of resource-saving measures helps to meet targets and, often also, to open cost saving opportunities.

Resources

Resources are sources for the manufacture of products, but also absorb the resulting emissions [1]. Apart from the natural resources water, air and soil, also raw materials, auxiliary materials and operating materials as well as energy carriers and the energy sourced from them are to be mentioned. Raw materials are mostly only available to a limited extent. With rising demand, this fact is reflected in increasing prices. Thus, the increased costs for energy, whether electricity, gas or oil, and for raw, auxiliary and operating materials, represent an important share in the cost structure of German foundries [2]. The use of these and other resources also impacts the environment along the entire value chain. The economic and efficient use of resources helps to save costs and, in addition to other measures, to reduce

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**Veranstalter
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NürnbergMesse GmbH
Messezentrum
90471 Nürnberg
Germany
T +49 9 11 86 06-0
F +49 9 11 86 06-82 28
euroguss@nuernbergmesse.de
www.euroguss.de

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the environmental impacts. Another reason for making efficient use of resources is that the legal requirements are becoming more and more strict and violations result in substantial penalty payment. In an interview, Prof. Dr.-Ing. Klaus Drechsler, lightweight specialist at the Fraunhofer Research Institution for Casting, Composite and Processing Technology IGCV in Garching, Germany, points to another advantage: “With the topic of resource efficiency, the enterprises have the opportunity to shape their image positively and to generate a competitive advantage from this”. [3]

Increasing the resource efficiency

Quantifying resource efficiency is possible within certain limits. For example, companies are aware of their annual consumption of raw, auxiliary and operating materials. Therefore, an increase of resource efficiency can be defined in terms of numbers and achieved through specific measures. The subject of a research project on the increase of resource efficiency was the aluminium die casting industry with the “ProGRess” project (Design of resource efficient process chains using the example of aluminum die casting). This industry is one of the energy-intensive industries and representative for the metals producing and processing industry, which accounts for around 10% of the total energy consumption of all German production areas. The results of the research project, which have been published in a scientific book, show, among other things, the variety of measures to increase the resource efficiency, whereby a bundle of measures is usually necessary to achieve significant efficiency gains. In addition, it is advisable to consider complete value chains and to analyze and evaluate individual measures across company firewalls [4 and 5].

Energy management

The power requirements in the die casting industry is so high that savings in this area have an enormous impact on costs. By means of a computerised



energy management, which is certified according to DIN EN ISO 50001, an energy monitoring of the individual production facilities is possible. In this way, for example, leaks in the compressed air supply system and other wastes can be detected early and eliminated. In this context, the topic of “digitization” (Industry 4.0) is of growing significance because by means of digital technologies, processes can be controlled more efficiently and optimization potentials can be better recognized and documented. And last but not least, modern die casting machines, melting furnaces and peripheral devices, which are economical in raw material and energy consumption, make a significant contribution to increasing resource efficiency. Energy consumption analyses show at which points of the die casting process the energy balance could be optimized (Fig. 1). Further ways in which energy efficiency can be improved is to use waste heat and to install sensor controlled LED lightings in the production halls.

Environmental protection and management Environmental protection measures include air pollution control, noise reduction, waste recycling and the use of alloys extracted from recycled scrap metal. Suggestions on how individual process steps can be made more environmentally compatible are continually discussed in the professional press. Basic thoughts on this can be found in a brochure published some time ago by the German Foundrymen’s Association (VDG) [6].

Die cast parts enhance resource efficiency

Die castings have the advantage of helping customers and users to optimize their resource efficiency. For example, die casting can be used to replace material-intensive production processes such as machining processes. Die cast parts can be designed so that they are ideally tailored to the respective application and the material properties are optimally exploited. The use of modern machines promotes the trend towards an increased material



efficiency, i.e. a production with a scrap rate which goes to 0%. The production is time and cost-effective, because modern simulation methods take over a lot of work from the designers. In a similar way, processes can be virtually simulated and optimized. Another benefit of using die cast parts is that they can be made from recycled metal and fully recycled once their usage time has ended.

The trade fair EUROGUSS 2020

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, but also around resource efficiency and environmental protection, will be provided at the EUROGUSS 2018 –International Trade Fair for Die Casting: Technology, Processes, Products in Nuremberg, Germany, 14–16 January 2020.

The EUROGUSS family includes EUROGUSS trade fair as well as the non-European die casting trade fairs China Die Casting, Alucast in India, EUROGUSS Asia Pacific in Thailand and EUROGUSS Mexico.

Contact for press and media

Katja Spangler, Simon Kögel

T +49 911 86 06-89 02

F +49 911 86 06-13 89 02

simon.koegel@nuernbergmesse.de

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