



EXPERT ARTICLE

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Mobile with die casting Mobility, new drive technologies and market opportunities for die casting foundries

The technological change in the automotive industry away from the combustion engine and towards electrified and other alternative drives is also having an impact on the die casting industry. By die casting thin-walled complex workpieces can be made that are ideally suited for the respective technological requirements and meet the demand for lightweight construction. Furthermore, there arise also new market opportunities for die casting foundries in connection with the digitization.

The established and the emerging industrial countries are experiencing a mobility change. Megatrends such as urbanization, the use of renewable energy sources and environmental considerations play an important role. At the same time, the automotive industry is at the beginning of a profound change. The by far biggest change is the trend towards electromobility [1 and 1a]. Both developments are connected with each other and have a major impact on the supply chains of the automotive industry, among which the die casting industry has a powerful position.

Mobility needs

Experts expect that the global development will increasingly concentrate on urban conglomerations. In the future, this will result in a far greater demand for electrical energy, among other things in order to meet the mobility needs of the population. Electricity is required e.g. for the emission-free drive of tramways, subways and trains, but also electrically powered buses, delivery vans and individually used vehicles need to be reliably supplied with electricity. Electricity is also required for traffic management systems that intelligently control traffic flows by means of real-time data and help to make optimal use of the space which is available for traffic, and electricity is also needed for the communication between the means of transportation. Car

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manufacturers must adapt to these developments in order to be able to remain in the market. These companies are also faced with the challenge of being able to offer complex mobility and transport solutions based on new vehicle operator models such as car sharing and the intelligent use of vehicles.

Automotive industry in a period of change

The entire automotive industry is likely to experience a complete change in the next ten years, perhaps even earlier [2]. This change will be completely novel because it will lead away from a rather continuous and slow technology development, as known up to now, to disruptive technological leaps. A central topic is the development of new drive technologies, referred to as alternative. In many regions of the world, legislative requirements are forcing the automotive industry to launch more and more vehicles with pollutant-free drives. According to a study published by the financial institution Deutsche Bank, battery-powered vehicles will be the top priority in the future [3].

A number of specialist articles deal with the question how the technology change towards electrified drives can look like and which role can be played by cast parts in detail [1, 4, 5, 6]. In addition to the battery drive, other technologies are also subject for research work, for example hybrid drives, hydrogen fuel cell drives, natural gas and LPG drives, and drives based on synthetically produced fuels. While experts are not in agreement over the importance of the different drive technologies over time, there is general agreement that vehicles with alternative drives will have a growing share in the global motor vehicle production. Nevertheless, efforts are further being made to optimize internal combustion engines in order that they will globally retain their position as basic drives for passenger cars even after the year 2030 [3].

New drives, lightweight solutions, digitization

Die casting foundries must assume that certain components which are indispensable for e.g. the engine block, the gear box, the cooling system, the fuel supply and the exhaust treatment system of conventionally powered vehicles will no more be in demand in the hitherto habitual quantities. In turn, for electric engines fewer parts are required: While engine and gearing of a conventionally powered car consist of around 1,400 parts, the number of



parts for an electric engine including transmission is no more than around 200 [7]. For vehicles with a battery drive system, however, there will be a great need for die cast parts. This drive technology also needs a gearbox and thus complex die cast components made from aluminum. For the battery, the electric engine, the transmission system, the power electronics, sensors and other components, housings are required that can be ideally manufactured by die casting. The same also applies to certain components that are required for all types of motor vehicles, for example structural components for the chassis and body and parts for the interior.

In view of the development of orders, it should also be interesting for die casting foundries that hybrid vehicles require a larger number of components as these vehicles are equipped with two drive systems.

The manufacturers of electric and hybrid vehicles are required to make these vehicles lighter in order to compensate the weight of the battery and to extend their range. Also in this regard, die casting proves to be advantageous. This is because several functions can be integrated in one die cast part with the consequence that individual parts can be omitted and thus also the weight increase caused by the battery can be weakened or even compensated.

Die casting processes also offer promising application possibilities to replace other processing methods. Researchers of the Fraunhofer Institute for Manufacturing Technology and Applied Materials Research IFAM, Bremen/Germany, for example, have developed a die casting technology for the production of aluminium coils with a flat conductor arrangement for electric engines (Fig.).

According to an IFAM study, such coils increase the continuous efficiency of electric machines, compared with coils with copper windings, reduce the operating temperature and the weight, save raw material costs and enable a better use of the available installation space [8].

Strengths of die casting

The die casting industry should be well-prepared for the expected changes. The companies of this industry have already gained experience with transformation processes which the automotive industry has experienced. These include the demand for weight savings through lightweight construction, which has often been discussed for a long time, and the



miniaturization of components associated with lightweight construction. The die casting process generally offers the possibility of manufacturing automotive components in such a way that the requirements for lightweight construction are optimally met. Die casting enables a high degree of design freedom in order to use materials in an ideal manner and helps to integrate several functions in one component. Due to the possibility of producing very small wall thicknesses, thin-walled battery housings and battery carriers can be produced, which can be provided with complex cooling channels for temperature control of the battery.

An additional area where die casting foundries can offer pioneering solutions concerns digitization. In the future, automobile manufacturers will no longer only build and deliver cars, but will offer complex mobility and transport solutions based on the intelligent use of vehicles. This also creates new business models for die casting foundries. Die cast components can be manufactured, for example, with cast-in RFID transponders that can store different information. This gives automobile manufacturers, for example, the opportunity to provide vehicle operators with information in relation to safety, maintenance and entertainment matters.

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 2020 – 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.

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