Domat/Ems, 19. Oktober

PRESSE INFORMATION

Press Release K 2022

Energy cost reductions from metal replacement

Stiff and strong specialty polyamides reduce energy consumption in manufacturing and use

The energy supply situation in Europe is an issue for concern and is driving up costs for electricity and natural gas. From August 2021 until August 2022 the electricity prices in Switzerland and Germany increased by more than 550% (Fig. 1). This dramatic increase in energy costs is forcing manufacturers to analyse and optimize their complete energy management in production.

High energy costs promote use of polymer materials

EMS specialty polyamides are well known to trade experts and are recognised and valued for metal replacement. Along with weight savings, which in the car industry go hand in hand with a reduction of CO_2 emissions, these materials also make a reduction of up to 60% in manufacturing costs possible. Metal die-cast components, on the other hand, are manufactured at high temperatures and are therefore, very energy-intensive **(Fig. 2)**. The energy requirements for the manufacture of metal alloys as basic materials is substantially higher than for the manufacture of polymer materials. This is a significant reason for the sharper increase in metal prices compared to polymer materials in the past months. This energy-driven cost increase also makes use of high-performance polymers additionally attractive in comparison to metal.

Main potential for savings at the start of the development phase

65 – 75% of manufacturing costs are already defined during the design phase, i.e. at the start of a development project. This makes it essential that design engineers create a range of design variants and materials used for comparison reasons. In the following example of a water meter, the savings potential in three development phases is illustrated **(Fig. 3)** .

Potential for cost saving taking a water meter as example

Phase 1, choice of material and design: Grivory HT1VA-4 FWA is used to replace brass for the insert of a water meter. The maximum operating conditions are 16 bar pressure and 70°C for an intended life expectancy of at least 20 years. With a part weight of 340 g (brass), this is a medium-sized water meter.

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Using Grivory HT instead of brass, the manufacturing costs can be reduced by 50% and the part weight by 75%. Additional energy savings can be achieved which, with the current energy prices compared to 2021, is a very significant from a part cost point of view.

Phase 2, design optimisation: Using Moldflow simulation and Finite Element Analysis, component geometry is defined according to the effective requirements and wall thicknesses are reduced to a minimum resulting in a shorter cooling time. As a practical rule, the cooling time in seconds (t_c) is taken as 2 – 3 x (max. wall thickness in mm)^2. Flow channels are optimised for perfect flow behaviour and unnecessary filling energy or filling pressure is avoided. For a trade expert it is clear that the steps described here are ideally taken at the start of the development process, but it is always worth applying them to ongoing applications to achieve the maximum optimisation potential and additional energy cost savings from material and process innovation.

Phase 3, optimisation of the manufacturing process: As third and last step, the whole component manufacturing process from drying of the granules to insulation of the mould and recirculation or treatment of cooling water is examined in detail. In this way, a further saving of up to 40% on energy costs can be saved.

Summary: The chosen simulation example of a water meter illustrates optimum cost and weight reduction. With the currently high energy costs however, it is also worth your while to contact our application development experts for advise on applications where the savings potential may be less apparent – the earlier the better!

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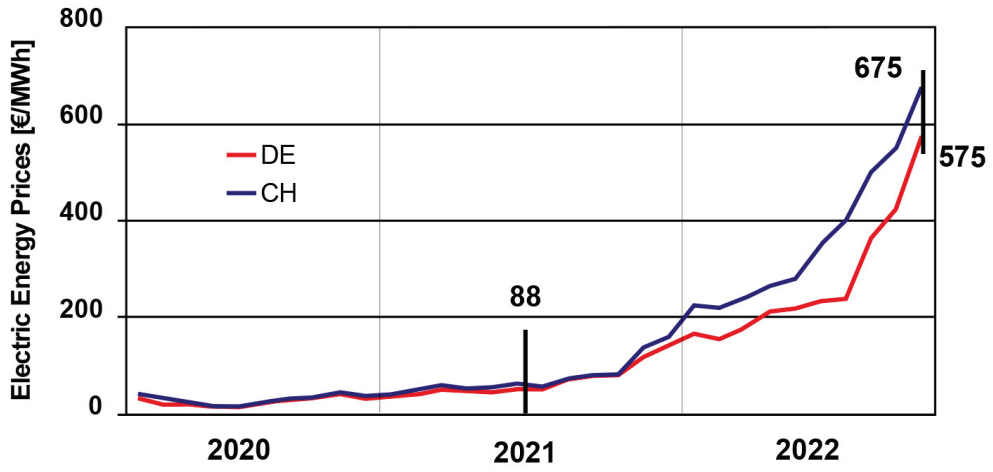
Fig. 1:
Development of Electricity Prices in Switzerland (CH) and Germany (DE)



Quelle: EEX (European Energy Exchange, 31.08.2022)

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Fig. 2:
Melt energy

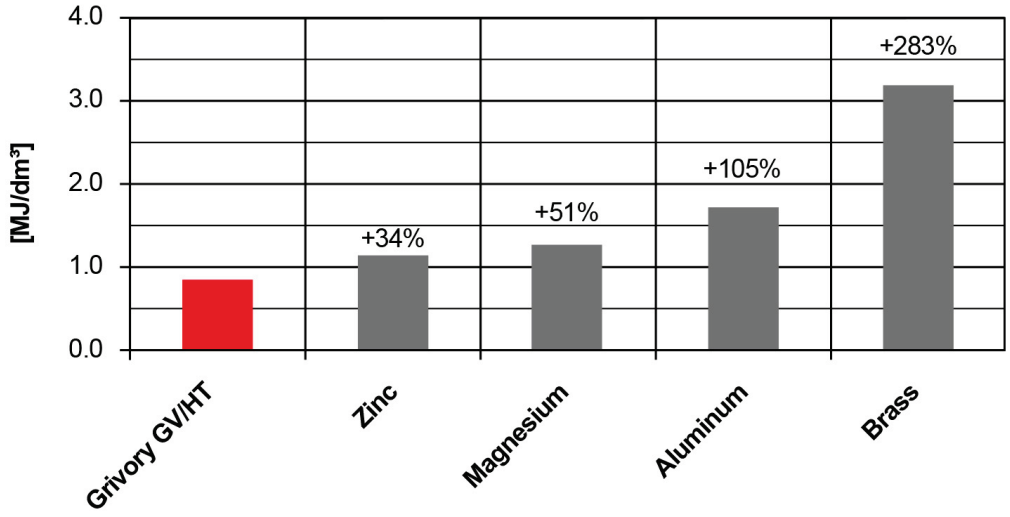
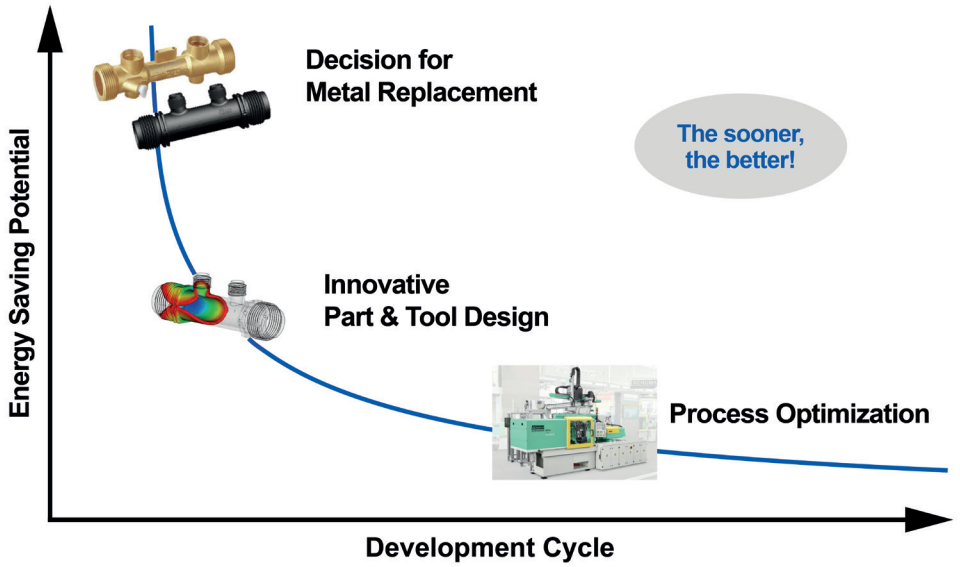


Fig. 3:
Energy-saving potential during development cycles



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