

Wear and tear in the processing of Durethan with improved thermal conductivity

Compared with metal parts, molded parts of Durethan® not only weigh less, they also offer advantages in their greater design freedom and simple functional integration. To be able to exploit these advantages also in applications where high demands are made on heat transport, e.g. cooling elements of LED lamps, it is necessary to raise the thermal conductivity of selected Durethan grades. Plastics have by nature a low thermal conductivity of around 0.2 W/mK.

Improved thermal conductivity is achieved in Durethan grades by adding mineral fillers. To attain a significant improvement in heat conductivity, a high filler content in the range of up to 75 % by wt. or 50 % by vol. in the compound is required. The fillers vary in their hardness, size and form (sharp-edged, round, flat etc.). Depending on the filler content and type of filler, Durethan with improved thermal conductivity becomes more abrasive. This can lead to greater wear and tear, even in comparison with highly filled glass fiber-reinforced polyamides.

Abrasive wear occurs in a tribological system in which the wear partners interact with one another in a relative motion. As a result of the interaction, there is an irreversible change in the surface and areas close to the surface of the two partners. The wear is

thus not a property of a material but an interplay between the partners causing the wear.

In plastics processing, wear occurs in many different areas of the process chain. During processing, it can happen in the area of the material feed, the plasticizing unit and in the mold. A distinction is made between "solid-solid friction" (metal and granule beads, metal and newly solidified plastic) and "solid-liquid friction" (metal and molten plastic). A quantitative prediction of the wear and the resultant life expectancy – particularly of the processing machine and mold – is not possible due to the large number of influencing parameters occurring at the same time.

To minimize wear, the machine, mold and process must be adapted accordingly. Depending on the process, the wear can be influenced primarily via the shear velocity, temperature or pressure. For the processing machine and mold, there are a wide variety of wear protection measures that extend from the choice of a suitable steel and various hardening processes right through to a material coating. It is therefore the processors' task to talk to raw material suppliers, machine builders, mold-makers etc. at an early stage in order to find a technically suitable and economically viable solution for the particular case.

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