Cryogenic deburring of non ferrous die castings

There are various established deburring processes for pressure die cast parts. They all have one thing in common: To a certain extent, they all lead to a change in the appearance of the as-cast surface, a shift of tight-tolerance dimensional accuracies, changes in the outside geometry as well as in the microstructure – and with that, in the most extreme case, this may even change the material properties of the treated part.

Thanks to technical innovations and highly complex, movable tooling arrangements, it is possible today to produce pressure die cast parts made of non-ferrous (NF) metals for most different industries and applications. Such applications and constantly growing or even completely new requirements on dimensional accuracy, tolerances, surface conditions and reduced roughness call for finishing processes that safeguard a part’s quality, which often required a great technological effort to be achieved. Moreover, in series production 100% reproducibility has become a standard requirement (Figures 1, 3 and 4).

Mewo Maschinenfabrik, Olpe, Germany, which since 1948 has specialized in equipment for deburring processes, a few years ago accepted the challenge to develop a deburring solution specifically for the current requirements placed on NF-metals die castings on the basis of the company’s cryogenic blasting process, an established process for the treatment of elastomers and molded plastic parts. This application of the cryogenic blasting process is able to fulfill the requirements placed by customers on the full range of deburring processes – from prototype making through to fully automatic large series production.

Cryogenic deburring is a process which involves freezing of the cast parts to a predefined range of below-zero temperatures by means of liquid nitrogen. The temperature is set according to the specific requirements of the parts on hand. The process extracts sensible heat from the castings, leading to embrittlement of the excess material flown out during the casting process. The cast part proper freezes only superficially, i.e. down to the root of the burr. The core of the casting is less affected by the low temperature and therefore retains its elasticity. When the cast parts are in this state of embrittlement induced by freezing, they are subjected to the blasting treatment. The treatment can be targeted on specific spots of the part or the entire part can be treated. Polycarbonatic material is used as blasting medium. Depending on the specific application and the requirements, different geometries and grain sizes from 0.15 to 2.0 mm are used. During blasting, also the medium is constantly subjected to the low temperature, giving it the nec-

Example of application: zinc die casting with finished surface (Photos: Mewo)
necessary abrasive resistance and impact strength for the process. Deburring is thus effected by knocking off the excess material and not by abrasion.

In the PLC controlled deburring machines, the entire process takes place automatically (Figure 2). The process consists of various individual operations. First, the parts are cooled to the specifically defined target freezing temperature. Then, the actual blasting process takes place. Finally, media residues are removed from the cast parts and separated from broken burr material. Depending on the geometry, size and maximum usable kinetic energy, the entire process takes 3 - 6 min on average.

Just for parts with very delicate surfaces it is recommended that they should be dried after deburring in order to accelerate defreezing. This reduces the temperature gradient between the ambient air and the surface temperature avoiding fogging of the cast parts and subsequent staining caused by thaw or rust formation. Also for this case and for parts that have to meet extremely exacting cleanness requirements, Mewo offers an optional system specifically designed to clean and post-treat such parts, avoiding any unnecessary handling and shifting of filigree parts for downstream processes. An outstanding feature of this sophisticated variant of the Mewo technology is the fact that it is suitable for any parts in any conditions, i.e. as cast, after punching or after machining, and for any geometries, including thin-walled and crack-sensitive contours. The process provides extremely precise deburring and is 100% reproducible. It is even suitable for surface-finished parts. Another advantage of the Mewo process over conventional processes is the fact that it does not affect in any way the surface, microstructure or appearance and feel of the part, nor the material properties or dimensions. Moreover, any risk of fire during equipment operation can be generally ruled out. Instead, all pre-existing tolerance values and dimensions, sharp-edged contours or polished surfaces will be 100% retained. Plus, due to the excellent deburring result achieved by the process, there will be no additional post-treatment.

Depending on the geometry and material of the parts, the Mewo process achieves fine and ultra-fine deburring of up to 0.2 mm thickness and burr tolerances of up to 0.02 mm, with the minimum material thickness of the part being 0.5 mm. Renowned foundries use this process predominantly.

Figure 1: Example of application: aluminium casting with article-specific holding device

Figure 2: Mewo Rotor TS 7.12 for batch deburring and inserts for article-specific holding devices

Figure 3: Example of application: batch deburring of zinc parts
for parts made for the automotive and electronics industries, because the potential risk of “burrs getting loose”, which has been moving increasingly into focus, can be generally ruled out when using the Mewo process. Mewo Maschinenfabrik has an own service, development and training centre. There, interested customers may test the deburring process on their own products.

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Figure 4: Zinc castings – left: as cast, right: deburred