Die casting processes.

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Beside casting cells equipped with carefully matched die casting machines and peripheral equipment, high productivity also requires a casting process optimally designed to suit the desired component characteristics.

In addition to the four standard die casting processes (aluminum, magnesium, and vacuum die casting plus squeeze casting), Bühler Druckguss AG has also developed four other optimized die casting processes to further raise the efficiency of standard die casting.

Conventional aluminum die casting
The molten aluminum alloy is ladled at temperatures of about 650 to 700 °C by a ladling unit into the shot sleeve of the die casting machine and then injected by a plunger with high velocity into the die cavity. There, the aluminum solidifies under high pressure in order to offset solidification shrinkage. After complete solidification, the die is opened, the component is extracted, and the die is prepared by a die spray unit for the next cycle.

Magnesium die casting
Things are much the same as in aluminum die casting. But here, a molten magnesium alloy is ladled into the shot sleeve of the die casting machine and then cast. Magnesium is a promising option especially due to its low density. But in die casting these alloys, a number of points must be observed: Thus, this process requires safety-relevant measures such as preheating of the ingots and melting in an inert gas atmosphere. Due to the lower heat content of magnesium alloys, the first injection phase and die cavity filling times must be additionally reduced compared with aluminum die casting.

Vacuum die casting
Since the die cavity filling times are very short in die casting, and because cavity filling is associated with turbulence, part of the residual air inside the die cavity will always be unable to escape through the venting ducts. This residual air will be entrapped inside the molten metal and be encountered again as gas porosity in the finished component.
In order to appreciably reduce this effect, the die cavity can be evacuated by vacuum systems before casting. This makes the cast components weldable and heat-treatable.

Squeeze casting
In Squeeze casting on conventional Buhler horizontal die casting machines, it is possible to produce components with relatively thick wall sections which satisfy high mechanical requirements. A special die design allows laminar die cavity filling and a good introduction of forces for offsetting the increased shrinkage during solidification. The cast components are weldable and heat-treatable.

Engine block process
The new, Engine block casting process eliminates various weaknesses of conventional engine block die casting. Through skillful matching of the die casting system and die designs, the new dies cost 10 to 25% less while achieving a longer service life. Other advantages of this process include lower maintenance costs and shorter cycle times.

Structural
The goal of the Structural process is to produce high-grade, ductile, weldable components on existing horizontal cold-chamber die casting machines. For this purpose, the required individual process steps are reviewed and optimized: This requires careful alloy preparation, a special-purpose metal feeding system, a vacuum system tailored to the desired component quality, optimized die spraying and casting, and subsequent thermal treatment.

Detailed sales literature is available on the individual processes.

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