

# Carat – a step into the future

**Knowing what tomorrow's markets will need is a prerequisite for developing products that will satisfy the market requirements. The new Carat die casting machine series is the Die Casting division's response to this challenge.**

Was it sheer coincidence? Exactly 80 years after Buhler shipped its first die casting machine, the Group rolled out its new, trail-blazing "Carat" machine design at the GIFA 07 foundry trade show held in Düsseldorf in June 2007.

## **More accept parts at lower cost**

A number of surveys conducted around the world unmistakably show the value drivers in the die casting industry. Top among the requirements that a state-of-the-art casting cell is expected to satisfy are the following: machine uptime, global service availability, rugged and low-maintenance operation, and higher specific casting capacity relative to the footprint of a machine.

In sum, this means: higher uptime and higher utilization rate or – in other words – higher profitability of a casting cell. This requirement profile is summarized by the acronym OEE (Overall Equipment Efficiency). Translated into die casting terms, it means more accept components per time unit at minimum cost.

## **40 possible variants**

The Buhler development team's assignment in designing the new machine series was based on this requirement list and an investigation of the current and future range of components to be cast. The result is now available in the form of the new modular Carat two-platen machine series with a locking force range from 10,500 to 44,000 kN. Each die closing unit can be combined with three shot units of different size – called "lean," "compact," and "extended." This modularity produces the required number of variants that the market needs. For example, customers can now select from among thirteen size graduations and a total of five shot units of different size in the locking force range mentioned. In all, this provides almost 40 Carat variants.

## **Higher specific shot capacity**

The two-platen machine design eliminates the need for a toggle system. The locking forces are applied to the tie bars through four hydraulic clamping cylinders. The benefit is a much shorter machine, which increases the specific shot capacity. An improved distribution of the locking force and automatic compensation for dimensional inaccuracies of the die reduce the creation of tinsel, cut the scrap rate, and increase the service life of the die.

Plastic injection molding machines have long utilized this design using hydraulic clamping cylinders. But die casting machines operate in much more



For more information on the Carat machine design, please contact:  
 Marco Luchetti  
 Team Manager Carat Machine Development  
 Buhler Die Casting Division  
 at Buhler in Uzwil  
 T +41 71 955 22 81  
 F +41 71 955 33 88  
 marco.luchetti@buhlergroup.com



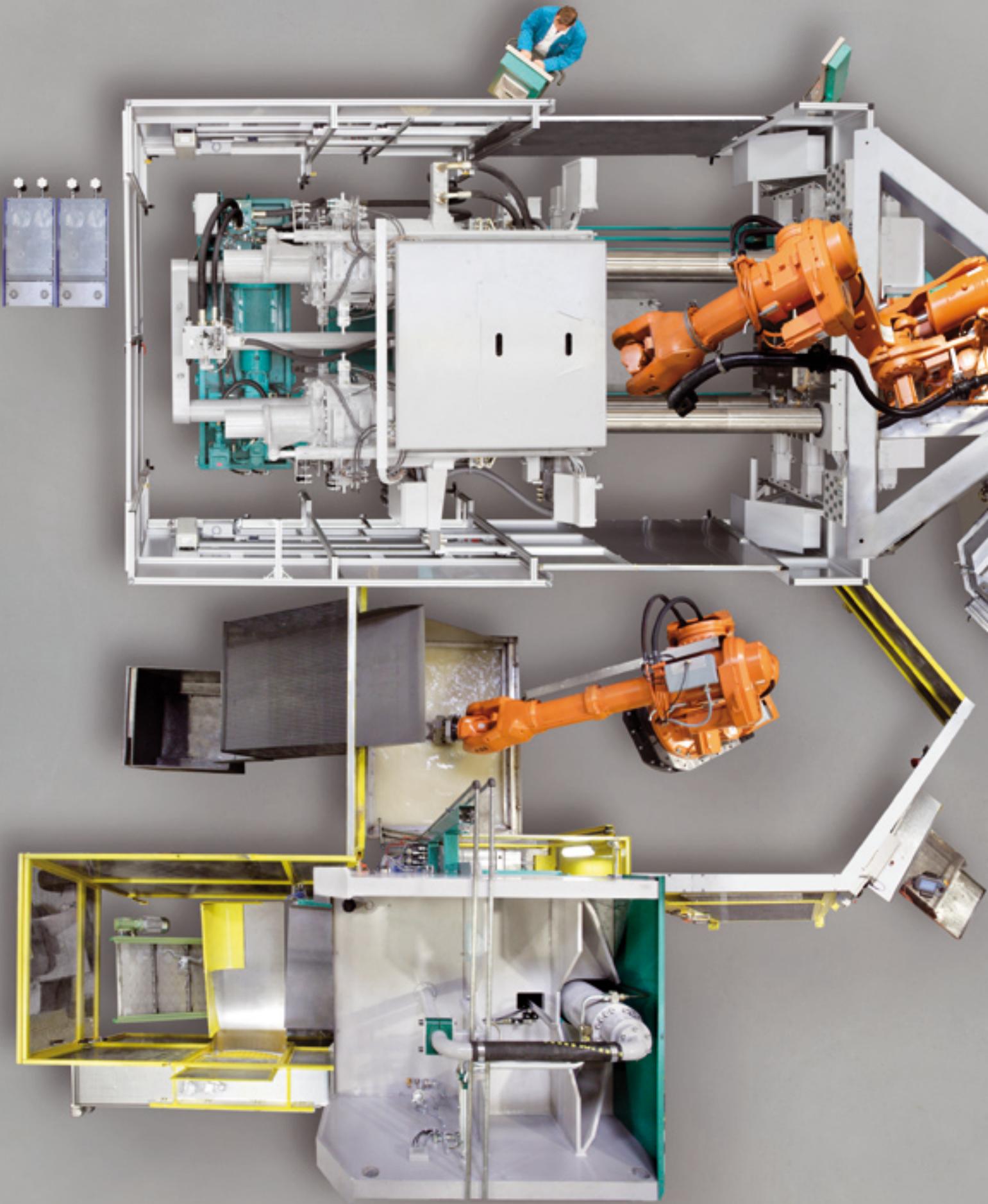
The new Carat machine with restyled safety fences.

adverse and corrosive environments than injection molding equipment. This means that the designs applied for injection molding cannot be successfully transferred to the field of die casting. The special thing about the Buhler Carat design is that all the mechanical parts of the hydraulic clamping system are encapsulated and never in contact with the harsh foundry atmosphere. The clamping system was tested by subjecting it to over four million load cycles. None of the seals failed, nor were the clamping and running surfaces damaged. This is roughly equivalent to a production period of twelve years – an exceptional contribution to the life cycle of the elements involved.

### **Fast die changes possible**

Despite the encapsulated clamping system, access to the die area is clear along the entire length for die changes. The tie bars can be retracted completely into the moving die mounting platen. No protective tie bar pipes project into the die area, which is a substantial advantage for achieving fast production changes.

The calculations made showed that the overall system has a higher rigidity. This is achieved through shorter tie bars, smaller volumes of the hydraulic chambers, and a particularly rigid moving die mounting platen. The measurements performed on the prototype confirmed these calculations. This, too, is an appreciable advantage in terms of component quality and die service life.



### Two prototypes

The first Carat was constructed in mid-2006 at Buhler in Uzwil. The prototype underwent thorough testing during several months. For almost a year now, a system has been in tough industrial service at a Buhler customer's site – TCG Unitech in the Austrian town of Kirchdorf.

The machine, which weighs some 60 metric tons, left Uzwil on March 1, 2007. It was unloaded in Kirchdorf the next day. It might be assumed that the installation of such a behemoth would require several weeks of effort. That was not so. Thanks to smooth collaboration with the customer, the casting cell consisting of the machine and the peripheral equipment was up and running within twelve workdays. The die casting machine alone was installed within three days. On March 20, the first component was cast in the manual mode. The next day at 11 in the morning, the first fully automatic casting cycle was completed. At 4 in the afternoon of the same day, the shift crew took charge of the machine for commercial production. The machine has been running without a glitch ever since, to the customer's entire satisfaction. (ml/bm) ■

