Cubed – not shaken

KraussMaffei is cooperating with a French manufacturer of cube molds – Cycle time for the first reclosable can closure is reduced by half

Ready to use: beverage can with innovative closure from DPI. On the right in the image, top and bottom view of the can cover.
Photo: KraussMaffei

The centerpiece of the closure: A 2-component base body made from black polypropylene with a transparent TPE seal.
Photo: KraussMaffei

Injection Molding Size is relative. Sometimes all it takes is a small yet effective team to be ex-tremely innovative and cover the whole range of a project. Just like the French mold manu-facturer, DPI International, which developed and launched a new pull-tab for series produc-tion. All thanks to a cube mold and a swivel plate machine from KraussMaffei.

Cube molds are "specialists." Because they are 70 percent more expensive than conven-tional swivel plate multi-daylight molds, it only makes sense to use cube molds when certain special requirements must be met. Very frequently, small components are being produced with a high number of cavities, and sometimes it is even advantageous to assemble these components directly in the mold.

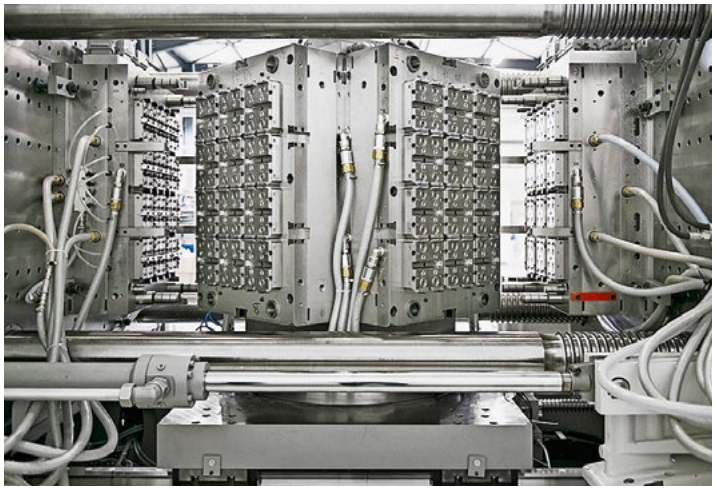
There could also be larger components for which long demolding or cooling times might lead manufacturers to choose a cube mold. In situations with these requirements, cube molds ensure enormous gains in efficiency. Take, for example, the innovative closure for beverage cans developed by the French company DPI International (DPI), which is made of two 1-component parts and one 2-component part. The latter previously required an approximately 20 second cycle time in an 8+8 cavity mold when using a turntable technique. In the 48-cavity cube mold, which runs on a 550 GXW SpinForm swivel plate machine from Krauss-Maffei, the cycle time has been reduced to less than ten seconds. This means considerable savings for high quantities, which are customary for beverages in the packaging market.

The can closure was a customer's idea, and in this project DPI is once again playing to its strength by planning and implementing the entire production line around its heart, the injec-tion mold. To ensure that this centerpiece also has the capacity required for high-volume packaging projects, the company has built, for example, its own customized hot runner noz-

zles. These allow cavity distances to be kept as small as possible and positioning to be flexi-bly configured.
The closure is special in two regards: It is the first resealable product for cans and it is excep-tionally tight. Even after forceful shaking, the liquid does not spray out like a fountain when the container is opened. Initially manufactured exclusively for the French supermarket chain Casino, but today distributes the product worldwide, the assembly line is located in France. The DPI customer delivers the closures already installed on a sheet metal cover to the bot-tlers, who then add this completed cover to their cans. The closure mechanism itself consists of a 2-component base body as well as an arm and a cap. Machines of the Netstal brand are being used for both 1-component parts.

Cube mold equalizes the cooling time

In turn, the 2-component base body can be manufactured most efficiently in a cube mold on a swivel plate machine because a portion of the relatively long cooling time as well as the entire demolding process can be transferred to the 90° side.
The process is as follows: The mold closes and black polypropylene is injected into the cavity from the first nozzle side, where it forms the double-circle part body. The mold opens and the turnover unit of the injection molding machine and rotates it by 90° in only 1.1 seconds thanks to its high-speed design. The first preform cools on its side while the next one is al-ready being formed. After another 90-degree rotation, the first part body reaches the 180° position where it is overmolded with TPE, thereby obtaining its seal. The finished 2-component part arrives in the 270° position on the operator side at the next station, where it falls freely out of the mold. Since the injection processes, cooling times and demolding take place constantly and concurrently, the mold produces a finished can closure in less than ten seconds. Jean-Benoit Langlois says:



The cantilevered spin unit rotates the cube mold 90° in just 1.1 s.
Photo: DPI

"We see a clear trend at DPI for our future projects in this enormous productivity increase."
In order to achieve this production efficiency, optimal interaction between the mold and the injection molding machine is required. The 550 GXW from KraussMaffei offers significant advantages for this project. Perhaps the most significant: The second component can be supplied on the 180 degree side of the mold without redirection. TPE is a compressible mate-rial and must be injected at high pressure. This means that the longer the melting channel is, the denser the plastic becomes – and dwell time in the melting channel is generally a crucial factor for the subsequent quality of the product. In the case of the TPE seal, this primarily affects the impact strength at low temperatures. Achieving direct material feed through the moving platen was therefore an important criteria for DPI and was made possible by the GXW – unlike the toggle machines on the market, which do not provide enough space for the second unit and must therefore carry out the process using redirections.
In addition, the turnover unit, which is located beneath the cube mold for KraussMaffei ma-chines and requires no additional support from above on the crossbars thanks to high ma-chine stability, simplifies everyday manufacturing, in particular the mold change. Water and additional media are fed into the mold from below in concentrated form. Having two circuits with a diameter of two inches each allows 39 cubic meters of water per hour to be pumped through the mold. The cooling output achieved in this method surpasses other systems that provide water from above and below, but with significantly smaller cross-sections, ultimately resulting in only half of the cooling capacity.

Cube molds without patent infringement

It is sometimes claimed on the market that cube molds are patent-protected, but this is not the case. Only molds that are fed from above and below are patent-protected, and in fact the only aspects of this method are protected are the release and retraction of the crossbar used above the machine crossbar. None of this is necessary with the cantilevered turnover unit from KraussMaffei. The design also functions without synchronization control, which is in-tended to prevent the mold from jamming like a drawer when being fed from above and be-low. With the GXW, sliding tables and turnover units are electrically powered by default. This shortens the cycle time at very high levels of precision and also eliminates the two largest oil consumers. This allows a large amount of energy to be saved with little effort. The patent situation mentioned above has the effect that customers of KraussMaffei swivel plate ma-chines are not bound to a certain mold manufacturer.The extremely positive experiences with DPI have also given both companies a desire for closer cooperation in the future, so that they can become more active in the market of cube molds and swivel plate machines
Apart from development efforts, moldmaking and plastics processing, DPI also made metal-working an integral part of this project. Sheet metal covers for what will (eventually) become beverage cans are trimmed and fitted with the three-part closure, followed by ultrasonic weld-ing and an in-line test for seal tightness. This method allows 25,000 covers to leave the plant fully packaged every hour. Jean-Benoit Langlois and his team already have their next project in mind: a transparent PET can with the same closure mechanism.

www.dpi-international.com
www.kraussmaffei.com

A young company with a wealth of experience

DPI was founded in 2010 in Chaleins, France, as a provider for engineering services. It grew into a complete mold-making company within one year by acquiring a company that had been working in the packaging sector since 1966. As a result of this, DPI can now draw upon layouts and designs for over 8000 molds with their archived data. The company continued to gain momentum, and in 2013 a new building was built in Chaleins, France, containing the development and service center. DPI now employs a total of 60 workers, and in 2015 it gen-erated a sales volume of around 7 million euros. Its customers include well-known brands such as Biomérieux, BIC, Texen, Danone, L'Oréal, Aptar and Becton Dickinson. The portfolio includes thin-walled items, flip-tops, cosmetic packaging, sealing caps and medical articles.