Optimum use of tie-bar-less benefits for 2-component packaging part

Twice as fast as the competitor

En route to even shorter cycle times in the production of coffee capsules for espresso machines, the tie-bar-less design of the ENGEL victory injection moulding machine inspired O.C.S.A. to create a totally new cooling concept. This not only secured the mould maker and injection moulding specialist from northern Italy the ENGEL HL-Award 2012 in Silver, but also follow-up orders from its customer illycaffè.

"The coffee capsules are not just packaging, but an important functional element of the espresso machine", emphasises Marco Milan, General Manager of O.C.S.A. in Creazzo near Vicenza. The company produces 150 million coffee capsules per year, each comprising four individual parts, which are assembled at illycaffè immediately before filling the coffee powder: the coffee holder, the baseplate, the filter disc and the lid, which is later automatically penetrated in the espresso machine to scald the coffee. "You need a high brewing pressure to release the full aroma", Milan continues. This is why the illycaffè espresso machines force the hot water through the capsule at a pressure of 16 bar. The requirements on the plastic parts are correspondingly high, both in terms of the materials used, and their precision and fit.

The biggest challenge in manufacturing the capsules is, however, that of continuing to increase production efficiency. In the packaging field, it is all about volume and achieving it at low unit prices. To remain competitive as order volumes rise, O.C.S.A. launched an in-house project in 2010 with the objective of reducing the cycle time in the manufacturing of the largest of the four components, the coffee holder.

Pipes instead of hoses for greater cooling water volumes.

The coffee powder containers are two-component parts. The body of crystal clear polypropylene is provided with a membrane and a seal of TPE on the underside. The
membrane is perforated to allow the scalded coffee to enter the cup. The containers are produced on an ENGEL victory 1350H/200W/220 combi injection moulding machine in a 32+32x rotary plate mould. First, the polypropylene is processed in the lower mould position, and then the TPE is injected on top after rotating the mould. The finished containers are ejected during the mould's opening movement. "The only key to further cycle time reductions was cooling the PP components", says Milan. "For packaging parts in general, there is a need for fast cooling. Based on our experience, the cooling water volume is more important here than its temperature."

Initially, wider cooling water hoses were mounted. "We immediately noticed a positive effect", Marco Milan reports, "however, the hoses turned out not to be tough enough for the fast rotary platen movements." Finally, it was company founder, Tarcisio Milan, Marco's father who commissioned in-house mould making with creating fixed pipes to the cooling water supply – totally decoupled from traditional concepts of mould and cooling. "The barrier-free clamping unit on the tie-bar-less victory machines and the huge amount of free space this creates gave my father this ingenious idea", Marco Milan says. "Today, we achieve extremely short cycle times of 9.2 seconds with this design, and thus produce twice as quickly as our competitor. This put us in a position to substantially improve our supplier rating at illycafè, so that we have now already been commissioned with further projects.

In March 2011, the first mould with the new cooling concept went into serial production. Now, two identical moulds are working on two victory machines in a parallel layout. The water pipes that are directly connected to the cooling unit jut out upward through the clamping unit. Because there are no tie-bars in the way, the pipes can easily follow the motion of the rotary plate.

**Automotive efficiency as role model**

The creative mould concept, combined with the plastics processor's economic success that quickly followed suit, convinced the jury of the HL Award 2012. In the scope of the ENGEL
Symposium in Austria in June 2012, Marco Milan accepted the award, accompanied by his sister, Sabrina Milan. The siblings dedicated the award to their father, who passed away this January. For O.C.S.A., his legacy means a contribution towards safeguarding the future; after all, it took a high degree of manufacturing efficiency to substantially expand business in the packaging division. "Two years ago, 89 percent of our customers came from the automotive industry", says Marco Milan. "Now we have reached 66 percent and that makes us far more resilient to crises."

Of course, decades of experience with customers from the automotive industry provide an optimum basis for success in the packaging industry. "The pressure to be efficient is far greater in the automotive sector", Milan reports. "The automotive industry has always been technology-driven to a great degree; multiple component applications have been standard here for a long time, while they are just slowly becoming more important in packaging right now."

Large moulds on small machines

ENGEL's tie-bar-less technology leverages its benefits to the full in multiple component technology in particular. Moulds are usually relatively large, whereas clamping forces are comparatively low on account of the comparatively small projected part surfaces. Since the clamping unit in the ENGEL victory machines operates without tie-bars, the mould can project beyond the edges of the mould fixing platens. This means that large moulds fit on relatively small machines. "Without tie-bar-less technology we would need to invest in larger injection moulding machines for our multiple component applications", says Milan, "although we try to keep the machine footprints as small as possible. Each square metre of floor space in production is valuable."

The victory machines' solid frames and the 3-point platen guidance system with precision guides on both sides and a central clamping cylinder achieve excellent platen parallelism despite the tie-bar-less design. The stationary platen's extremely stable mounting to the frame ensures that it does not stray out of its vertical position – even for fast movements;
this is gentle on the mould and extends the maintenance intervals.

Tie-bar-less machines also offer benefits in terms of automation. Because robots and automation equipment have free access to the mould area, parts can be removed faster, thus reducing the overall cycle time. Although not in coffee capsule production, this aspect is important in other O.C.S.A. applications. "The level of automation is increasing", Marco Milan emphasises. "To secure contracts in Europe, we need to work with the best technologies available on the market. The key factors here are automation and a high level of process stability."

Award-winning tie-bar-less applications

2012 ENGEL HL Awards 2012

The HL Awards are ENGEL’s acknowledgement of excellent applications with ENGEL tie-bar-less injection moulding machines. 25 contributions from 15 countries made the independent jury’s job very difficult this year; they thus strictly scrutinised the deployed technologies, the progressiveness of the applications, and the economic benefits compared with legacy machines. Besides O.C.S.A. (HL Award in Silver) the award winners were: Volkswagen in Wolfsburg/Germany (Gold), Anton in Zalaegerszeg/Hungary (Bronze), Schneegans in Emmerich/Germany (4th place), Doctor Zeta in Moscow/Russia (5th place) and Okartek in Kaarina/Finland along with Fiskars in Billnäs/Finland (6th place).

Interview:

"Being number one"

Editor: Mr. Milan, you have substantially and very successfully expanded your packaging business in just two years, thus making yourselves much more independent of the automotive industry. What are the most important factors for success in your opinion?
Marco Milan: If you want to succeed in the automotive and packaging industries, you have to be the number one; that is, you need to continually invest in new applications. This makes it important to have good suppliers, like ENGEL, for example. Secondly, we greatly benefit from our in-house mould making shop which puts us in a position to respond to new challenges far faster than many of our competitors can. And thirdly, you need courage. Developing a company always depends on its managers’ willingness to take risks. There can be no new business without risk! I learned from my father that you can achieve your goals if you pursue them with passion.

Editor: What trends do you see in injection moulding?

Marco Milan: There is a clear trend towards automation. This is the only way for European plastics processors to keep pace with Asian producers. For example, we have succeeded in becoming the first supplier for a Chinese company with an automotive product. This is a huge success for us and we owe it to our efficient processes. Despite this drive for efficiency and automation, one must never forget the people that back it up. They are the most important asset we have because they manage and control the automated processes. In future, we need the best staff, and that is becoming an increasingly difficult issue.

Editor: How are you meeting the challenge of a lack of qualified staff?

Marco Milan: We are training more and more staff in-house, and we offer courses. To ensure the loyalty of good staff, we need to be able to offer them a perspective for development. Unfortunately, we have noticed that university graduates in particular are increasingly unwilling to make a humble start. Everybody wants to start their career as a manager, and virtually nobody is willing to get their hands dirty, familiarising themselves with and understanding processes.
O.C.S.A produces 150 million coffee capsules per year for its customer illycaffè's espresso machines. Each capsule comprises a total of four moulded parts. (Fig.: ENGEL)

A partner to the international automotive and packaging industry for more than 40 years: O.C.S.A. in Creazzo/Italy. (Fig.: ENGEL)
Successful teamwork: Marco Milan, owner and CEO of O.C.S.A., Fabio Crivellaro, CTO with O.C.S.A., Sabrina Milan, owner of O.C.S.A., and Franz Pressl, Product Manager ENGEL victory with ENGEL AUSTRIA (from right to left). (Fig.: ENGEL)

Company founder and inventor of the new mould concept: Tarcisio Milan. (Fig.: O.C.S.A.)
Instead of using hoses, the cooling water supply to the mould uses pipes. This helped to increase the water volume and reduce the cycle time. (Fig.: ENGEL)

Because there are no tie-bars in the way, the mould cooling pipes can easily follow the motion of the rotary plate. (Fig.: ENGEL)
The ENGEL victory injection moulding machine's tie-bar-less design inspired its owner to a new cooling concept. Additionally, tie-bar-less technology helps to keep the machine footprint small. (Fig.: ENGEL)

The polypropylene cup contains a membrane and seal made of TPE. Both materials are processed in a single step in two component injection moulding. (Fig.: ENGEL)