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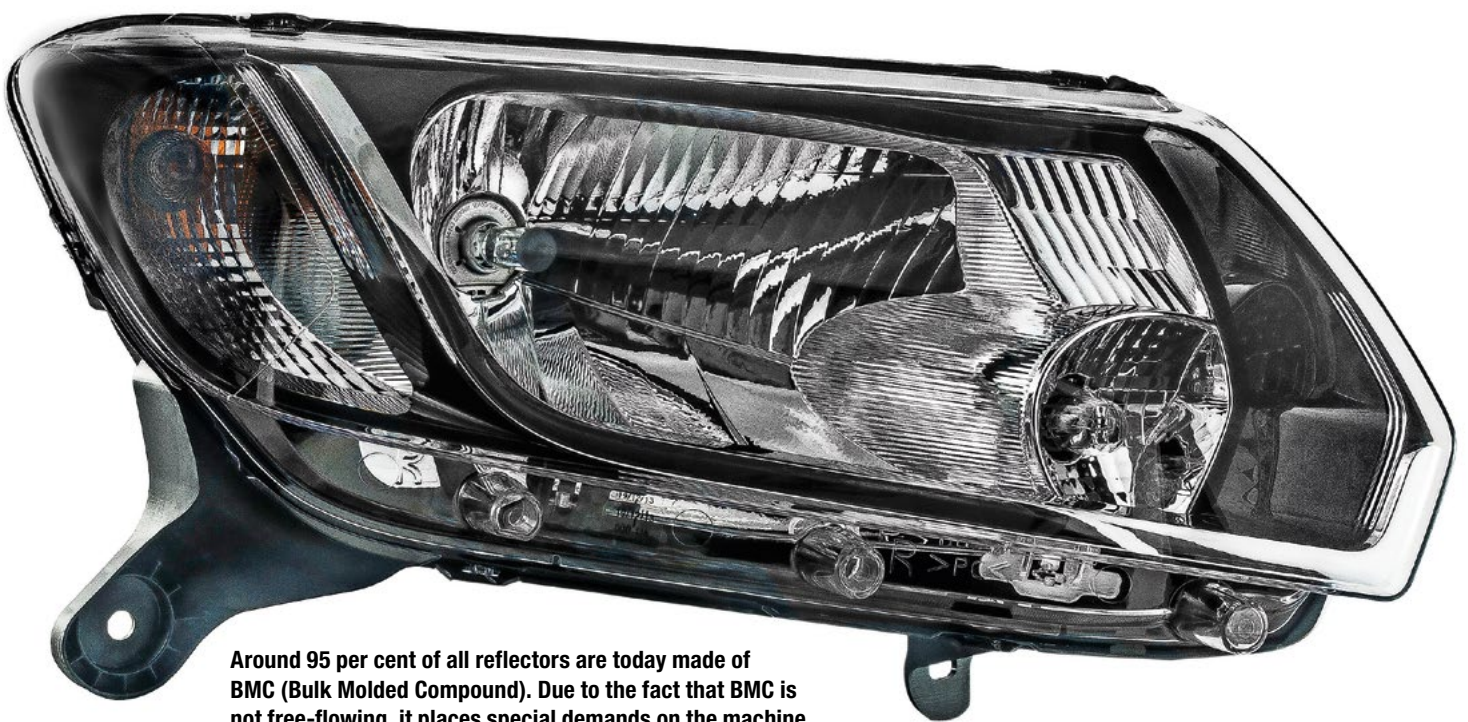
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# A thermoset plastic in the injection molding machine

ELBA produces reflectors for the automotive industry using PolySet technology from KraussMaffei



**Around 95 per cent of all reflectors are today made of BMC (Bulk Molded Compound). Due to the fact that BMC is not free-flowing, it places special demands on the machine equipment, especially on the material feed.** Photo: Elba

**Automotive** Whether halogen headlamps or LEDs, the reflector behind the lamp ensures that the headlight lights up the road at night. The renowned light manufacturer, ELBA, produces reflectors for Renault, Dacia and Skoda in Romania using

PolySet technology from KraussMaffei. This makes it possible to process thermoset plastics in the injection molding process.

Car headlamps have to be able to tolerate extreme temperature fluctuations, from minus 40 degrees Celsius

in the Nordic winter to the blistering heat of the Italian summer sun. Only thermoset plastics provide the necessary warping resistance. They crosslink in a chemical reaction and are substantially more dimensionally stable compared to the aliphatic-

structured thermoplastics. ELBA uses BMC (bulk molded compound) for manufacturing reflectors. Today, 95 percent of all reflectors are manufactured using BMC. A proven material that can absorb up to 80 percent of mineral fillers is used in this pro-

**The CX 420 PolySet allows reliable processing of non-free-flowing, filled polyester and vinylester compounds.** Photo: KraussMaffei



cess to achieve the desired mechanical properties. In the case of reflectors, glass fibers that are four to six millimeters long are added. Due to the fact that BMC is not free-flowing, it places special demands on the machine equipment, especially on the material feed.

For this reason, ELBA opted for a total package from Munich, which included a CX injection molding machine with 420 tons of clamping force, an AZ 100 automatic feed unit and the PolyLift material lift that makes it possible to load the BMC without physical exertion or cycle interruption.

"It was important for us to ensure that all components are compatible with each other and for us to only have one contact person. Compared to the earlier BMC machines, we are now experiencing more uniform levels of repeatability and lower scrap rates," emphasizes Nicolae Motateanu, Director of the Automotive Division at ELBA.

#### Automatic feed unit

The AZ 100 automatic feed unit contributes to this as well. It breaks up the tough molded material in a hopper with pins without damaging the fiber and has an important design advantage compared to the conven-

tional piston stuffers on the market. Its screw feeder pulls the BMC downward and makes it possible for the air inside to escape from the back at the same time. In other models, however, the air remains inside of the material as soon as the material is sealed at the top. This air is trapped and, under certain circumstances, passes into the mold which results in fault patterns. To date, ELBA has been struggling with this, especially in visible parts. The AZ 100 has a filling volume of 100 liters and is fitted automatically by the PolyLift. The user loads the new BMC batch easily into a window at waist level. From there, it is brought upwards, the AZ 100 cover opens automatically and its hopper receives the replenishment. Because the cross-linking reaction in BMC is triggered by heat, the temperature control of the process is different than injection molding with thermoplastics. In the plasticizing unit, the temperature of the thermoset is held at approximately 25 to 40 °C while the mold is run at temperatures of 155 to 175 °C. For this reason, the PolySet machine has the 8 x 7.0 kW heating capacity by default. For the mold heating and the plasticizing barrel, it has a combination of cooling ducts and cooling jackets. Water-cooled extension nozzles make

the connection to the mold, decreasing material consumption and shortening cycle times.

Specially designed plasticizing unit The plasticizing unit, the core element of the machine, was developed specifically for this procedure. The screw also ensures a long service life under the abrasive conditions of high filler content levels in material and has been consistently optimized to conserve fibers. A mechanical anti-rotation device ensures the screw position is held precisely and a nonreturn valve designed specifically for BMC prevents unwanted material backflow. The overall result is an extremely stable shot weight.

In their automotive area, which accounts for nearly 60 percent of its business volume, ELBA specializes in headlights and tail lights. The company carries out all manufacturing steps it needs to be able to ship a complete light module to its customers in-house. This includes all steps from the component design and optimization to moldmaking, to the production of reflectors and colored multicomponent disks made out PC and PMMA final assembly.

#### All process steps at a glance

ELBA also provides the reflector's aluminum coating itself, which re-

quires an immaculate surface. For BMC, which is fibrous, this is achieved by compacting the material. The glass fibers are surrounded by a low-viscosity resin matrix, which is squeezed out under pressure like liquid in a sponge and clings to the walls of the cavity where it cures and forms an approximately 3 µm thick closed layer without any fiber content. Due to the low-viscosity nature of the resin, molds have to be very well sealed. They must also feature a forced ventilation system to force out any air contained in the cavity. This can be done by applying a vacuum to the mold or by using a geometric solution, what is known as flashes or burrs, which are separated in a connected manufacturing step. As flow fronts that come into contact with each other connect poorly when using BMC, ejector molds or core-pulling molds are used to prevent joint lines. To ensure the large selection of different compression molding and ventilation steps and mold functions remains clearly arranged and user-friendly, the multitouch MC6 machine control system has a 24-inch touch screen with a rugged glass surface and the ProcessDesigner software program. This ensures the mold setters can see all ongoing process steps, including the vacuum pump,



**Good cooperation:**  
The engineers from Elba  
and KraussMaffei in front of the  
CX 420 PolySet. Photo: KraussMaffei

AZ 100 and handling in a graphic display. Furthermore, they can move icons for dragging ejectors (for example) via drag and drop, and are thus able to control the entire sequence intuitively. For Motateanu, it was "the right decision because it has given us significantly higher levels of user-friendliness than we ever had before."

KraussMaffei uses its full range of expertise in the area of plastics processing and offers a complete package of material feed, preparation and processing for a technically advanced procedure like PolySet. "We are extremely satisfied with the product quality and service. For these reasons, KraussMaffei is our preferred partner when it comes to injection molding machines" adds Motateanu. ELBA wants to grow rapidly in the area of electromobility with new products. It is safe to say that both partners will continue to collaborate successfully in the future.



**View of the machinery pool at Elba:** In addition to the processing of BMC on the CX 420 Polyset, thermoplastic matrix materials are also processed on KraussMaffei machines. Photo: KraussMaffei