Who thinks of Siempelkamp Foundry when buying a crate of mineral water? Probably nobody because primarily one is only pleased about the light plastic bottles inside the handy crates. Who has ever wondered how the interior trim for a car is made? Here, not only the design is important but also the functionality, for example, in regard to the sound insulation. This, by the way, goes for many everyday necessities. Rarely are we aware how something is made, especially when the product is only a means to an end. Just as the bottle which to most only serves as a transport and storage means for water or the door trim panel inside a car which minimizes driving noises.

Nodular cast iron gets plastics into shape

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These two consumer goods are only examples for a number of products made of plastics. Whether it is the housing for a hair-dryer or a blank for a DVD, whether it is the complete roof of a car or the syringes used in the medical field, they all have one thing in common. They all are made of thermoplastics. The advantages including light weight and high rigidity result in an increasing application range for plastics.

As different as both materials are, nodular cast iron and plastic, as similar are their methods of production.

Plastics are molded in injection molding machines of which the heart is a clamping unit. This unit consists of two face plates made of nodular cast iron. According to the size of the machine, these plates can be up to 4,000 mm x 4,000 mm x 1,200 mm in dimension and up to 70,000 kg in weight. The molds that are fastened to these platens represent the future outer contour of the plastic part as the negative mold.

What are plastics?

Plastics are organic chemical materials which are made by chemically altering natural materials or are produced artificially of inorganic and organic raw materials. Compared to natural materials, almost all plastics can be easily shaped because they pass through a plastic state during their making or processing. Thermoplastic materials can be melted and solidified with the correct temperature as often as needed. They consist of linear or branched chain molecules which are not cross-linked. These materials include, for example, polyamide, polyester, and polyethylene.
The movable face plate moves on the machine bed horizontally against the stationary platen. Large guide pins guarantee a precise closing process of these plates. High clamping forces of up to 5,000 KN act on the plates. These forces keep the molds closed tightly during the injection process.

The melted plastic is injected into the mold cavity through a feeding screw inside an injection unit. The plastic material quickly solidifies inside the mold and achieves rigidity. Then the movable face plate moves back to the starting position and the mold opens. The plastic part is ejected from the mold. The next injection molding process starts with the closing of the movable platen. In this way, this process is a classic example for mass production.

During this production it is imperative that the finished product has high net shape accuracy. Costly finish work is not acceptable.

To achieve high net shape accuracy, it is necessary that the face plates optimally distribute the applied forces to the molds without bending them. This ensures an absolute form fit.

For this reason the face plates are optimally constructed according to the finite element method. Next to the correct dimensioning of the platens, the choice of material is important. Here, the designer needs to consider the requirements imposed by the mechanical loads during the closing process as well as the cost-effective procurement of the platens. For these reasons the manufacturers of injection molding machines use nodular cast iron.

Just as with plastics, when casting with nodular cast iron the base material has to be melted first. The main ingredients of nodular cast iron are steel scrap and pig iron which are heated inside a furnace to approx. 1350°C. At this temperature the materials are
melted and can be poured into the molds made of furan resin bonded molding sand. By adding alloying elements such as silicium, copper and nickel, the engineers and metallurgists of Siempelkamp Foundry determine the mechanical properties of the future part. The properties have to meet the requirements of the injection molding machine.

The thick-walled and compact face plates especially require the experience of the caster. Siempelkamp Foundry provides the necessary expert knowledge to ensure the production of large castings. The irregular wall thickness within a component part leads to different cooling rates which are, next to the analysis of the material, the most important indicator for the future mechanical characteristics of the component part. Only if the structure of the face plate is uniform and flawless, the forces of the injection molding machine can be optimally supported and a secure production of the plastic parts can be ensured. Nodular cast iron provides these advantages and has become indispensable for the production of plastic products for this reason.

For many years Siempelkamp Foundry has been a reliable partner for the injection molding machine industry. Injection molding machines worldwide operate with machine tool face plates that have a special quality feature: They are “Made by Siempelkamp”.

Facts and figures about plastics production

In 2007, 260 million tons of plastics were produced worldwide. 8% of this amount was produced in Germany, 25% in Europe. Current forecasts predict a worldwide rise of plastic consumption. A yearly increase of 5% for the per capita consumption is predicted until 2015. Important growth markets are Eastern Europe and Southeast Asia.