Engineering plastics in food processing equipment

by Andreas Weidenfeld

Plastics have been used for a long time to pack food – even in direct contact with the contents. Materials such as polyethylene (PE), polypropylene (PP), nylon or polyethylene terephthalate (PET) are made into diverse packaging and films and are constantly replacing traditional packaging materials. But in the area of "machinery for food processing," the advantages of engineering plastics over conventional materials are known and used to advantage.

In particular, the design engineers of meat processing equipment utilize the advantages of engineering plastics. The many convenient, variable material properties of modern plastics, which are continuously refined and optimized, have led to their acceptance as a true and innovative alternative to conventional materials. Much better mechanical and thermal properties, along with being non-toxic, have made plastic the first choice in many areas. Therefore, plastics are chosen more and more in the design of sensitive components. This is particularly valid in areas where food comes into direct contact with the machine part. In these areas, the full advantages of the plastics can be utilized.

Components made of ZL 900 (acetal) in a sausage processing machine. Photo: Poly-Clip GmbH, Germany.

When can these materials be used, and what advantages are there to using plastics? This question is often asked by the designers of meat processing equipment who are used to working with stainless steel. The next question is "Can it even hold up?" Many times, the questions of the skeptical designer go unanswered. But plastics offer immense advantages over stainless steel. With materials like PET with solid lubricant or polyetheretherketone (PEEK), specialists for highly loaded sliding applications or high temperature applications are ready to help. Nylon, acetal and polyethylene also have many common properties which make all of them convincing alternatives.

Cost reduction through good machinability

Increasing cost pressures require a machine design which is functional in all details but still economical. Only in this way can the product be successfully placed on the market. This is where plastics can support the engineer's efforts to design economical components. High cutting speeds and feed rates compared to metal parts allow for much less expensive manufacturing of components. Even complicated parts with a lot of machining can be manufactured economically on conventional machines.

Often, components which previously had to be made separately and assembled can now be made in one piece. To connect the plastic components with the rest of the machine, standard threads or inserts made of stainless steel can be used. The material cost is another weighty argument for plastic. In a direct comparison between materials, plastic is clearly the winner.

Good sliding properties without lubrication

The function of bushings made from conventional metal materials would be accomplished with lubricants or press fit plastic coated bushings. Both variations have drawbacks. Conventional bearings require periodic maintenance and lubrication; bushings must be pressed in and eventually replaced with high disassembly and reassembly costs.

This is where the exceptional slide and wear properties of engineering plastics come into play, and with which a maintenance free bushing can be realized. The bushings require no lubrication, and, generally, must not be assembled separately. Because no metal parts rub against one another, no unwanted metallic wear dust results.

Components made from various plastics in a sausage machine. Photo: Vemag GmbH, Germany.

High thermal or mechanical loads do not pose unsolvable problems. For this, there are specially developed, high temperature materials along with materials which have solid lubricants integrated in their polymer matrix.

Hygienic and non-toxic

Components made from engineering plastics can have a smooth surface without using special techniques. A secondary process of grinding or polishing, such as is often done with metal, is not needed. Contamination has very little area to take hold, so that maximum hygiene is ensured during the machine's operation. Maximum hygiene is also assured after usage during cleaning of the machine.

Generally, all the engineering plastics which are used in food processing equipment can be cleaned easily. They are resistant to the standard cleaning agents and

chemicals which are used and show no signs of corrosion. The non-toxicity and neutral taste make the use of plastics in direct contact with food an easy decision.

Plastics – materials with character

Each plastic has its own, different set of properties. Therefore, not every plastic is suited for all applications.

Nylons, for example, tend to absorb moisture which can lead to swelling and dimensional changes. This eliminates its use in areas with high humidity. But because cast nylon has good damping properties, extreme wear resistance, and can be produced in almost limitless dimensions, it is perfect for knock out covers and discs for meat cutters.

Acetal, by contrast, has excellent dimensional stability and extremely low moisture absorption. A very smooth surface finish can be achieved during machining without much extra work. Therefore, this material is excellent for complex components which require high dimensional stability and very good surface quality.

PET has very similar properties to acetal but is considerably more wear resistant. It has a good combination of mechanical properties, outstanding dimensional stability and excellent wear resistance. In general, all parts made from acetal can also be made from PET. It is especially suitable for components which have high requirements for wear resistance. Especially suited to this application is PET with solid lubricant, out of which the pictured pump housing is made (pump with stainless steel mixer as sliding partner; contents: hot meat), and which has proven itself in daily use.

In addition to the engineering plastics, the high performance plastics have also secured a place in the food processing industry. These are normally found in applications where temperatures exceed the limits of traditional plastics. Materials such as PEEK can be used in constant temperatures of 480EF.

Perspectives for the future

The application field for modern plastics is constantly enlarging in the area of food processing equipment. Plastics of the past were mainly used for wear strips and items of secondary technical importance, but in a short time span, a group of materials has arisen which designers can no longer overlook. Improved material properties, new composites and specially developed combinations of different material properties: the result is constantly new product developments and the growing trust of designers. Plastics are driving traditional materials from their supremacy. Although they cannot take over in every area, the application areas for which plastics have been designed will not remain controlled by the traditional materials.

There is no end in sight for development and application possibilities for modern plastics. We can all eagerly look forward to future developments. ■

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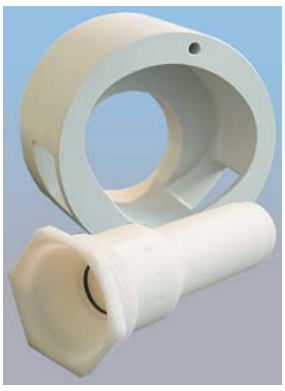

Pump housing made of ZL 1400 T (PET with solid lubricant) and sausage stuffing tube made of ZL 900 (acetal).