Converting Metal Components to Plastic in Food Processing

Plastics in Food/Beverage Processing

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Food processing applications pose unique challenges for equipment. High humidity, extreme temperatures and chemical exposure are routine. In addition, any components that come into contact with food must be certified food-safe by the Food and Drug Administration (FDA).

Increasingly, equipment manufacturers and food processors are turning to high performance thermoplastics for the answer to these challenges. In many cases, the right thermoplastic will rival and surpass metal in performance, price and utility.

Benefits of thermoplastics

Over the decades, innovations in formulations have produced plastics that solve diverse application challenges. Today, it is common to find plastics with properties such as low water absorption, high wear resistance under heavy loads and excellent machinability.

In fact, many high performance plastics are available today that are ideally suited for food processing applications. And while most equipment designers know the cost benefit of plastics, many do not realize the significant performance benefits that are possible as well.

Metals often cannot compete with plastic on weight, durability, maintenance requirements or cost. As a result, when metal parts are converted to plastic in food processing applications, numerous advantages are gained. For example, when metal components in a food processing line are replaced with high performance plastics:

- The initial cost of material and machining is often lower.
- Parts are lighter, so surrounding infrastructure can be lighter, reducing overall cost.
- A smaller drive mechanism can be designed, reducing energy consumption.
- The parts require less maintenance and last longer because they are durable and non-corrosive (and possibly self-lubricating), so downtime decreases.
- Parts are cleaned more easily and may be formulated for bacteria-resistance, so food safety increases. (A plastic may even be chosen that is detectable by optical scanners, metal detectors and X-ray equipment for an extra measure of safety.)
- Operations are quieter.

As you can see, the simple conversion of food processing line parts from metal to thermoplastics has both immediate and long-term benefits.

Choosing the right thermoplastic for the application

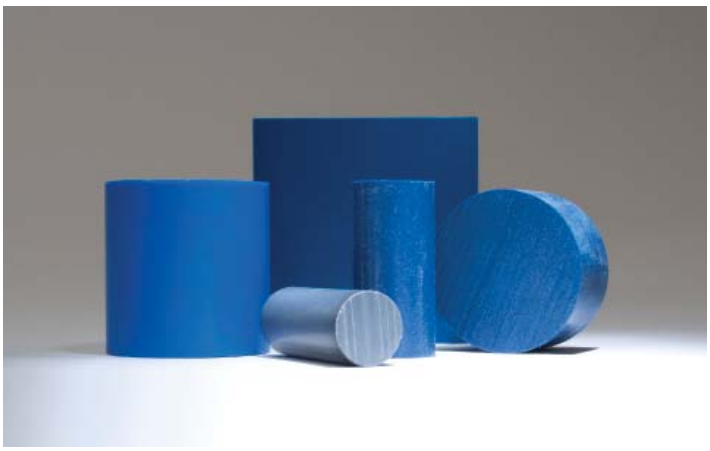
Because the list of thermoplastics available to manufacturers is long and growing, the challenge is to choose the best option. Several materials may be available that meet application requirements, but issues such as cost and machinability will affect the final selection. To achieve optimal results, it is wise to consult with an application engineer who has expertise in the properties and machinability of various plastics. A knowledgeable application engineer will know all of the issues to consider including whether additives are available that will enable a desired plastic to meet performance requirements. Factors that should be considered in the material selection process include:

Many metal parts can be converted to high-performance thermoplastics for improved performance, productivity and cost savings.

The wearing or bearing ability of the plastic: Will the part be subjected to ongoing wear from contact with another part? If so, a plastic with superior abrasion and wear resistance would be advisable. Or if a part is weight-bearing, a plastic with good dimensional stability and high tensile strength would be in order.

The temperature of the service environment: In addition to mechanical properties, environmental factors must be considered. In food processing applications, plastic components may need to be selected that can withstand temperature extremes.

Speed or motion to which the part will be subjected: Parts that move at high speeds or are subject to ongoing motion require plastics that have good fatigue and wear resistance.



Thermoplastics have been engineered to meet the specific needs of the food processing industry, such as specialized materials that are readily detectable in food.

Table 1: Materials commonly used in food processing applications

Name	Example Applications	Characteristics
ABS	• Plumbing parts • Housings and covers • Structural components	• Good dimensional stability • Economical • Superior stiffness and strength
Acetal	• Mechanical gears and valves • Bearings • Packaging equipment components	• Easy to machine and fabricate • Excellent mechanical stability • Low water absorption
Metal Detectable Acetal	• Wear strips • Conveyors • Agitators	• Detectable by standard metal detection equipment • Excellent machinability • Resistant to chemical agents
Nylons	• Rollers, wheels, gears and wear pads • Sheaves and bearings • Nozzles and sprockets	• High impact resistance • High wear resistance under heavy loads • Excellent electrical insulator
PBT	• Bushings, bearings and pistons • Valves and manifolds	• Heat and solvent resistant • High impact strength • Can be intricately machined
Polyethylene	• Conveyor guides • Chute liners • Liquid dispensing equipment	• Economical • Excellent chemical resistance • Performs well in extreme cold
PVC	• Food and beverage grade tubing • Pumps, valves and seals • Electrical and cable insulation	• Low water absorption • UL 94-VO fire rating • Good electrical and thermal insulator
Polyphenylsulfone	• Plumbing manifolds • Hot water fittings • Wire insulation	• Heat resistant • Superior impact strength • Flame retardant
PTFE	• Bearings • Slide plates • Piston rings and seals	• One of the very lowest coefficients of friction • Resistant to nearly all industrial chemicals • Heat resistant

Potential exposure to chemicals or other fluids: Depending upon the location and role of the component in the food processing application, exposure to cleaning fluids may be routine. If this is the case, a plastic that offers excellent chemical resistance would be recommended.

Weight of the component: The weight of the component can come into play in the case of moving parts (such as conveyor belts). The lighter the material, the smaller the drive mechanism that is required.

Putting it all together

More often than not, materials must meet several of these criteria. This is where an application engineer's expertise will come into play. He or she will know when a certain material is preferable — or whether an additive can provide the extra properties that are needed. This person's experience will also be invaluable in helping select a material that meets time frame and budget as well as application requirements. Working with a knowledgeable application engineer will ensure that the optimal material is selected.

Options for food processing applications

There are a number of plastics today that can withstand the rigors of food processing applications. Table 1 provides an overview of some of the most commonly chosen materials, applications in which they are used and select characteristics.

Because today's plastics have been engineered to meet specific application demands, there are significant long-term advantages to converting metal parts to plastic:

- Plastic parts don't corrode and many require little if any lubrication, so they have a longer service life and require less maintenance.
- They are easier to clean, improving workplace sanitation.
- Thermoplastics are lighter weight, decreasing infrastructure and energy costs and increasing productivity.
- Some can be easily detected in food, both visually and with detection equipment, improving food safety.

In many cases, plastics perform at a level unmatched by metals. As a result, the conversion of metal parts to plastic offers a real opportunity to reduce cost, increase productivity and enhance food safety.

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