



Metal additives engineered to improve the performance of critical quality plastics.

Innovative metal additives to help the plastics industry

With a renewed focus on the environment, sustainable living, and health, the way we engineer plastic products for all markets is changing. Greater attention is being paid worldwide to the plastic materials used to create our packaging; handle our food and drinks; and improve part performance and function.

Text & images by Dr. Brad Richards, Product Manager at AMETEK Specialty Metal Products

The research and development team at AMETEK Specialty Metal Products (SMP) has taken an interest in the emerging capabilities of plastics. The business has invested time and resources into turning its high-alloy and stainless steel powders into ideal additive or filler materials for use in several applications, including detectable plastic compounds for food and pharmaceutical manufacturing as well as

next generation engineered plastics for improved functionality and durability.

Increase detectability, reduce plastic contamination

As food handling becomes more and more sophisticated to meet public demand for cleanliness, the additives that go into plastics in these applications must perform at an increasingly higher level. The expectation for plastic

additives is that the product will now easily mix and suspend in plastic or epoxy materials used to make final parts or coatings with a negligible defect rate. End parts must be produced in very precise colors and grades of plastic to match pre-existing branding, hazard colors, or food safety guidelines while at the same time offering substantially increased properties. For example, detectable blue plastics produced with



Metal powders impart x-ray detectability, vibration and sonic dampening, magnetic properties, and wear resistance.

high levels of metallic additives are now common in food and beverage manufacturing facilities and allow for identification of small plastic pieces. Brad Richards, Product Manager for AMETEK SMP, explains further: "Bringing our specially tailored stainless steel powders into the mix as detectable additives for plastics offers numerous advantages. Food and beverage contamination are reduced as plastic pieces that can't be seen or felt within an item are now easily identifiable on X-ray machines or via magnetic detection. This increases quality for manufacturers by providing critical capability to reduce contaminants and adhere to exacting industry regulations around food and beverage quality, safety, and handling."

Tighter legislation leads to industry developments

These regulations include strict legislation in the U.K., Europe, and the U.S. The U.S. FDA Food Safety Modernization Act (FSMA) and European council regulation EU 10/2011, for example, both require the implementation of controls that prevent plastic contamination of food products. This has led to a host of improved detection technologies with X-ray systems, but also to improvements in the magnetic and X-ray detectability of plastics themselves when compared to food and beverage products. A common application resulting from this legislation is the use of water-atomized stainless steel additives for plastics to substantially increase X-ray contrast and allow for easy plastic detection.

Possibilities of metal additives in plastics

Metal additives offer numerous advantages for other engineered plastic parts and polymer compounds as well. These include vibration dampening, which results in a composite material with elasticity, density, and vibration attenuation properties that can all be modified across a broad range. Other combinations of metal additives can also increase electrical conductivity of the overall material, creating an increase in anti-static or even conductive properties in high loadings. Including harder metallic particles in materials known as polymer matrix composites leads to a

stronger product that offers better wear resistance and an increased useful life. Richards explains that incorporation of metal additives "also gives an edge to those customers making more technical engineering plastics. Increases in hardness, abrasion, and erosion resistant properties make them highly versatile and suitable for a wide range of applications."

Thermal and electrical conductivity can be increased, and the material density easily modified. Plastic parts can also be made which are capable of being heated by induction, a unique and sought-after property as it allows for rapid and uniform heating of individual components.

AMETEK SMP produces metal powders from 300 and 400 series stainless steels in a range of fine (~30 µm) and coarse (~100 µm) sizes as additives and fillers for polymer compounds. Custom alloys and sizes can be tailored to a customer's specifications for varying production needs. Five different grades of its stainless steel powders have become prevalent: 316L, 304L, 434L, 430L, and 410L alloys. All have been engineered in precise size ranges to blend best with polymer additives.

The company's engineers and metallurgists work with customers to consult on product recommendations and material selections. Customers can select the alloy, particle size, and shape to ensure a precise result to meet the quality requirements of the food, pharmaceutical, defense and automotive sectors.



Plastic conveyor belt used in the food industry produced with metal additives to avoid foreign object contamination.