

White Paper

Metal Detectable Plastic Application Considerations



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The Food Safety Modernization Act (**FSMA**) requires Agricultural Producers, Food Processors & Packers to implement Hazard Analysis & Risk-Based Preventative Controls (**HARPC**) to prevent physical contaminants like glass, metal & plastic from entering the market. The FDA considers contaminants greater than .275" (7 mm) in length to present a hazard. Growers, packers & food processors are using their existing metal detector inspection system & metal detectable plastics to prevent plastic contaminated foods from reaching consumers.

Metal Detectors are sensitive instruments that create an electromagnetic field. When metal passes through this field, "detection" occurs & the offending product is isolated & rejected. The sensitivity of a Metal Detector is set up & verified by using a ferrous steel, brass or 300 series stainless steel sphere of different diameters. For instance a high sensitivity metal detector may be set up to detect a 1 mm ferrous steel sphere & larger.

Two methods of detection are used to identify metal contaminants: length detection & phase angle detection.

The amount of metal additive included in a plastic part & the size of the plastic piece determines how "detectable" the piece is based upon the length of the signal. Here are typical plastic piece sizes, metal loadings and the size of the detectable plastic signal alone compared to a ferrous steel sphere in food products that contain some moisture. When evaluating plastic detectability the plastic piece should be scanned with the normal food product and quantity because the detectable plastic + the food produces a longer signal.

Plastic Piece Size (inch)	Net Metal Loading	Ferrous Steel Sphere Equivalent
.12" x .12" x .12"	7%	1.0 mm
.12" x .12" x .12"	14%	1.2 mm
.12" x .25" x .25"	7%	1.8 mm
.12" x .25" x .25"	14%	2.0 mm
.27" x .27" x .12"	7%	2.0 mm
.27" x .27" x .12"	14%	2.8 mm
.27" x .27" x .27"	7%	2.7 mm
.27" x .27" x .27"	14%	3.3 mm

Another consideration is "Product Effect". It is much easier to detect Metal Detectable plastic in moist or conductive food products. Detection in dry foods like flour is more difficult because the phase angle of the dry food and the metal detectable plastic is nearly the same. Oils, margarine, dry spices and frozen foods also have phase angles similar to metal detectable plastics. To detect metal detectable plastics in these food products the plastic piece must have a longer signal than the food product so a larger piece of plastic with a higher metal loading is required.

Here are some questions you should learn about the application.

- What is the food product? Is it wet or dry? Is it frozen when it is inspected by a metal detector?
- Does the product contain iron which produces a long signal i.e. enriched flour or beef?
- What sensitivity are the metal detectors set up for? What sphere sizes do they detect?
- How much product is in the Metal Detector aperture at one time? For instance a 50 lb bag of enriched flour produces a long signal so the plastic part needs more metal additive and a larger size.

The concentration or "let down ratio", of the FDA compliant PolyMag® metal detectable additives included in plastic or rubber moldings, can be changed to suit the demands of the food processor's application and metal detector sensitivity. The PolyMag® additives also impart **Magnetic Susceptibility** and **X-Ray Contrast**.