

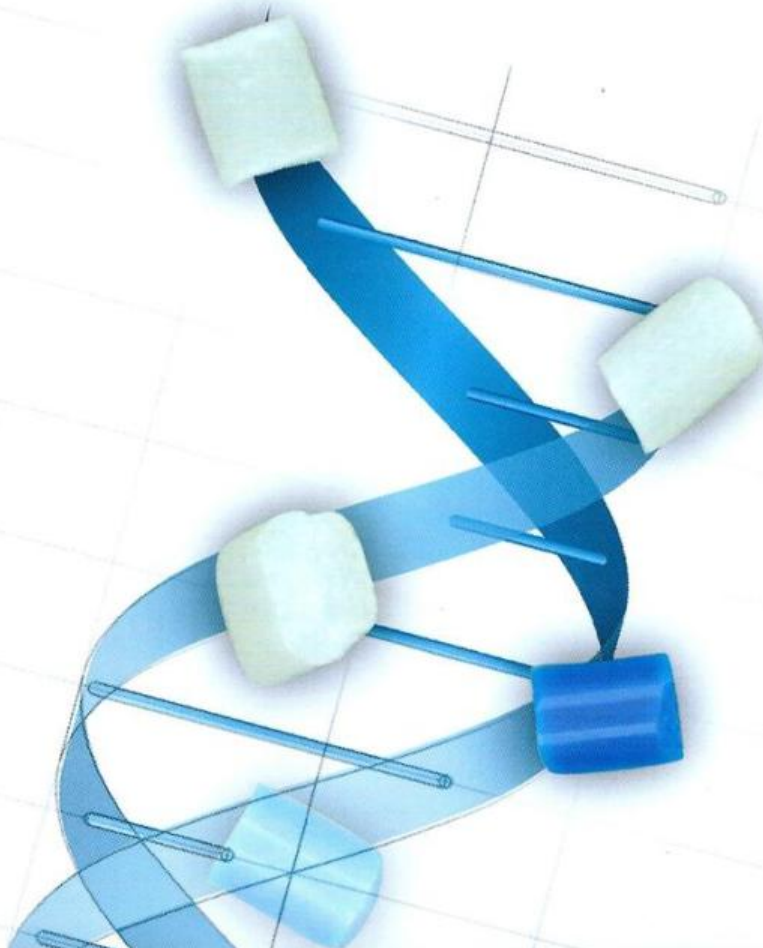


RADICI PERFORMANCE PLASTICS

METALDETECTABLE GRADES

FOR APPLICATIONS

IN FOOD AND PHARMA MARKETS



Plastic contamination in the food/pharmaceutical processing and packaging stream

Food/Pharma safety vigilance and increasingly stringent international protocol guidelines continue to drive the importance of keeping foreign material out of its ingredients. More often than not, the threat to food/pharma safety comes when some unwanted element – a fragment of metal, a piece of rubber, plastic or grain husk – enters a ingredient or its package.

It is difficult to stop plastic contaminant from slipping through food processing and packaging monitoring checkpoints. Visual inspection cannot always catch plastic contaminant, and the use of metal detectors and x-ray machines are excellent for screening out metal contaminant, but plastics are generally invisible to these monitoring systems.

Plastic contamination in finished product, no matter how large or small, can have a major negative impact. It only takes one incident, and just a small amount of plastic contaminant getting to the consumer's mouth, to set off a major recall, possible legal action, and unwanted bad press. One small piece of plastic, from one piece of food processing equipment, and one injury, resulted in unwanted bad press as well as an expensive recall. In addition, an injured consumer meant unplanned legal expenses.

Plastic contaminate in final product is a multi-million dollar problem for the food/pharma packaging and processing industry.

But ordinary plastics cannot be detected by metal detectors or x-ray machines.

So a first resource has been to use a contrasting color to the product be used to enable it to be seen more easily in the product. Materials are colored blue to provide a good background color against most foods and drugs since few of them are blue in color.



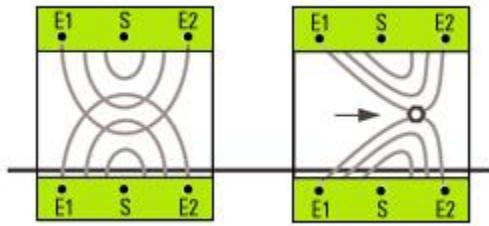
How do metal detectors work?

Metal detectors provide protection against ferrous and non-ferrous metals for many different applications, e.g.

- for the inspection of bread and bakery products, meat and sausage product, fruit, vegetables, dairy products, spices, sugar;
- when frozen food is manipulated (frozen food tend to stick to metal)
- or when we have to ensure uniform distribution, absolute reliability and hygienic application like i.e. for granular or liquid substances.

In addition to consumer protection, metal detectors are also used to protect machinery. Even smallest metal particles can lead to machinery failure. Expensive repairs and production downtimes are the consequences, often followed by revenue decreases.

When used for machinery protection, the metal detector is installed directly before the machine to be protected. An inspection of raw material has the advantage that metal particles are separated before they are broken up into smaller pieces which might be harder to detect.



E1, E2 = Receiver S = Transmitter

Basically there are several types of metal detectors that operate with different detection methods. In the food/pharma industry, metal detectors usually apply the transmitter-receiver method (see graphic).

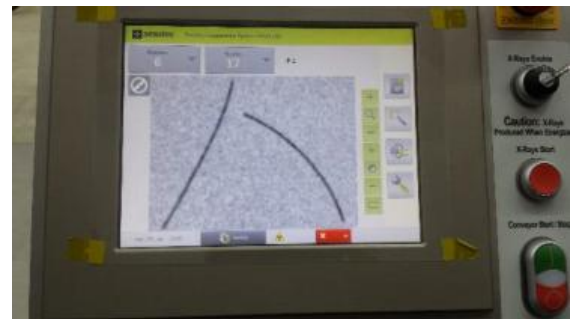
Such metal detectors are equipped with a transmitter coil and two receiver coils. The transmitter coil gener-

ates a constant electromagnetic field. When a metal particle passes the detector it interferes with the elec-

tromagnetic field, causing a signal to be detected by the receiver coils. The electronic unit in the metal detector analyses this signal, evaluates it and signals a metal contamination.

As a rule metal detectors in the food industry are equipped with automatic reject units that directly separate the contaminated product from the production line.

Generally X-ray system can detect any contaminant whose density essentially differs from product to be inspected. Usually this applies to metals such as materials (steel, sandstone, quartz, ...) that have poor detectability when passing through a metal detector operating with magnetic fields. The X-ray detection is operated by high energy X-rays which penetrate the solid bodies and are attenuated according to the different density of materials (the higher density, the higher is the attenuation). The detectors converts the different remaining radiations into an electrical signals which can be easily represented by an image (the higher the density, the darker is the area in the image). The use of X-ray detectors in food/pharma industry has to be considered, despite their higher cost in comparison to magnetic detectors, the necessary step for a more complete detection and removal of contaminants.



Detectability of metal detectable plastics:



Metal detection systems were originally designed to detect ferrous/iron containing, 100% metallic items. Now, by incorporating new additives during manufacturing, broken pieces or fragments of plastic materials can be detected by a metal or a X-ray detector before getting mixed in with food or pharmaceutical products.

The trend today is the continued improvement in the detectability of supplies and equipment, including those made of plastic.

The use of metal detectable plastics in processing and packaging operations has rapidly spreading in both the Food and Pharmaceutical markets. Cable Ties and Cable Tie Mounts, Labels, Shovels, Ear Plugs, Pens, Measuring Cups, Wear Strips, Guide Rails on processing equipment, and General Processing and Packaging Equipment Machinery Parts, as well as several different kind of brushes are just a few of the products now available in metal detectable plastic materials.

However, we must be aware that the metal detectability of any foreign body will depend on many things, including the:

- metal content of the contaminant, both the quantity and type of metal
- size and orientation of the metal containing contaminant
- food product and packaging
- speed of the conveyor belt
- detector used

Consequently, metal detection systems accuracy is depending to many factors.

The selection of appropriately metal detectable plastic equipment is therefore essential to minimize the foreign body risk from this source.

Applications



Plastic cable ties and mounts are a significant potential source of plastic contamination since are used everywhere inside of a processing and packaging operation. (The reason cable ties are a potential source of plastics contamination is the fact that they are constantly being cut-off and reinstalled in a processing plant. Every time this is done, pieces of cable ties that are cut away have the potential to get into the food/pharma processing or packaging

stream, and if undetected, shipped out the door in finished product.)

The data indicates that, to achieve a similar detection to that of a ferrous ball with a spherical diameter of 1.5mm, upon testing a 1/2" section of a cable tie in a metal detector, it was found to be detectable. However, when using a smaller piece of the cable tie tail (1/4" or 1/3") they were not getting an alarm reading from the metal detector when this section of a metal detectable cable tie passed through the aperture opening.

Similary a metaldetectable wire lengths from 3mm and 8mm would be required. Currently brushes with metal detectable filaments are only available with filament diameters of 0.35mm, 0.5mm and 0.6mm, i.e. much thinner than the metal wires assessed. It can be concluded therefore that even longer lengths of metal detectable plastic filaments would be required to achieve the same level of detection.

Radici Performance Plastics' Offer

By incorporating new additives during manufacturing, broken pieces or fragments of plastic materials can be detected by a metal detector or a x-ray detector before getting mixed in with food products. Detectable additives can be infused during manufacturing to slightly magnetize some of the plastics, so they can be separated by magnetic separators or detected by metal detectors.

By incorporating these special- FDA approved additives, RADICI Performance Plastics has expanded his current product lines to offer detectable versions of existing products, or even introduce brand new offerings.

In food/pharma processing areas, sometime aggressive equipment cleaning chemicals are used. Then the process equipment is exposed to a hot water wash down where water temperatures run 90 °C (195 °F) plus. Radici Performance Plastics has developed a Pa 610 copolymer metaldetectable ideal for extrusion of monofilaments for this applications. (RADILON® CD 32MX2M)

For general use around plants, in panel boxes, and in areas not exposed to a continuous exposure to harsh chemicals and high temperature hot water wash downs a standard Nylon 66 metaldetectable for injection molding is available. (RADILON® A LMX1M 766 BL)

For different applications also a version based on PBT is available (RADITER® B HMX3M 333 BK)

Pls refers to Radici technical representative for additional info.

The data listed here fall within the normal range of properties, but they should not be used to establish specification limits nor used alone as the basis of design. The Radici Group assumes no obligations or liability for any advice furnished or for any results obtained with respect to this information. All such advice is given and accepted at the buyer's risk. The disclosure of information herein is not a license to operate under, or a recommendation to infringe, any patent of Radici or others. Since Radici cannot anticipate all variations in actual end-use conditions, Radici makes no warranties and assumes no liability in connection with any use of this information.

RADILON A LMX1M 766 BL

Material code

Colour code

PROVISIONAL

DESCRIPTION

PA66 high fluidity injection moulding grade. Blue colour.

Suitable for parts requiring high productivity. X-ray and Metal detectable.

ISO 1043 : PA66 MX

MATERIAL HANDLING AND PROCESSING

The material is delivered in moisture-proof packaging ready for processing. Maximum recommended water content for best processing is 0.15%. Typical conditions with a desiccant drier: temperature 80 ° C, dew point -20 ° C or below, time 2-4 h or more.

Special care must be taken to avoid moisture absorption and contamination with other polymers when adding regrind material. Colour variation and mechanical properties reduction may occur and should always be carefully monitored.

Processing Parameters

Melt Temperature:	Mold Temperature:	Injection Speed:
270 ÷ 290 °C	70 ÷ 90 °C	Medium

PRODUCT SAFETY AND APPROVALS

For safety instruction please refer to Material Safety Data Sheet

RoHS compliant 2011/65/UE and following amendments

TECHNICAL DATA SHEET

PROVISIONAL

RADILON A LMX1M 766 BL

Material code Colour code

PROPERTY	UNIT	STANDARD	VALUE	
			DAM*	Cond**
Physical Properties				
Density		ISO 1183	Kg/m ³	1235
Mechanical Properties				
Tensile Modulus	1mm/min	ISO 527-2/1A	MPa	3200
Stress at Break	5mm/min	ISO 527-2/1A	MPa	72
Yield Strain	50mm/min	ISO 527-2/1A	%	10
Nominal Strain at Break	50mm/min	ISO 527-2/1A	%	17
Flexural Modulus	2mm/min	ISO 178	MPa	3000
Flexural Strength	2mm/min	ISO 178	MPa	100
Charpy Impact Strength	+23°C	ISO 179/1 eU	KJ/m ²	96
Charpy Impact Strength	-30°C	ISO 179/1 eU	KJ/m ²	97
Charpy Notched Impact Strength	+23°C	ISO 179/1 eA	KJ/m ²	4,5
Charpy Notched Impact Strength	-30°C	ISO 179/1 eA	KJ/m ²	4
Thermal Properties				
Melting Temperature	10°C/min	ISO 11357-1-3	°C	260
Heat Deflection Temperature	1.8 MPa	ISO 75/2 A f	°C	70
Flammability Properties				
Flammability	0.8mm	UL 94	class	HB
Automotive interior flammability	3mm thk	ISO 3795	mm/min	0

The characteristics shown here must be considered purely provisional and indicative for a product at developmental stage.

*DAM = Dry As Moulded state **Cond = Conditioned state similar to ISO 1110 ***Melt Temp [°C] / Mold Temp [°C] / Cavity press [MPa]

RADILON CD 32MX2M 766 BL

Material code

Colour code

PROVISIONAL

DESCRIPTION

PA610-based Copolymer, medium viscosity extrusion grade. Blue colour.

X-Ray and Metal detectable. The grade has been especially developed for extrusion of monofilaments for food contact applications.

ISO 1043 : PA610 MX

MATERIAL HANDLING AND PROCESSING

The material is delivered in moisture-proof packaging ready for processing. Maximum recommended water content for best processing is 0.10%. Typical conditions with a desiccant drier: temperature 80 ° C, dew point -20 ° C or below, time 2-4 h or more.

Special care must be taken to avoid moisture absorption and contamination with other polymers when adding regrind material. Colour variation and mechanical properties reduction may occur and should always be carefully monitored.

Processing Parameters

Melt Temperature:	Mold Temperature:	Injection Speed:	Extrusion Temp: 220 ÷ 240 °C
220 ÷ 250 °C	70 ÷ 80 °C	Medium	

PRODUCT SAFETY AND APPROVALS

For safety instruction please refer to Material Safety Data Sheet

RoHS compliant 2011/65/UE and following amendments

Technical data sheet

PROVISIONAL

RADILON CD 32MX2M 766 BL

Material code

Colour code

PROPERTY	STANDARD	UNIT	VALUE	
			DAM*	Cond**
Physical Properties				
Density	ISO 1183	Kg/m ³	1260	
Moisture absorption 23°C – 50%RH	2mm thk ISO 62	%	1,5	
Water absorption, immersion at 23°C	2mm thk ISO 62	%	3,3	
Mechanical Properties				
Tensile Modulus	1mm/min ISO 527-2/1A	MPa	2250	
Stress at Yield	50mm/min ISO 527-2/1A	MPa	53	
Yield Strain	50mm/min ISO 527-2/1A	%	3,8	
Nominal Strain at Break	50mm/min ISO 527-2/1A	%	40	
Flexural Modulus	2mm/min ISO 178	MPa	2000	
Flexural Strength	2mm/min ISO 178	MPa	65	
Charpy Impact Strength	+23°C ISO 179/1 eU	KJ/m ²	NB	
Charpy Impact Strength	-30°C ISO 179/1 eU	KJ/m ²	125	
Charpy Notched Impact Strength	+23°C ISO 179/1 eA	KJ/m ²		
Charpy Notched Impact Strength	-30°C ISO 179/1 eA	KJ/m ²	4,4	
Thermal Properties				
Melting Temperature	10°C/min ISO 11357-1-3	°C	200	
Heat Deflection Temperature	1.8 MPa ISO 75/2 A f	°C	42	

The characteristics shown here must be considered purely provisional and indicative for a product at developmental stage.

*DAM = Dry As Moulded state **Cond = Conditioned state similar to ISO 1110 ***Melt Temp [°C] / Mold Temp [°C] / Cavity press [MPa]