REO Processing, Inc.

Metal Detection & Removal

Introduction

Many manufacturing and logistics issues can cause METAL CONTAMINATION. Some of the most common reasons for contamination include lost tools, metal parts breaking off of the manufacturing equipment, or, in some cases, the friction from moving parts can cause metal shavings to fall into the manufactured material. During storage or shipment metal can contaminate a product if faulty shipping components (such as a valve) fall into storage containers, or, in extreme situations, if a trailer or railcar is in an accident.

Metal contamination can result in significant risk for material manufacturers. Some obvious issues include metal that has contaminated conducting plastics, the absorbent materials used for diapers and hygiene products or food products. Besides the brand damage and potential safety hazards associates with metal contamination in final products, manufacturers must also consider the severe damage that can be done to the production equipment that used to make the final products.

When metal contamination is suspected, it is imperative that the type of metal, the minimum potential particle size and the acceptable level of metal contamination are defined prior to determining the appropriate method for metal removal. Good results on the first pass are unlikely without first defining these parameters.

Types of Metal

There are three types of metal to consider when determining the type of technology needed for detection and removal. These are:

1. Ferrous: This metal has enough iron in it to be attracted by a magnet. Common ferrous metals are steel and pig iron.
2. Non-Ferrous: These metals do not contain iron. Common non-ferrous metals are copper, lead, aluminum, zinc, and tin.
3. Stainless Steel: This metal has been modified with other metals (primarily chromium and nickel) to increase its resistance to corrosion. The addition of nickel makes this material nonmagnetic.

Particle Size

Particle size is important to determine the type of technology needed for removal. If the contamination is a nut, a pair of channel locks or anything over a quarter of an inch screening is the most effective, and cost-effective, solution. Contamination less than a quarter inch will need to be run through metal detection and removal process.

Types of Metal Detection and Removal

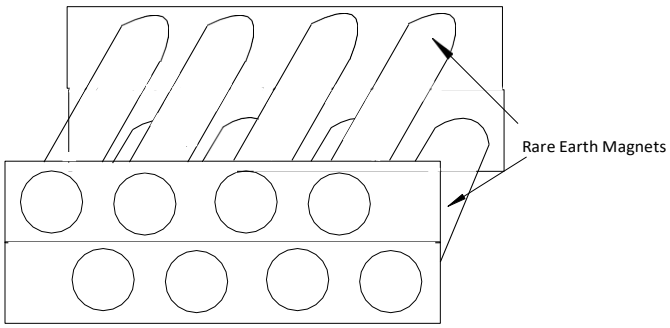
There are three types of metal removal processes: rare earth magnetics, metal detectors and a combination system.

Rare Earth Magnets

Rare earth magnets are made of neodymium or samarium-cobalt. These magnetics are much stronger than ferrite or alnico magnets. Rare earth magnets can have a Teslas (T) value of up to 1.5, while typical ferrite or alnico magnets have a Teslas of 0.5. Neodymium magnetics have the greatest Teslas value, however, these are not as effective at very high temperatures.

When using rare earth magnets material is gravity flowed over a grid of rare magnetic tubes that are usually 1 inch in diameter. Diagram 1 illustrates a typical rare earth magnet.

Diagram 1:



These magnets are typically placed below the last operation in the processing line. It can be placed in a bagging line, a FIBC filling line or at the discharge of a bulk filling station.

The advantages of rare earth magnets are:

1. Low processing cost
2. Attracts ferrous metal smaller than 0.1 millimeter (limits of human sight)

Does not inadvertently remove any material with the metal

The disadvantages of rare earth magnets:

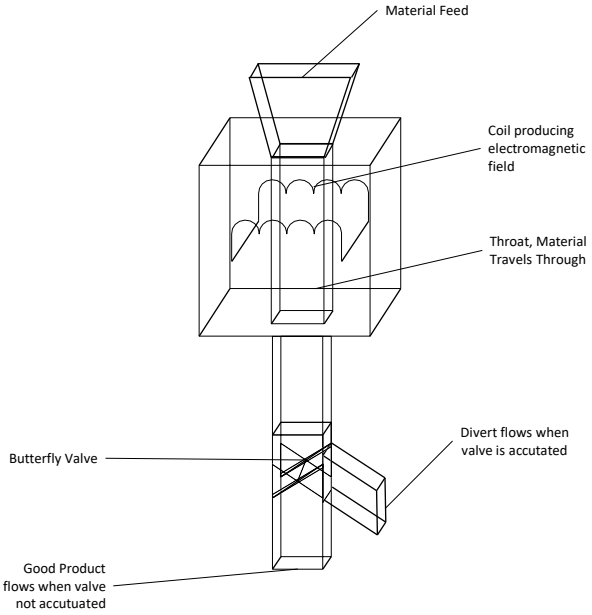
1. They only remove ferrous metals.
2. They only remove free metal(i.e. they will not remove metal embedded in the material, such asthat which might be inside or attached to a pellet.
3. The grid must be designed so that all material passes within proximity of the magnets.
4. Material that has already been attracted to the magnets can be “wiped off” by the material falling through the magnets.
5. Magnets are easily damaged so a robust “pull strength” program must be in place to ensure themagnets remain effective.

Metal Detectors

Metal detectors do not use magnets to remove metal. They use a detection device connected to an electronic system to remove metallic materials. Metal detectors establish an electromagnetic field by passing electricity through a coil attached to an earth ground. Material is fed through the middle of the field, when any type of metal (ferrous, non-ferrous, or stainless steel) passes through the coil the

electromagnetic field changes. When the sensors detect a disturbance in the field, they send a message to a divert valve to remove the material. The time it takes for the material to flow between the sensor and divert valve is programmed into a delay in the valve opening. Diagram 2 illustrates a cutaway diagram of a metal detector:

Diagram 2



Metal detectors can be placed in line with other processes, although metal removal from a known batch of contaminated material is typically a a standalone process. In these cases, good material is then moved to a packaging operation. Metal detectors will remove stainless steel and non-ferrous down to 0.5 mm and ferrous down to 0.3 mm.

The advantages of metal detectors are:

1. They remove all types of metal, ferrous, non-ferrous, and stainless steel.
2. They remove material that has embedded metal.
3. Known parameters can be programmed to ensure proper operation during processing.
4. They do not require material to come in very close proximity of magnets.
5. The equipment does not need to be cleaned during the process to prevent “wiping off” of metal.

The disadvantages of metal detectors are:

1. They produce divert, or good material that is removed because it is in the proximity of metal.
2. They are not as sensitive as rare earth magnets for ferrous metal.
3. The electrical equipment associated with the metal detector can influence performance (this is model dependent).
4. The equipment requires programing at the start of operation.

Combination System Combination systems combine metal detectors and rare earth magnets. The typicalconfiguration involves placing rare earth magnets at the end of the metal detection process where they can capture ferrous free metal that is too small to be detected by the metal detector and where they can capture the divert and save additional good material. The addition of rare earth magnets will allow for the capture of 0.3 mm – 0.1 mm sized free metal particles left behind by the metal detector.

Every manufacturer should have a partner that is skilled in all types of metal removal to recover or provide a safety net for their material. REO Processing has been providing metal removal services using state of the art rare earth magnets, metal detectors and combination systems for over 20 years.

Please contact REO to discuss your *Metal Removal* and other Tolling needs.

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