Ferrous Metals Contaminant Removal

Material: Recycled Glass

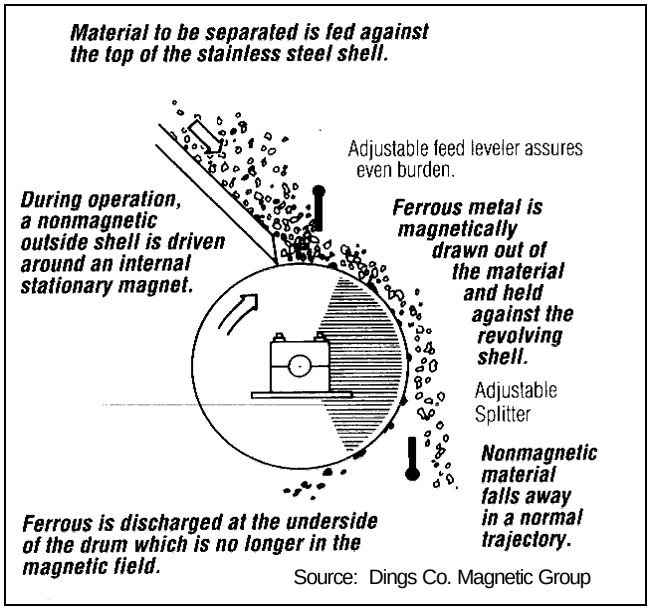
Issue: *Ferrous metal contaminants are common in post-consumer glass waste streams. However, end-use specifications frequently call for near zero levels of ferrous metals (see* Specifications for Container Manufacturing *and* Specifications for Fiberglass Manufacturing *Best Practices). Ferrous metals can cause damage to glass furnaces and production equipment. Also, many alternative uses for recycled glass cannot tolerate ferrous metals because of chemical incompatibilities or because the ferrous metals will oxidize over time. In addition to these manufacturing problems, larger pieces of ferrous metal may also damage crushing and screening equipment. Therefore, efficient and economical ferrous metal removal is critical in glass processing.*

Best Practice: The positive characteristic of ferrous contamination is that these materials are magnetic and therefore can be detected and removed with the strategic use of magnetic separation technologies. Magnetic separation has been used in many material-handling applications for decades. Magnetic separators can be configured in numerous ways to meet the processing needs of any commodity.

Two basic types of magnetic devices are electromagnets, which generate magnetic fields when power is applied, and permanent magnets, which self-generate a magnetic field. Magnets are configured for use in two primary ways: rotating, which work within a material stream to detect and segregate ferrous contaminants by diverting their flow; and as stationary magnets, which physically pull ferrous metals out of the material stream. Rotating magnet configurations include magnetic head pulleys which function in conjunction with conveyor systems (see *Conveyor Technologies for Glass Handling* Best Practice), and magnetic drum separators.

Magnetic head pulleys are often the least expensive technology for achieving removal of ferrous metals, and are self cleaning by their configuration. With head pulleys, the magnet operates under the conveyor belt and generates a magnetic pull which retains any ferrous metals long enough to cause them to fall in a different trajectory from the other materials off the end of the belt. A carefully located splitter plate segregates the discharge of the material flow based on those different trajectories.

Magnetic drums are another type of all-purpose magnetic separator used to purify streams of granular material. Magnetic drums can be used to protect grinders, crushers, and other processing equipment against tramp iron damage. Drums employ either permanent or electro-magnets.



Permanent magnet drums can be installed inside closed chutes, at outlets of chutes and hoppers, or where materials discharge from feeders and conveyors. Drums usually have a non-magnetic surface cover and cams to prevent build-up. Ferrous metal flow is diverted in a manner similar to that described with head pulleys, as illustrated in the graphic.

Overhead and cross belt magnets lift ferrous contaminants from material streams and deposit them in discharge hoppers. These configurations also use both permanent and electro-magnets. The magnets can be positioned in several fashions, including directly above or just beyond the end of a conveyor, where they function similarly to head pulleys in affecting the trajectory of the ferrous materials coming of the belt. Cross belt magnets employ a moving belt containing the magnet that attracts ferrous metals out of the stream and carries them to the discharge. Wipers or brushes can be used to facilitate cleaning.

Implementation: Magnets can be configured in several different ways to control operating efficiencies based on process flow characteristics. The key elements in the design of magnetic separation systems include the strength of the magnetic field, the size of the contaminants to be removed, the mass and thickness of the material flow, and the speed of the belt. Designers should consider conveyor layout and the configuration of other ancillary equipment. Magnetic separation will not remove non-ferrous metals (which do not contain iron) such as aluminum, brass and other alloys (see *Non-Ferrous Separation Technologies* Best Practice).

Benefits: Ferrous metal contamination can cause significant damage to manufacturing equipment and processing systems. Magnetic separation technologies are necessary to prevent costly repairs and downtime. Failure to effectively remove contaminants can result in lost revenue from load rejection and jeopardize market access for processors. The benefits of quality separation can be quantified in the market value of processed glass and reduced maintenance and equipment costs.

Application Sites: Glass processors, Material recovery facilities.

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References:

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