Best Practices in Wood Waste Recycling

Magnetic Removal of Ferrous Metals

Material: Wood Waste

Issue: *Ferrous metal is one of the most common contaminants in recovered wood waste supplies. Ferrous metal are found in crates, pallets, and construction and demolition debris in the form of nails, screws, staples, or other hardware. These contaminants can create problems for the processor and end user alike. High value manufacturing feedstock specifications require that wood waste products be essentially free of ferrous metal contaminants. Removing ferrous metals from wood waste is critical to wood waste recovery.*

Best Practice: This Best Practice recommends using magnetic separators to remove ferrous metals from recovered wood waste. The following types of magnetic separation devices are described below:

Stationary, Non Self-Cleaning Suspended Magnets: These are large permanent plate or electro-magnets designed to be suspended over a conveyor belt. These stationary, non self-cleaning magnets pull tramp metal out of wood waste as it passes underneath. To avoid excessive clean-up, the suspended magnets should be installed in areas where tramp metal volume is relatively small. So, they are generally inefficient for most applications at a wood waste processing facility. Since the overhead magnets work against gravity, they must be stronger than magnets underneath material flow.

Self-Cleaning Suspended Magnets: A large permanent plate or electro-magnet. The self-cleaning varieties are equipped with a cleated transfer belt that continuously removes metal from the magnet face. The self-cleaning magnets are designed for high tramp metal volumes situations. These can be positioned over the conveyor two ways: parallel to the conveyor (in-line) or perpendicular (cross-belt). The in-line configuration is usually positioned at the head pulley of an upward inclined conveyor so that the wood material is projected toward the magnet. The problem metal trapped among the wood materials (especially wet wood) is reduced at the head pulley. The cross-belt configuration is used when the in-line configuration over a head pulley is not practical.

Self-Cleaning Magnetic Head Pulleys: These permanent magnets are installed within the head pulleys on troughing or flat belt conveyor systems for automatic removal of tramp metal. As wood waste material comes within the pulley's magnetic field, the ferrous will be held to the belt until it reaches the underside, where it is released into a discharge bin. The non-magnetic material is discharged normally over the pulley. Pulleys can be manufactured to meet the size and installation requirements of most conveyor systems. Since the head pulley magnet is closer to the material and works with gravity, they are more effective at removing small particles of metal than the overhead varieties. However, they are not as effective at removing large pieces of ferrous or material trapped on top of the wood flow. They also require thin burden depths and relatively low conveyor speeds.

Drum Magnets: These magnets are similar to pulley magnets except that the magnetic field is stationary on one side of the drum. Material falls onto a non-magnetic drum casing as it rotates around the internal

stationary magnet. Ferrous metal is draw against the drum casing while the wood flow follows a normal trajectory. Ferrous metal is discharged on the underside of the drum which is no longer in the magnetic field. This system is usually used for metals with weak magnetic properties.

Permanent Magnets vs. Electromagnets: Permanent magnets are cheaper and easier to maintain. Electromagnets offer operational flexibility in that their field strengths can be adjusted.

Implementation:

A number of magnetic separation systems can be installed at strategic locations on conveyor systems to remove ferrous metals from recovered wood waste. The issues to consider in selecting magnetic separation equipment include:

Operational. The magnetic separation equipment should be carefully chosen and sized to effectively remove the anticipated type and volume of metal from the material flow. Through work with an equipment vendor, the right style and size of magnetic separation equipment can be selected. The vendor can also assist the operator in properly adjusting conveyor speeds and the thickness of the material flow mat. The feed rate of material through the magnetic removal system must be controlled so that it doesn't overwhelm the separation capacity. Many wood waste processors find that magnetic head pulleys provide the most effective and efficient metal removal service for their facility. They operate continuously, can be installed at multiple locations in the material handling system, and automatically remove ferrous metal at no additional operating cost. However, the strength of the magnet is limited by the size of the head pulley. Design and configuration of magnetic separation systems should handle the most difficult situations. To achieve the best results, some operators employ a combination of overhead and head pulley magnets (adequately spaced to avoid magnetic interference) to maximize each system's strengths.

Cost. In general, head pulley magnets are the least expensive magnetic separation equipment. The in-line magnets tend to be cheaper than cross-belt varieties because they don't require as much field strength to combat entrapment problems or change the direction of the ferrous metal.

Maintenance. Self-cleaning magnets and head pulleys require the least regular maintenance.

Benefits:

Ferrous metal contaminants are very common and in wood waste feedstocks and very problematic for most end use applications. Using magnetic separation systems at processing facilities is critical to achieve the feedstock specifications of many end use markets. Effectively removing ferrous contaminants improves the value and broadens the marketability of a processor's products.

Application Site:

Processing Facility.

Contact:

For more information about this Best Practice, CWC (206) 443-7746, e-mail info@cwc.org.

References:

1. Bolstad, Harold. Dings Magnetic Group. Milwaukee, WI.
2. Leonard, Don. Industrial Magnets, Inc. Boyne City, MI.
3. "Magnetic Separation Basics"; Mark Phillips; Recycling Today; November 1996.
4. "Selecting a Magnetic Separator"; Mark A. Herrick; Resource Recycling; August 1993.

See Appendix for an Equipment Manufacturer's List.

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