

Is Tramp Metal Wreaking Havoc in Your Pulp/Paper Mill?

Learn Where, How and Why Magnetic Separators Are Effectively Used in Pulp/Paper Mills Today

By Bill Dudenhoefer, Separation Products Manager, ERIEZ®

For many years, electromagnetic and permanent magnetic separators have played a vital role in pulp and paper and various other processing industries by effectively removing unwanted iron from both dry and liquid lines. With the benefit of significant experience and knowledge, today, particularly in the recycling of municipal refuse, ferrous (magnetic) metals are considered the easiest fraction to remove.

Unwanted iron is quite common and can be found in just about every bulk product. An investigation into the sources of tramp iron concludes there is possible tramp iron or fine iron presence in all material flow lines. This includes: wood chips to pulp mill; coal being fed to pulverizers in a power house; additives such as starch, clay colored pigments, dry chemicals, etc., being fed or dumped into lines; and chemical recovery plants.

It is widely believed that the majority of iron comes into the mill via contaminated wood chips and other wood products entering the plant. Other ways that tramp metal can be introduced is via sabotage by a disgruntled employee or by nuts, bolts, washers and other

tramp falling off conveying lines, ducts or chutes.

Pulp and paper mills often must deal with small pieces of unwanted iron in the form of steel armor-piercing bullets. These are regularly

found in trees near military installations. Steel bullets are also commonplace in areas used for hunting wild animals. These bullets, which become embedded and hidden in the wood, sometimes are not freed in the chipping process. In some cases, magnets eradicate the embedded bullet along with the chip concealing it. However, electronic metal detectors are more commonly used to detect the presence of embedded metal in logs ahead of the chipper.

With technological advancements in magnetic strength, today's manufacturers are able to build magnetic separators as required for any application. When properly engineered and applied, these powerful separators can remove all recoverable damaging iron that passes through their magnetic fields. The availability of super strong magnetic separators coupled with the prevalence of ferrous metal and the potential damage it can cause to refiners, pulpers, pumps, jordan — and to board mill presses, platens and wood hogs — are triggering mills to install more magnetic separators to supplement conventional cleaning equipment.

Today, paper mill consultants and designers are well aware of the many advantages of incorporating magnetic protection in the initial mill design, especially in situations where qualified and capable maintenance and repair personnel are in short supply.

The essence and application of magnetic separation equipment can be placed into three major categories of wood products users: (1) paper mills; (2) secondary fiber mills; (3) particle board, hard board, plywood, insulating board and roofing-felt mills. In each of these operations, it is enormously beneficial to remove damaging tramp iron as early in the process as possible, followed by supplemental magnetic protection in





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front of at risk equipment (on an as-needed basis).

In the initial processes of paper mills, suspended magnets or magnetic head pulleys are often used in combination with belt conveyers to move chips or coal. A magnetic drum on the discharge of hoppers is another standard method for automatically eliminating tramp iron from wood-chip and coal lines.

Powerful electromagnets that require rectifiers are frequently used on suspended applications. Nonetheless, in pulleys and drums, permanent

magnetic-powered elements provide effective, economical removal of ferrous contaminants.

The mounting trend toward chips, particularly purchased chips that, unfortunately, have a greater chance of being contaminated, means more chip conveying, screening and cleaning is necessary in

advance of digesters and chip-refining systems.

Although most fine paper mills use Type 304 and 316 stainless steel (which is nonmagnetic)* in liquid lines, magnetic traps and grate separators are often used ahead of the digester. Liquid traps (commonly called T-Traps) are comprised of a series of magnetic tubes through which the slurry must pass. Besides magnetically removing tramp iron and non-magnetic heavies such as stainless steel and stones by gravity, T-Traps

also collect tiny particles of black ferrous materials and oxides that could affect the brightness of the paper.

In secondary fiber mills where the majority of equipment is carbon steel, total cleanliness is virtually impossible to attain. As a result, these mills have more tramp iron. Further complicating the situation is the fact that wastepaper is often laden with stones, dirt, rags, string and metal. Moreover, bales and batts utilize steel strapping and tie buckles that are challenging to entirely remove prior to the pulper.

Bagasse, the fibrous residue that remains after the extraction of juice from the crushed stalks of sugar cane, is used as a source of cellulose for some paper products. Mills using bagasse encounter a number of their own unique problems. While many sugar mills use magnetic separators before the rolls that squeeze juice from cane, a considerable quantity of small tramp iron remains. The open mill tandems shed ferrous parts. Keeping bagasse free of trash when in open storage ahead of baling presents a major challenge.

Bagasse mill operators can sometimes persuade sugar mill management to magnetically clean the bagasse, which is also used for heating fuel and cattle feed. If not cleaned, unwanted iron can damage boiler feed equipment or cause "tramp-iron disease" in a cow's stomach.

In most cases, pulpers maintain a trap for heavy trash that is cleaned by hand. A "rope" cleaner that mechanically fishes out debris from the agitated pulp is used in some instances. Unfortunately, neither one nor the other of these methods is 100 percent effective.

Additionally, the pulper — in pulping magazines and papers — frees thousands of staples and paper clips. Obviously, it is advantageous to remove large and small tramp iron before it reaches the close-clearance







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suction pump that draws the slurry from the pulper. A self-cleaning magnetic drum following a weir in the pulper can be used to remove medium and small iron as well as reduce pump damage in some scenarios. Still, some clips and staples will get through the unit.

Stock preparation machines, including refiners, jordans or Clarlins, run at such close settings that a paper clip or staple can wreak havoc with refiner plates or bars.

Nearly all secondary fiber mills have discovered through experience that placing a magnetic T-Trap ahead of the pressurized refiners or jordans is very effective. T-Traps have strong

magnetic fields emanating from a number of 1-inch diameter tubes that are strategically positioned in a way that causes even small wire staples to bump into them.

With this arrangement, these elements are "trapped" while the clean pulp continues to flow.

Other pieces of magnetic separation equipment consistently used in both paper mills and secondary fiber mills include: plate magnets on the discharge end of chip screens, magnetic humps on pneumatic conveying lines

handling chips, lap pulp, clay, starch and paper trimmings and grate magnets to clean bag or bulk colored pigments going into the system. Magnetic grates have been built especially for open slurry flow lines of white and black liquid.

To protect platens from damage in particle-board and other wood manufacturing operations, some of the world's largest electromagnets are installed in particleboard mills ahead of presses. As labor costs escalate, many mills are investing funds to position a magnet ahead of shredders and wood hogs to avoid costs of rising hammers. In these situations, faster-moving flat-belt conveyors to reduce the burden depth and enhance the magnet's effectiveness follow chain-link conveyors.

It is also important to remember that magnetic separators can typically be built to operate effectively on existing lines, with no need to relocate major equipment.

So, how can mill operators justify an investment in magnetic protection? First, estimate yearly savings on removing unwanted metal in the following areas: (1) reduction on equipment maintenance and repair; (2) reduction in downtime and production loss; (3) reduction in paper rejects due to "black specks"; (4) reduction in labor costs attendant with all of the above; and (5) improvement in brightness factor. Next, authorize a complete mill survey by an experienced magnet separation specialist, who will generate proposals for the required magnetic separators. After receipt of the magnet proposals, compare the yearly savings to the cost of the magnetic separators to determine the length of time it will take to cover the capital cost of the magnets. In most instances, the

length of time will be a matter of a few short years, which easily justifies the expense to the mill owner.

*Some food and pharmaceutical plants specify Type 400 stainless for fastenings, size-reduction equipment, ribbon feeders, etc. Type 400 series S.S. is magnetic, so subsequent magnetic separators will pick up worn parts. In the mining industry, magnetic digger teeth are specified so magnetic separators can help protect size-reduction equipment.

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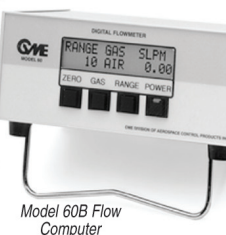
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