

Retrieving Milling Abrasive with Mammoth Magnetic Sweeper Case Study

MAMMOTH

Processing raw ore containing soft metals into useable material requires SAG milling, this process uses steel balls to crush rock small enough to extract the copper or gold inside. During maintenance of these mills the balls get spilled into a processing yard producing a slipping hazard and costing the company money to replace the balls. Bluestreak Equipment developed our Mammoth with the help of the New Afton Mine in Kamloops British Columbia to retrieve these balls and flew out a year later to check the results.

Leaving Money on the Gravel

Processing ore that contains soft metals like copper and gold requires the use of Semi-Autogenous mills to break the material down to a size that can be refined into useable pieces. These mills use steel balls to process raw material rather than relying on gravity and rotation to crush the rocks. The mills need to be cleaned out periodically as a regular part of maintenance and when that happens small steel abrasive balls get out into the yard. These need to be picked up as they can become a slipping hazard and are costly to replace.



Once the steel abrasive is emptied from the verti-mills it litters the yard surrounding the processing plant, this creates a slipping hazard because the abrasive is spherical and becomes slick when wet. There is enough abrasive on the ground that it can be multiple layers deep which is not only dangerous for workers to walk on, but it can also get caught in truck tires, which can damage the tire and split the treads. Trying to pick this material up with a shovel or bucket on a skid steer is inefficient in that it takes more time to retrieve the material and that it is more difficult to do a thorough job.



View of Vertimill Processor Opened Up for Maintenance

There is obviously a health and safety issue when the debris is left out in the processing facility yard. But since this material is necessary for operation of this facility and can be re-used there is an environmental aspect to reclaiming and reusing the material until it disintegrates and gets flushed out as waste. To replace this material, it costs about 4000\$ per ton (depending on steel prices); so by using the Mammoth to retrieve the steel debris there is also a financial incentive to keeping this debris off the processing facility yard.

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Power Requirements for Effective Retrieval

The Mammoth magnetic sweeper was created in association with the New Afton mine in Kamloops British Columbia. Their yard gets covered in steel abrasive balls following a mill cleanout. The mine came to Bluestreak Equipment in search of an efficient way to retrieve and reuse this abrasive to increase efficiency at the plant. Because the abrasive is spherical, it is very difficult to pick up with a magnet because of the cross-sectional ferritic composition. A flat piece of steel has a lot of surface area containing ferritic material and the weight of the piece is evenly distributed across this surface area, therefore a magnet can pick it up very easily.

Most of the ferritic material in a steel ball is in the center, with only a minute amount at the point closest to the magnet and therefore the magnet has a very small amount of material it can attract despite the weight of the object. To achieve the pickup rate at the speeds and heights specified by New Gold, Bluestreak put a 12x12" permanently charged ceramic magnet into a trailer chassis with hydraulics to adjust height and perform clean off. The result is a magnetic sweeper that easily picks up steel abrasive at speed and has amazing performance with regular metal debris.



Effectiveness of Mammoth Abrasive Retrieval Magnetic

Because of the heavy machinery operating in the processing yard, the steel milling abrasive at this copper/gold mine gets pushed into the ground. This Mammoth magnet was shipped to the mine with the Debris Digging Rake accessory, the DDR grooms the surface it is run across and it also helps to kick any metal debris out of the ground so the magnet can catch it. Combining the power of the 12" x 12" magnet on the Mammoth with the 3/8" spring teeth on the DDR results in a thorough cleaning system that can pull metal out of the ground even when it is embedded.



The Mill Operations Supervisor reported that they can recover up to 1 ton of the used steel abrasive in an hour of operating the mammoth magnetic sweeper after the maintenance cleanout. All the collected used debris is loaded into a "Used Ball Bunker" (Pictured above) and is used to recharge the mill for further processing.

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12" x 12" C8 = Mammoth Pulling Power

The Mammoth magnetic sweeper was designed with the goal of retrieving the steel balls at this mine, this required Bluestreak Equipment to create the worlds largest permanent magnet equipped sweeper. The power of the Mammoth magnet allows for super-fast coverage of areas affected with metal debris. The Mammoth's 12"x12" C8 magnet can pull heavy metal debris out of dirt, in the picture below is an orange sized steel ball that was collected by the Mammoth from a sweeping height of 4" in the New Afton Yard.



The amount of debris that the Mammoth collected while touring around the processing plant outside of the mill cleanout area surprised the Mill operations supervisor and he decided that they should tour the whole property once a month to help control tramp metal in their access roads and prevent flats on heavy equipment and trucks.

Heavy Industries Need Heavy Cleaning Power



When you consider the amount of time, effort, and money that goes into maintaining machines that work at these industrial job sites on a scale like the New Afton mine, settling for cleaning the working yards and access roads with visual scanning and shovels just doesn't cut it. If worker safety and machine uptime can be increased by preventing tramp metal contamination on site, then it makes sense to go for a machine that doesn't look out of place on an industrial scale.

The Mammoth is the only magnetic sweeper that can operate at a level beyond the commercial scope and can keep massive areas clear of massive debris at surprising speeds. New Afton uses theirs to keep the yard safe and save money but in any case where there is a continuous and severe debris problem in large spaces the Mammoth can perform at the level you need.