

PROJECT REPORT ON

"MAGNETIC SEPARATOR"

Submitted to:

BIZASTRA

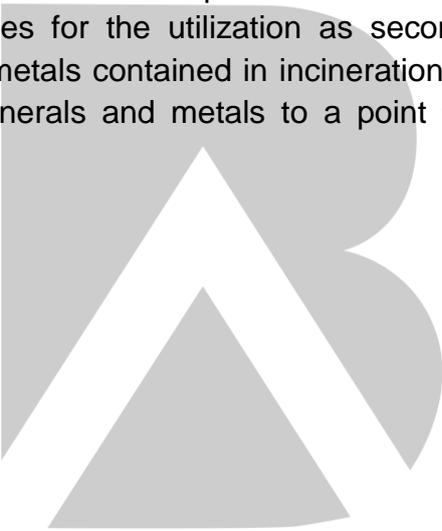
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ABSTRACT

Treatment ways are aiming at the decrease of the organic carbon content so that the process output meets criteria for final disposal. This work focuses on the recovery of non-ferrous metal .compared to other waste components ,such as plastic ,wood or textiles,nf –metals exhibit better reusability and higher market values .the production of metals from primary resources is limited in resources is limited in source and represents an extremely energy consuming process.

These concelebrates have to be separated in order to generate metal produce that exhibit sufficient purities for the utilization as secondary raw materials. The residues and the different metals contained in incineration ashes reduces the visual differentiability between minerals and metals to a point where handpicking is not particles.



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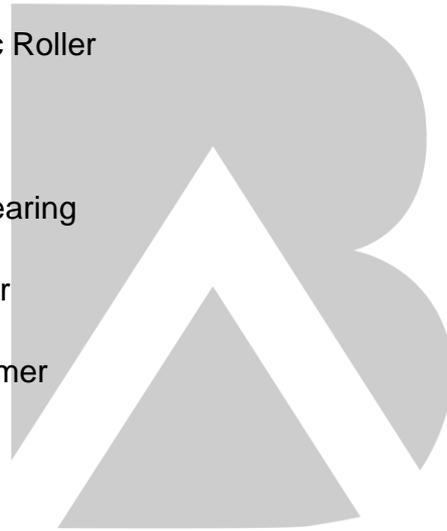
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1. COMPANY PROFILE

1.1 Introduction

_____ Magnetics is one of the leading and renowned names in the manufacturing of magnets and magnetic products. Since its inception in _____, _____ Magnetics has taken strides in manufacturing of permanent magnetic equipment, rare earth equipments and all type of magnetic appliances. Involving latest state of the art technology, we have carved a niche in the market both in India and abroad. Our company has been providing all types of magnetic appliances to the industries for more than ___ yrs.

1.2 Our Services

_____ Magnetics is known for its qualitative magnetic products which are manufactured using latest techniques and are based on sound scientific principles. Apart from this we also provide consultancy services to cater the needs of both the Indian and foreign industries. Our expertise is now being used for designing, manufacturing, and installing optimum solutions to meet the desired needs of the customers.

1.3 Infrastructure

Adhering to strict quality control policy we have combined sound infrastructure with latest technology due to which _____ Magnetics has steady fast moved ahead in its journey towards present day leadership in the field of industrial permanent magnetic equipment, rare earth equipments and all type of magnetic appliances. As we have uncompromising approach towards quality we have constantly kept ourselves abreast with the latest development in this field. Involving latest technology, along with high quality services we have ensured our customers outstanding reliability and value for money.

2.INTRODUCTION

Selecting the proper magnetic separator requires an understanding of magnetic properties, the process application and environmental elements that exist in each specific installation. This guide provides a basic understanding of how to choose the proper magnetic separator for different process requirements. Head roll magnets are available in various magnetic strengths. A head roll magnet is mounted as a drive roller in a conveyor belt. Next, it will attract iron particles present in the product and deflect these to the bottom of the belt. There, the iron particles will be released from the magnetic field and collected in a funnel or a slide plate. Overbelt magnets can be mounted both in line with and across the conveyor belt. All magnets have a short weakening pole at the end of the main pole, in order to promote releasing of iron particles.

A magnetic head roll is regularly used as a second deionization step in combination with overhead magnets, in order to realize a finer separation after the first separation of coarse steel particles. In this way, the head roll magnet will increase effectiveness. Head roll magnets are available in various magnetic strengths. A head roll magnet is mounted as a drive roller in a conveyor belt. Next, it will attract iron particles present in the product and deflect these to the bottom of the belt. There, the iron particles will be released from the magnetic field and collected in a funnel or a slide plate. Overbelt magnets can be mounted both in line with and across the conveyor belt. All magnets have a short weakening pole at the end of the main pole, in order to promote releasing of iron particles. The magnetic field will become steadily weaker, as a result of which iron particles will be released easier and are less likely to return to the magnetic pole.

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3. INDUSTRY DEFINE PROBLEM

The main object of the project is manufacturing of magnetic separator which can be able to sort ferrous and non ferrous metal.

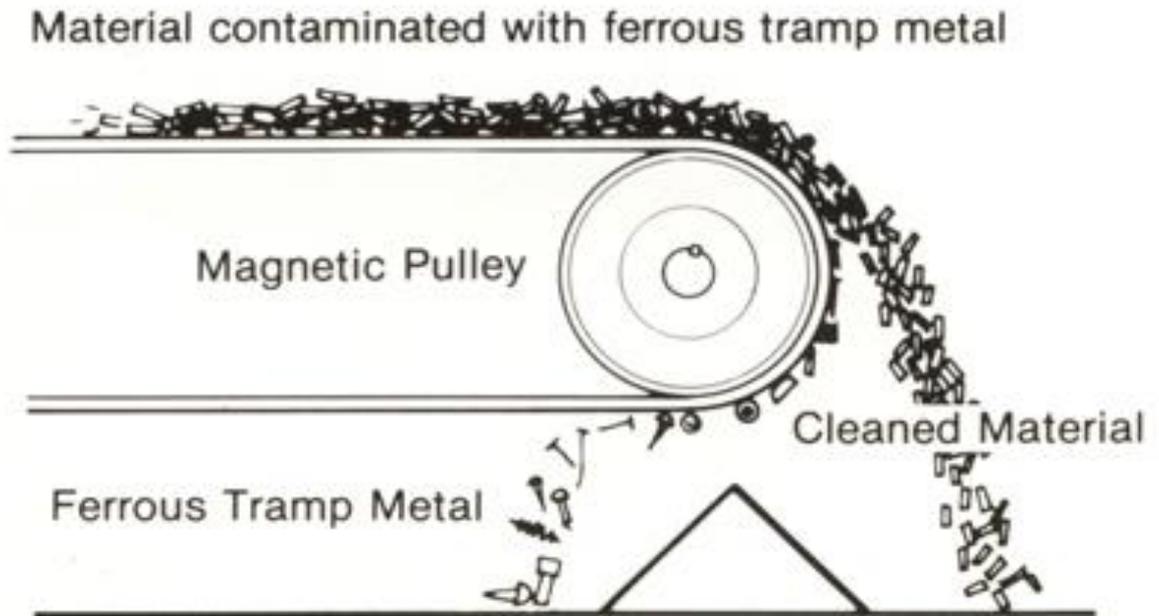


Fig. 3.1 principle of operation

Below given fig. can show the principle of operation. Magnetic separator is pinned inside the solenoid coil, placed with a certain number-magnetic stainless steel wool (or metal mesh) sorting cans, coil excitation, the magnetization of the magnetic stainless steel wool, the surface height uneven the magnetization of the magnetic field, i.e. a high gradient magnetic field, paramagnetic materials through the steel wool in the separation tank, will be a product of the applied magnetic field and the magnetic field gradient is proportional to the magnetic force, adsorbed on the surface of the steel wool, rather than the magnetic material directly via magnetic valves and pipes, through a non-magnetic material, to flow into the non magnetic product tank. When steel wool collector's weakly magnetic material reaches a certain level (calling for a decision by the process), stop to the mining. Disconnect the excitation power washing the magnetic material, magnetic material magnetic material valves and piping, inflow of magnetic products slot. Then a second job, and so on, again and again.

In the recent past the problem of removing the deleterious iron particles from a process stream had a few alternatives. Magnetic separation was typically limited and moderately effective. Magnetic separators that used permanent magnets could generate fields of low intensity only. These worked well in

removing ferrous tramp but not fine paramagnetic particles. Thus high intensity magnetic separators that were effective in collecting paramagnetic particles came into existence. These focus on the separation of very fine particles that are paramagnetic.

The current is passed through the coil, which creates a magnetic field, which magnetizes the expanded steel matrix ring. The matrix material being paramagnetic behaves like a magnet in the magnetic field and thereby attracts the fines. The ring is rinsed when it is in the magnetic field and all the non-magnetic particles are carried with the rinse water. Next as the ring leaves the magnetic zone the ring is flushed and a vacuum of about – 0.3 bars is applied to remove the magnetic particles attached to the matrix ring.



4.DETAIL DESCRIPTION OF IDP

Magnetic separator is one of the most widely used in the aircraft industry, high versatility, is suitable for the powder particle removal of iron powder. Magnetic separator is widely used for resource recycling timber industry, mining, ceramics, chemical, food and other plants in. The magnetic separator is suitable for particle size below 3mm Manganese mine, Magnetite, Pyrrhotite Ore, roasting, Ilmenite Other materials wet or dry magnetic separation, but also for Coal, non Metal ore, Building material In addition to iron and other materials. Magnetic separator The magnetic system , use of high quality ferrite materials or with Rare earth Magnetic Compound and into, before the drum table average The magnetic induction intensity For 800-4000mT. With the development of technology, magnetic separator can be made into a roller shape, the strength of the magnetic field is increased to 8000mT is already present in the measured maximum field strength.

The use of magnetic fields for separation purposes is an old stuff. Its working principle is remarkably simple: it relies on the fact that materials with different magnetic moments experience different forces in the presence of a magnetic field gradient. It's usually accepted that the magnetic separation was born in 1792, when William Fullerton filled the first patent about its use in iron manufacturing. The earlier application is dated 1852 and was located in New

York: its aim was the separation of magnetite from apatite. Following this first application a huge number of industries involved in metal transformations adopted some kind of magnetic separator. Consequently a large amount of patents has been filled on that topic, both in Europe and in the USA.

After Heike Kamerlingh Onnes discovered superconductivity in 1911 an intense work in this field led, in 1962, to the first commercially available superconducting magnets. That meant the availability of large magnetic fields (more than 1T) over tents of cubic decimeters: the High Gradient Magnetic Separation (HGMS) was born. The HGMS is identical, in its working principles, to the traditional magnetic separation, but it takes advantage of a much greater gradient (104T/m are usually achieved). The gradient is usually enhanced by a special porous bed, located inside the magnetic field source, typically made with ferromagnetic material, such as spheres, rods, plates, wires or wool. Inside the packet bed the material that is going to be separated impacts the ferromagnetic material and is retained. This strong interaction means that also paramagnetic and even diamagnetic particles could be separated from flow streams. HGMS resulted faster and reliable if compared to traditional remotion techniques so that it is a critical technique in industrial plant where ferrous material is

managed. More recently magnetic separation have become commonplace in biotechnology where it is used for both protein purification and flow cytometry. Indeed, in biology, the need for magnetic beads that are coated so as to bind particular components arises. Commercial sources for magnetic beads have grown substantially in the past decades and a wide variety of substances may nowadays be selectively removed. The high working rate and selectivity are peculiar of HGMS as well as the lack of high pressure drop encountered by the stream in comparison to the ones involved in traditional separation. Moreover HGMS filters are usually smaller and safer. For these reasons HGMS has been intensely studied in the last decades leading to a large improvement mostly on the experimental side. Despite all, a wide lack of knowledge still persists. This is mainly due to the intrinsic complexity of the system: on one side there is the whole filter seen as a big device and on the other side there are the pollutant particles moving on a scale in which only an unknown and chaotic small system is involved.

4.1 TYPES OF MAGNETIC SEPARATORS

4.1.1 Conveyor Head Roller



Fig. 4.1.1 Conveyor Head Roller

Installed at the outlet of the conveyor, the head roller removes tramp iron and small steel parts that cannot be extracted with overband or strip magnets placed above the product. It should be used in conjunction with these units for

the fullest protection. Available in two strengths: standard, for removing large pieces of steel and high power, for removing large and small parts. The shaft of the roller can be machined for easy installation on existing bearings.

4.1.2 Rods



Fig. 4.1.2 Rods

High-intensity rare-earth magnetic rods are highly effective at removing ferrous contaminants from free-flowing products, sugar, grain, tea, plastic granules, chemical powders or liquids. These bars are ideal for technicians wishing to design and build their own magnetic separators.

4.1.3 Sampling Probe



Fig. 4.1.3 Sampling Probe

The sampling probe enables quality control personnel to quickly and easily inspect powders, pellets and liquids for contamination. These probes are used for inspection of product on arrival at goods inwards, before final shipping and at key stages of processing.

4.1.4 Circular Grid



Fig. 4.1.4 Circular Grid

Grid magnets are extremely efficient at removing ferrous contaminants from the flow of dry goods such as sugar, grain, tea, plastic pellets and chemicals powders. Circular grids are easily installed in hoppers, silo entry points and the exit point of finished product. Grids can be quickly installed to provide effective protection against contaminants such as rust particles and stainless steel, resulting from mechanical wear of processing machinery. These particles are often too small to be detected by a metal detector but can be easily removed by Eclipse Magnetics magnetic grids.

4.1.5 Square Grid

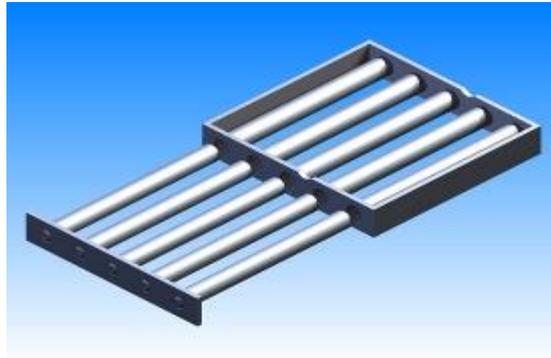


Fig. 4.1.5 Square Grid

Grid magnets are extremely efficient at removing ferrous contaminants from the flow of dry goods such as sugar, grain, tea, plastic pellets and chemicals powders. Grids are easily installed in hoppers, silo entry points and the exit point of finished product. Grids provide effective protection against contaminants such as rust particles and stainless steel resulting from mechanical wear of processing machinery. These particles are often too small to be detected by a metal detector but are easily removed by Eclipse Magnetix magnetic grids

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4.1.6 Sieve Magnet



Fig. 4.1.6 Sieve Magnet

Sieve magnet is specially designed for use in vibratory sieving machines. Our sieve magnets are lightweight, reducing the stress on the seal. The magnet is positioned below the screen for total security; the strong magnetic field is capable of attracting particles less than a micron in size. High-intensity grid magnets that can be cleaned in seconds. Simply release the locking mechanism, remove the magnetic cores from their stainless steel housings and the contaminants fall away. Replace the magnetic cores in their housings and the grid is again ready for use. The process takes less than 30 seconds. Easy-clean grid magnets are extremely effective at removing ferrous contaminants. Install where stoppage time has to be kept to a minimum.

4.1.7 Easy-Clean Grid Magnets

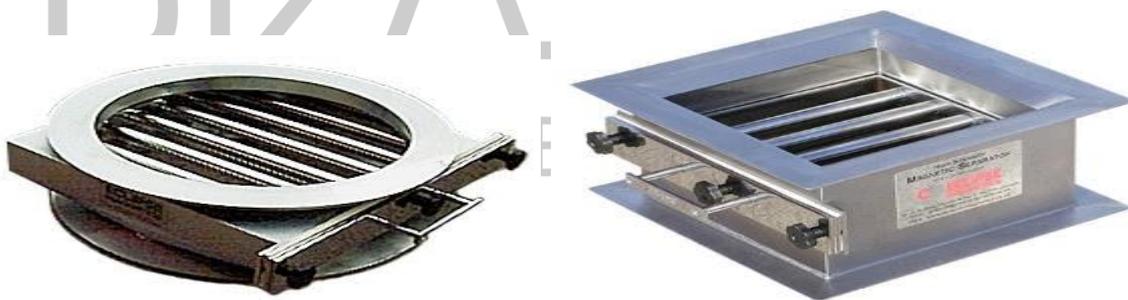


Fig.4.1.7 Easy-Clean Grid Magnets

High-intensity grid magnets that can be cleaned in seconds. Simply release the locking mechanism, remove the magnetic cores from their stainless steel housings and the contaminants fall away. Replace the magnetic cores in their housings and the grid is again ready for use. The process takes less than 30 seconds. Easy-clean grid magnets are extremely effective at removing

ferrous contaminants. Install where stoppage time has to be kept to a minimum.

4.1.8 Strip Magnet



Fig. 4.1.8 Strip Magnet

Strip magnets are very versatile. They can be placed above conveyors, at chute exits or at final product release points. Rare earth magnets are fully protected by stainless steel cladding, allowing use in wet environments. A magnetic field is generated on one face and attracting contaminants as they pass through. To optimize performance, magnets above conveyors must be placed as close as possible to the belt. Depth of field is 80 mm.

4.1.9 Hinged Strip Magnet



Fig. 4.1.9 Hinged Strip Magnet

Hinged strip magnet is designed to be installed above conveyor belts to remove ferrous contaminants from a wide range of products. High intensity rare earth magnet material is enclosed in stainless steel. A hinged cleaning plate covers the face of the magnet. The face emits a powerful magnetic field that attracts ferrous contaminants.

4.1.10 Underflow Magnet



Fig. 4.1.10 Underflow Magnet

'Primary' magnet which is positioned at the angle of chutes. Designed to remove large contaminates such as nuts, bolts and washers etc., which could enter the process line and damage machinery, resulting in significant repair costs. The magnet is provided with a hinge and locking clasps with hook for easy installation. Ideal for removing ferrous and Para-magnetic contaminants in a variety of free-flowing products such as sugar, grain, tea, plastic granules and chemical powders. The housing is available with a rectangular or circular flange, to customer specifications, for easy installation. Cleaning is exactly the same as for the Easy-clean grid. For even more effective contamination removal, or for processes with a high level of contamination, a double row unit is available.

4.1.11 Easy-Clean Single Row Grid Magnet



Fig. 4.1.11 Easy-Clean Single Row Grid Magnet

All the same benefits as the single row Easy-clean grid magnet but holds more contamination and can therefore go longer between cleans. Ideal for removing ferrous and paramagnetic contaminants in a variety of free-flowing products such as sugar, grain, tea, plastic granules and chemical powders. The

housing is available with a rectangular or circular flange, to customer specifications, for easy installation. Cleaning is exactly the same as for the Easy-clean grid.

4.1.12 Easy-Clean Double Row Grid Magnet



4.1.12 easy-Clean Double Row Grid Magnet

Developed to work continuously without manual intervention. The cleaning of the magnetic rods is done automatically without stopping the flow of product. PLC controlled. Ideal for ATEX environments. Application, performance and benefits are identical to the Easy-clean grid. Available in single row, double row and multiple row versions, as required by your application.

4.1.13 Auto-Shuttle: Self-Cleaning Grid



Fig.4.1.13 Auto-Shuttle: Self-Cleaning Grid

Developed to work continuously without manual intervention. The cleaning of the magnetic rods is done automatically without stopping the flow of product. PLC controlled. Ideal for ATEX environments. Application, performance and benefits are identical to the Easy-clean grid. Available in single row, double row and multiple row versions, as required by your application

4.1.14 Pneumag



Fig. 4.1.14 Pneumag

High intensity magnetic separator for use in pneumatic conveying lines. The Pneumag removes ferrous and Para-magnetic contaminants from free-flowing powders conveyed at speeds of up to 25m/s. It purifies the transported product and reduces the risk of spark or piercing of filter sleeves. It is designed not to affect product flow. It incorporates an Easy-clean magnetic grid and quick release closures so it can be cleaned very quickly.

4.1.15 Rota-Grid



Fig. 4.1.15 Rota-Grid

Primarily designed to extract contaminants from high humidity products, such as starch, which are liable to 'cake' or 'bridge'. The rods are arranged in a circle which rotates, gently agitating the product and maintaining flow. The magnetic surfaces of the rods come into contact with more product than those of a fixed grid, meaning the Rotagrid can be used where extremely efficient contamination removal is required. The housing is available with rectangular or circular flanges. Cleaning works on the same principle as the Easy-clean.

4.1.16 Auto-Rota Shuttle: Self-Cleaning Rota-Grid



Fig.4.1.16 Auto-Rota Shuttle: Self-Cleaning Rota-Grid

Combines the advantages of the Rota-grid with the continuous operation of the Auto-shuttle. It is also well suited to ATEX environments.

4.1.17 Bullet Magnet



Fig.4.1.17 Bullet Magnet

Housed bullet magnets remove ferrous elements, especially nuts, bolts, washers, staples, etc., from pneumatic feed and conventional supply lines. Usually installed where ingredients enter the line as well as at the first processing stage. The unit is designed to prevent ferrous items damaging expensive equipment such as grinders, mixers and screw conveyors. A 'bullet' magnet is mounted in the centre of a casing of stainless steel. The magnetic element is designed to not affect product flow.

4.1.18 Chute Magnet

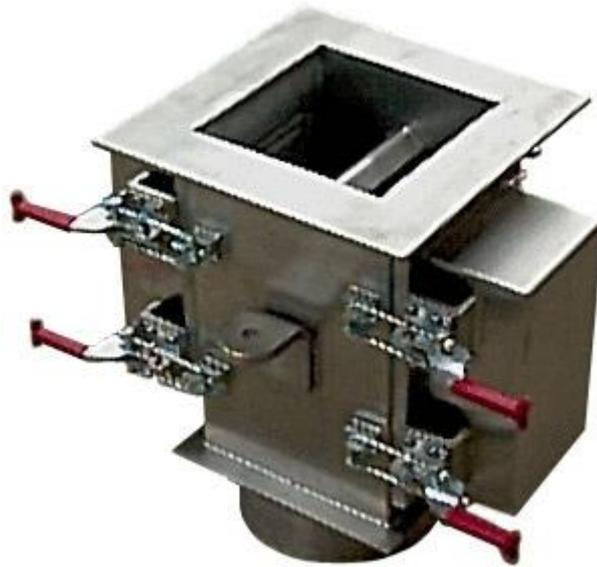


Fig. 4.1.18 Chute Magnet

'Primary' separator usually installed in gravity pipes and chutes to remove larger items such as nuts, bolts and washers, preventing damage to process machinery. With this unit there is virtually no reduction in product flow rate.

4.1.19 Liquid Filter



Fig. 4.1.19 Liquid Filter

Designed to remove contaminants from liquids and syrups. The high intensity neodymium magnet rods are contained in an Easy-clean assembly. The rod configuration guarantees maximum exposure of contaminants to the magnetic field without impeding flow. Filters are available in two versions: single wall or insulated. Insulated filters are used for applications where high line temperature is essential to maintain the viscosity of the product e.g. chocolate, syrups, jams, sauces. Both versions are tested and certified with a maximum pressure of 6 bar standard. A 20 bar maximum pressure version is available on request.

4.1.20 Magnetic Drum



Fig. 4.1.20 Magnetic Drum

Magnetic drums remove ferrous contaminants and tramp iron from bulk materials used in processing food, chemicals, minerals and other products. The drums are mounted at the outlet of the carrier or directly above a vibratory feed. High intensity rare earth magnets are mounted in a wear resistant stainless steel drum. The shell of the drum is supported by high-quality sealed bearings that provide reliable and smooth rotation around the magnetic element.

4.1.21 Housed Drum



Fig. 4.1.21 Housed Drum

Magnetic drum protected by a robust stainless steel casing, flanged to customer specification. Designed for the continuous removal of tramp iron and fine iron particles in dry bulk materials used in food, chemical, mineral and other processes. The shell of the drum is supported by high-quality sealed bearings that provide reliable and smooth rotation around the magnetic element. The drum is powered by a high quality geared motor block with single or three phase power.

4.1.22 Plate Magnet



Fig.4.1.22 Plate Magnet

Positioned above conveyors to prevent foreign bodies being introduced to grinders, screws and other valuable tools. These magnets generate a strong magnetic field that penetrates deep into transported product to extract metal contaminants. Can be used in harsh environments, humidity and temperatures. The magnet has five stainless steel sides and a painted steel plate with attachment points for attaching suspension chains.

4.1.23 Overband



Fig. 4.1.23 Overband

Widely used in the recycling, quarrying and heavy industries where it is placed over a conveyor plate to continuously extract metal contaminants from bulk products. The large permanent magnet generates a strong magnetic field that pulls ferrous contaminants from the conveyor. A rubber belt is drawn

continuously between two rollers and around the magnet pack. The contaminant is attracted to the magnet then carried on the belt to be released into a hopper can be supplied with electric or hydraulic drive for mobile machines.

4.2 CLASSIFICATION

- In accordance with the magnet species can be divided into:
 - permanent magnetic separator
 - Electromagnetic Removing iron machine
- According to mine classification can be divided into:
 - dry and wet to dry iron removing machine,
 - wet iron remover
- According to the classification of magnetic system can be divided into:
 - Drum type magnetic separator Machine,
 - roll type magnetic separator machine
 - roller type magnetic separator machine.
- According to the number of magnetic system classification can be divided into:
 - single drum magnetic separator,
 - magnetic separator with double cylinder
 - multi cylinder magnetic separator.
- According to mine classification can be divided into:
 - the upper to lower to mine ore separator,
 - magnetic separator.
- According to the strength of the magnetic field classification can be divided into:
 - weak magnetic separator,
 - magnetic separator
 - magnetic separator.
- According to the classification of magnetic system can be divided into:
 - open type magnetic separator,
 - closed magnetic circuit magnetic separator.

- Wet Permanent magnetic drum separator is Iron ore A magnetic separator plants commonly used, it is applicable to choose don't strong magnetic minerals.
- According to the different structure types of body, magnetic separator consists of concurrent flow, countercurrent, half counter current type three. Three kinds of magnetic separator with different groove type inclusion size as follows:
 - downstream trough $\leq 6\text{mm}$
 - countercurrent trough, $\leq 1.5\text{mm}$
 - semi countercurrent trough $\leq 0.5\text{mm}$.
- The downstream separator processing capacity, rough election and selection of magnetic materials suitable for coarse grain, can also be multiple serial work. The downstream separator when given a large quantity of ore, magnetic mineral grains easily lost in Tailings Therefore, to strengthen the operation management, low control Pulp Level.
- Countercurrent magnetic separator is suitable for Fine Strong magnetic minerals of roughing and scavenging operation, high recovery rate, but concentrate grade is low. Because of the coarse material deposited blockage choose don't space, so the countercurrent magnetic separator is not suitable for the processing of coarse material.
- Semi countercurrent magnetic separator can obtain high quality iron ore concentrate, but also can get better recovery rate, so the semi countercurrent magnetic separator is widely used in production practice. It is suitable for processing 0.5mm ore roughers to use gravity-flotation and select, also can have multiple series and parallel, multiple scan and pick.

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4.3 FEATURES

Magnetic separator the whole device by magnetic separation machine (host), coil cooling system, rectifier power supply, pneumatic control systems and machine electrical control system composed of five parts. The host includes a magnet (coil, outsourcing iron yoke), equipped with a magnetic medium and the support structure of the sorting box, the distribution system of the feed stream. Coil cooling system comprises a cooling water distribution pipe, the internal cooling and the external cooling circuit system and the heat exchanger, etc. including dry type rectifier, transformer rectifier and power thyristor rectifier cabinet. The gas control system including gas control valve, pneumatic control cabinets and air compressor. The control system includes a manual and automatic operation control system, cooling system, overvoltage, loss of pressure and overheating protection devices, peripherals interlock operation and fault alarm and automatic shutdown system.

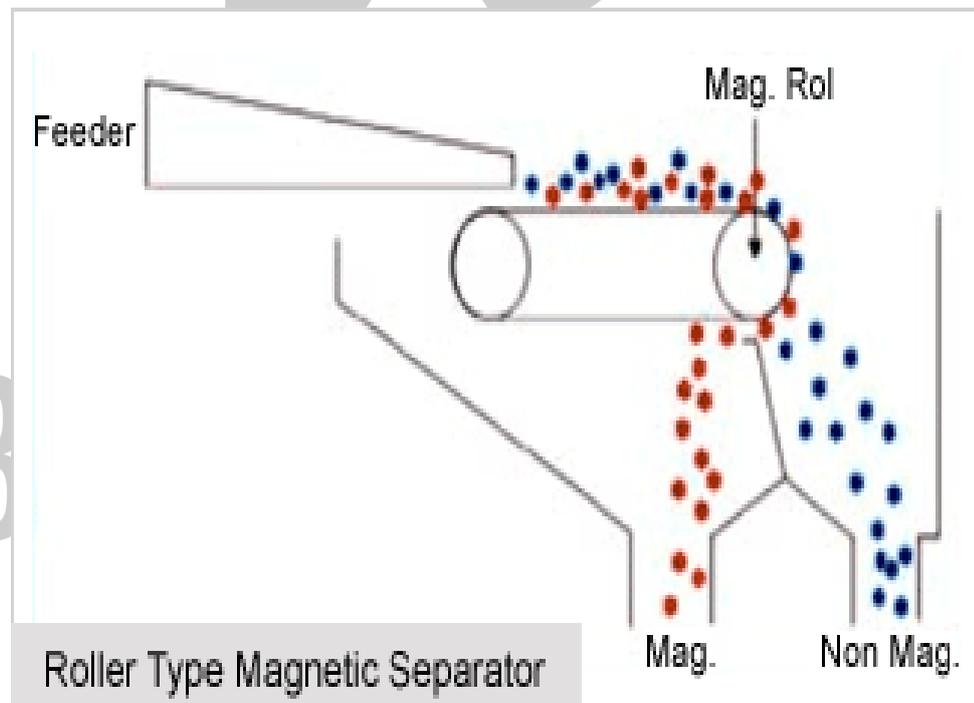


Fig4.3 Roller Type Magnetic Separator

4 HARDWARE USED

4.4.1 Conveyor Belt

A belt conveyor consists of an endless belt of a resilient material connected between two pulleys and moved by rotating one of the pulleys through a drive unit gearbox, which is connected to an electric motor. The driving pulley end is called as head

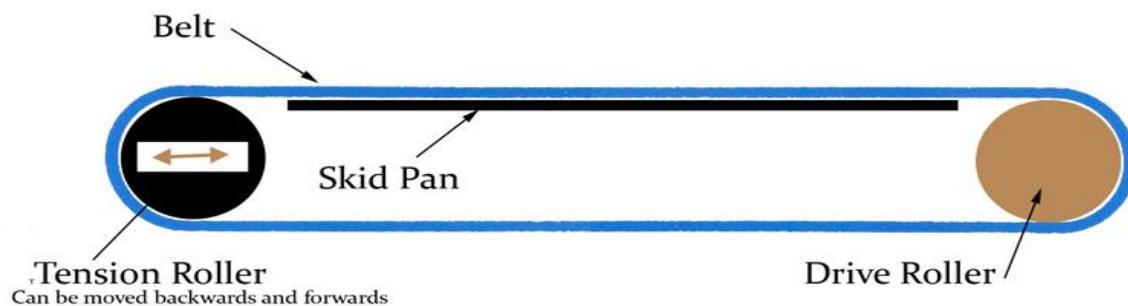


Fig. 4.4.1 conveyor Belt

end, and the pulley is called as head pulley. Conversely, the other pulley is at the tail end and is referred to as the tail pulley as shown in figure.

Material is conveyed by placing it on the belt, through a feeder. As the belt rotates, the material is carried with it on the other end, where it is then dropped in the discharge chute. It should be noted that discharge can be arranged at any point along the run by means of special discharge devices.

As the belt rotates, due to the weight of the belt and the conveyed material, the belt will sag. To support this sag, rollers called as idlers or idler pulleys are placed on both sides (carrying side and the return side). Closely spaced idlers are placed at the loading point, as there is some impact due to the falling material and overcrowding of the material in this region

4.4.2 Magnetic Roller



Fig.4.4.2 Magnetic Roller

Magnetic separators that used permanent magnet rolls could generate fields of low intensity only. These worked well in removing ferrous tramp but not fine paramagnetic particles. Thus high intensity magnetic separators that were effective in collecting paramagnetic particles came into existence. These focus on the separation of very fine particles that are paramagnetic. The current is passed through the coil, which creates a magnetic field, which magnetizes the expanded steel matrix ring. The matrix material being paramagnetic behaves like a magnet in the magnetic field and thereby attracts the fines. The ring is rinsed when it is in the magnetic field and all the non-magnetic particles are carried with the rinse water. Next as the ring leaves the magnetic zone the ring is flushed and a vacuum of about – 0.3 bars is applied to remove the magnetic particles attached to the matrix ring.

Permanent magnetic pulleys are important magnetic products which are used as head pulleys in belt conveyors for removing ferrous contaminants from material flow. The magnetic field generated by the pulley attracts the ferrous fines which are held to the belt until it reaches the underside. After passing out of the magnetic field the ferrous material is collected separately into a chute or bin. The cleaned material is discharged normally over the pulley in a vertical drop.

4.4.3 Roller

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Gravity conveyors are used as a level push line or down grade by utilizing the natural force of gravity. The use of gravity to convey the selected class of packages to move by their own weight, on a bed of rollers or wheels, is, perhaps, the most widely used means for conveying in industry. The weights to be conveyed may vary from a few ounces to several tons.



Fig. 4.4.3 Roller

For example, in department stores, conveyors are used for handling light weight boxes of hosiery and the same conveyors handle heavier boxes of dishes and appliances.

4.4.4 Roller Construction

Thin wall rollers are perfectly satisfactory for most package handling, but should not be used for handling extremely heavy packages with steel strapping or filled steel drums regardless of the indicated roller capacity. Thin wall rollers may be easily bent, dented or cut, thus impairing their usefulness.

4.4.5 Live Roller Conveyor

A series of rollers over which objects are moved by the application of power to all or some of the rollers. The power-transmitting medium is usually belting or chain.

A round part free to revolve about its outer surface. The face may be straight, tapered or crowned. Rollers may also serve as the rolling support for the load being conveyed.

4.4.6 Roller Bed

A series of rollers used to support a conveying medium.

4.4.7 Bearing

A machine part in or on which a shaft, axle, pin or other part rotates.



Fig.4.4.7Roller Bearing

A bearing is a machine element that constrains relative motion between moving parts to only the desired motion. The design of the bearing may, for example, provide for free linear movement of the moving part or for free rotation around a fixed axis; or, it may prevent a motion by controlling the vectors of normal forces that bear on the moving parts. Many bearings also facilitate the desired motion as much as possible, such as by minimizing friction. Bearings are classified broadly according to the type of operation, the motions allowed, or to the directions of the loads (forces) applied to the parts.

The term "bearing" is derived from the verb "to bear" a bearing being a machine element that allows one part to bear (i.e., to support) another. The simplest bearings are bearing surfaces, cut or formed into a part, with varying degrees of control over the form, size, roughness and location of the surface. Other bearings are separate devices installed into a machine or machine part. The most sophisticated bearings for the most demanding applications are very precise devices; their manufacture requires some of the highest standards of current technology.

❖ **There are at least 6 common principles of operation:**

- plain bearing, also known by the specific styles: bushing, journal bearing, sleeve bearing, rifle bearing
- rolling-element bearing such as ball bearings and roller bearings
- jewel bearing, in which the load is carried by rolling the axle slightly off-center
- fluid bearing, in which the load is carried by a gas or liquid
- magnetic bearing, in which the load is carried by a magnetic field

- Flexure bearing, in which the motion is supported by a load element which bends.

4.4.8 Dc Motor

Dc motor is an electric motor converts electrical energy into mechanical motion. The reverse task that of converting mechanical motion into electrical energy, is accomplished by a generator or dynamo. In many cases the two devices are identical except for their application and minor construction details. DC motors are used when there is positioning requirement and also changes in load and torque. DC motors can be conveniently interfaced to Bipolar DAC, or MPUs can generate PWMs to control them.

The classic DC motor has a rotating ligature in the form of an electromagnet. A rotary switch called a commutator reverses the direction of the electric current twice every cycle, to flow through the armature so that the poles of the electromagnet push and against the permanent magnets on the outside of the motor. As the poles of the armature electromagnet pass the poles of the permanent magnets, the commutator reverses the polarity of the armature electromagnet. During that instant of switching polarity, inertia keeps the classical motor going in the proper direction. (See the diagrams below.)

A simple DC electric motor. When the coil is powered, a magnetic field is generated around the armature. The left side of the armature is pushed away from the left magnet and drawn toward the right, causing rotation.

The armature continues to rotate.

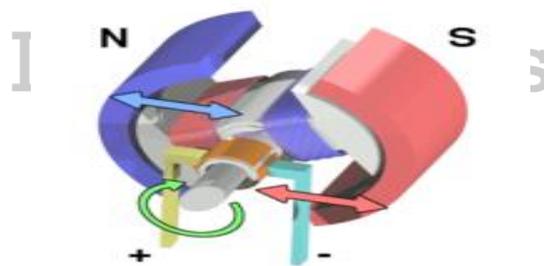


Fig.4.4.8 Dc Motor

When the armature becomes horizontally aligned, the commutator reverses the direction of current through the coil, reversing the magnetic field. The process then repeats Wound field DC motor

The permanent magnets on the outside (stator) of a DC motor may be replaced by electromagnets. By varying the field current it is possible to alter the speed/torque ratio the motor. Typically the field winding will be placed in series (series wound) with the armature winding to get a high torque low speed motor, in parallel (shunt wound) the armature to get a high speed low torque motor, or to have a winding partly in parallel, and partly in series (compound wound) for a balance that gives steady speed over a range of loads. Further reductions in field current are possible to gain even higher speed but correspondingly lower torque, called "weak field" operation.



4.4.9 Shaft

We are using aluminium shaft in roller.

Alignment Needle Roller with Inner Ring: Alignment type needle roller bearings have a convex outside surface which is located in a plastic seating ring with a concaved inner face to match that of the bearing which is located in a drawn sheet steel outer ring allowing for some degree of self alignment.

Benefits: Supplied with the inner ring, tolerates misalignment.

4.4.10 Transformer



Fig.4.4.10 Transformer

A transformer is a device that transfers electrical energy from one circuit to another through inductively coupled electrical conductors. A changing current in the first circuit (the primary) creates a changing magnetic field; in turn, this magnetic field induces a changing voltage in the second circuit (the secondary). By adding a load to the secondary circuit, one can make current flow in the transformer, thus transferring energy from one circuit to the other. It is the phenomenon of mutual induction.

The secondary induced voltage V_S , of an ideal transformer, is scaled from the primary V_P by a factor equal to the ratio of the number of turns of wire in their respective windings:

$$\frac{V_S}{V_P} = \frac{N_S}{N_P}$$

➤ **Transformers are of two types:**

- Step up transformer
- Step down transformer

In power supply we use step down transformer. We apply 220V AC on the primary of step down transformer. This transformer steps down this voltage to 12V AC. We give this 12 V AC to rectifier circuit, which convert it to 5V DC.

4.5 PERFORMANCE AND CHARACTERISTICS

4.5.1 Necessary Condition

The magnetic particles in the magnetic, except by the magnetic effect, but also by the competitions effect. Competitiveness can be defined for all mechanical force opposite magnetic direction, including gravity, centrifugal force, inertial force and the hydrodynamic resistance etc.. In the magnetic separation process, Magnetic is collecting magnetic particle force, also known as the force of magnetic trap; Competitiveness the magnetic particles from the magnetic force, also known as the detachment force. Obviously, the necessary conditions of magnetic particles and the non magnetic particle separation by the magnetic particles larger than the competition. If you want to make two kinds of magnetic particles from different, it is a necessary condition for the magnetic particles, magnetic strong competitiveness should be larger than the weak magnetic

particles, magnetic force should be less than the competition. To illustrate, absolutely pure magnetic products and non magnetic products is not possible in the magnetic separation in practice, in addition to the product purity intergrowth relationship does not monomer dissociation, the number of single magnetic particles with non magnetic products, the number of single nonmagnetic particles mixed with magnetic products. The first case, leading to recovery of magnetic component rate drop, main reason is the size of the magnetic particles is too thin, not enough to overcome the resistance of the magnetic fluid in competitiveness; after a magnetic product quality decline, because most is the existence of strong interaction force between particles, the particle size interest, slurry concentration particle interactions, the more obvious.

Electromagnetic coil can make the magnetic separator and magnetic pole iron core magnetization, produces a magnetic field around it. Between the poles of magnetic field and make the particle magnetization, show magnetism, and then generates a magnetic force; while the non magnetic particle can only receive the magnetic effect observed by naked eye not to faint, resulting in magnetic mineral grains and non magnetic particle separation. Therefore, further understanding of the magnetization of magnetic material, including the measurement of material structure, the magnetic field in the behavior and magnetization degree, is essential to understanding the nature of the magnetic separation process.

4.5.2 Application

Magnetic separator is used in the removal of iron powder in mitochondria; magnetic separator is widely used for resource recovery, the timber industry, mining industry, ceramics, chemical, food and other workshops, applied to particle size below 3mm magnetite, pyrrhotite, roasted ore, ilmenite etc. Material Wet magnetic separation, but also for coal, Non metallic minerals In addition to iron, building materials and other materials, is one of the most widely used in the aircraft industry, high versatility.

4.5.3 Advantage

Magnetic separator greatly reduces the possibility of costly dangerous flat tires and injuries caused by nails, scrap iron particles, staples. Magnetic separator, brooms, lifting magnets, conveyor magnets and magnetic separator for metal debris removal. Magnetic separator used in industry. Magnetic separator simply hangs it from your vehicle and sweeps your entire road or parking lot clean of tire damaging magnetic separator. More industrial use involve magnetic separator

- Steady performance
- Large capacity
- Low cost
- Easy maintenance

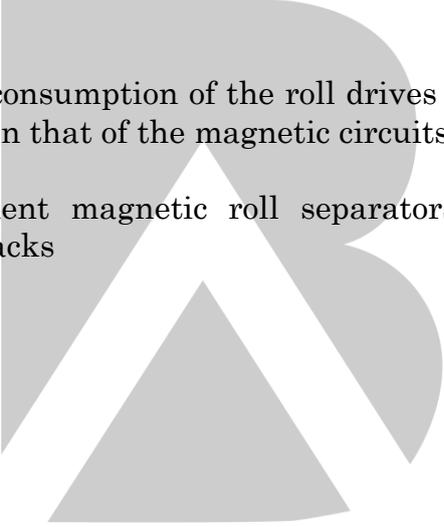
The permanent magnetic drum separator is important to remove ferrous metal from dry bulk products in free-flowing processing systems.

4.5.4 Disadvantage

A serious disadvantage of induced electromagnetic roll separators used for beneficiation of weakly magnetic ores is the need for frequent maintenance of drives and bearings.

In addition, power consumption of the roll drives used in the Ukraine and Russia is often greater than that of the magnetic circuits of these separators.

Rare-earth permanent magnetic roll separators and drum separators suffer from similar drawbacks



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5. EXPECTED OUTCOME

- This serious problem we try to magnet is more efficiency and less maintenance of drives and bearings.
- We try to reduce power consumption of roll drives In magnetic circuits. Also we use more lubricant to reduce friction but not more.
- We try to improve performance of rare earth magnetic separators and separators due not suffer from similar drawback.
- Magnetic separator greatly reduce by nails, scrap iron particles steeples
- The permanent magnetic drum separator is remove ferrous metal and dry bulk products.
- Magnetic separator is one of the ways of separating heterogeneous solid by mixtures.
- Carefully removed the plastic bag around the magnetic bar and scrap of the iron fillings.
- Long hair and loose scarves must be tacked away or tied up.
- The coarse separation of the lean iron ore after coarse crushing or medium crushing eliminates the barren rocks such as surrounding rock ,improves the taste of the iron ore and eases the load of the next procedure.
- Magnetic separator can be used in the closed circuit firing work for restoring the hematite .and it can separator the raw ore that are not fully restored and return it for firing again.
- In the ceramic industry, magnetic separator can remove the iron mixed in the petuntse and improve the quality of the ceramic product.
- Magnetic separator can also be used in coal firing sand making , refractory and other industries that need delroning.

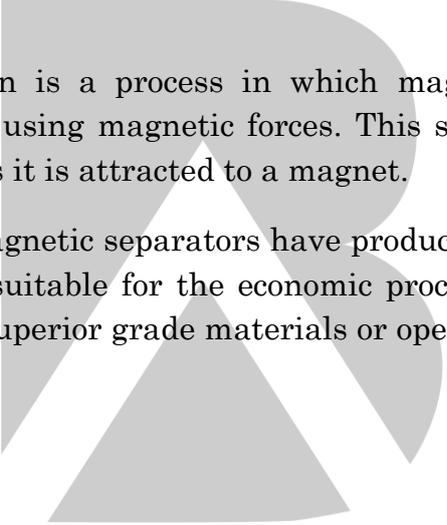
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6. CONCLUSION

Head roll magnets are available in various magnetic strengths. A head roll magnet is mounted as a drive roller in a conveyor belt. Next, it will attract iron particles present in the product and deflect these to the bottom of the belt. There, the iron particles will be released from the magnetic field and collected in a funnel or a slide plate. Magnetic separator is widely used for resource recovery, the timber industry, mining industry, ceramics, chemical, food and other workshops, applied to particle size below 3mm magnetite, pyrrhotite, roasted ore, ilmenite etc.

Magnetic separation is a process in which magnetically susceptible is extracted from a mixture using magnetic forces. This separation technique can be useful in mining iron as it is attracted to a magnet.

Developments in magnetic separators have produced user friendly wet and dry separator which are suitable for the economic processing of silica sands at high capacity to produce superior grade materials or open up new reserves which were previously unusable.



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