RM-200

Installation, Operation and Maintenance Instructions

STAINLESS STEEL SEPARATOR

ERIEZ WORLD HEADQUARTERS: 2200 ASBURY ROAD, ERIE, PA 16506–1402 U.S.A.
WORLD AUTHORITY IN SEPARATION TECHNOLOGIES

Introduction

This manual details the proper steps for installing, operating and maintaining the Stainless Steel Separator.

Careful attention to these requirements will assure the most efficient and dependable performance of this equipment.

If there are any questions or comments about the manual, please call Eriez at 814-835-6000.

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STAINLESS STEEL SEPARATOR

General

Please read and understand the cautions in the adjacent column before installing or operating your Stainless Steel Separator. Please make sure that all personnel who will come into contact with this equipment are aware of these cautions.

Please contact Eriez for additional assistance in the installation, operation, or maintenance of this equipment, as well as for application advice.

⚠ CAUTION ROTATING MACHINERY

As with all equipment involving rotating parts and moving belts, there is potential for property damage or serious personal injury if not treated with caution during all installation and maintenance procedures. Equipment should be switched off and locked out during all procedures that involve contact with the machine. Avoid pinch points between belt and pulleys. Never operate with drive guards removed.

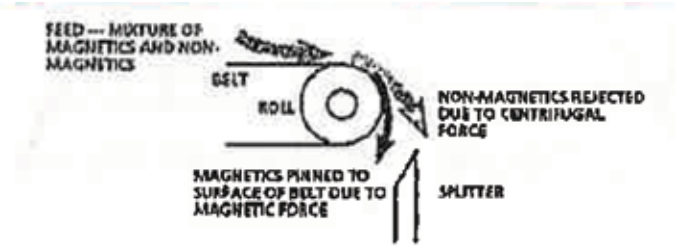

FIGURE 1.

⚠ CAUTION STRONG MAGNET

The Stainless Steel Separator incorporates exceptionally powerful magnetic circuits. Steel and iron tools and other objects may be attracted suddenly and strongly to the magnet, creating the risk of serious pinch-type Injuries. Keep all mild steel and iron tools and equipment well away from the magnetic roll at all times. Avoid situations in which hands, fingers, or other body parts could become trapped between a steel or iron object and the magnetic roll.

Personnel using heart pacemakers should not service or operate this equipment. Such personnel should remain at least 3 feet (1 meter) from the magnet at all times.

Description of Equipment

Principles of Operation

The primary physical principle that makes the Stainless Steel Separator effective is the ability of a highly magnetic pulley to attract and hold magnetically susceptible particles on the surface of a thin, non-magnetic belt passing over the pulley, thereby altering the discharge trajectory of these particles. Non-magnetically susceptible particles in the same mixture are not attracted by the roll, and therefore discharge in a "normal" trajectory, under the influence of the belt motion, centrifugal force, and gravity only. The difference in the discharge trajectories of the two classes of particles enables a separation to be made. (See Figure 1)

Magnetic Circuit

Figure 2 illustrates the typical magnetic field generated by an Eriez Rare Earth roll in the Stainless Steel Separator. The roll consists of a stack of alternating Rare Earth magnet rings and steel pole pieces. As can be seen from the figure, the lines of magnetic flux are concentrated in the steel pole pieces, which may be saturated near the surface of the roll. The field intensity is highest at the surface points where the pole pieces and magnet discs are in contact. At these points the field intensity may be more than two Tesla, compared to a field intensity of about .5 Tesla at surface points located close to the center of the magnet discs. Because of the concentration of flux in the pole piece, surface field Intensity over the entire pole piece will be nearly two Tesla. Material collected on the belt will tend to form lines defining the pole piece edges.

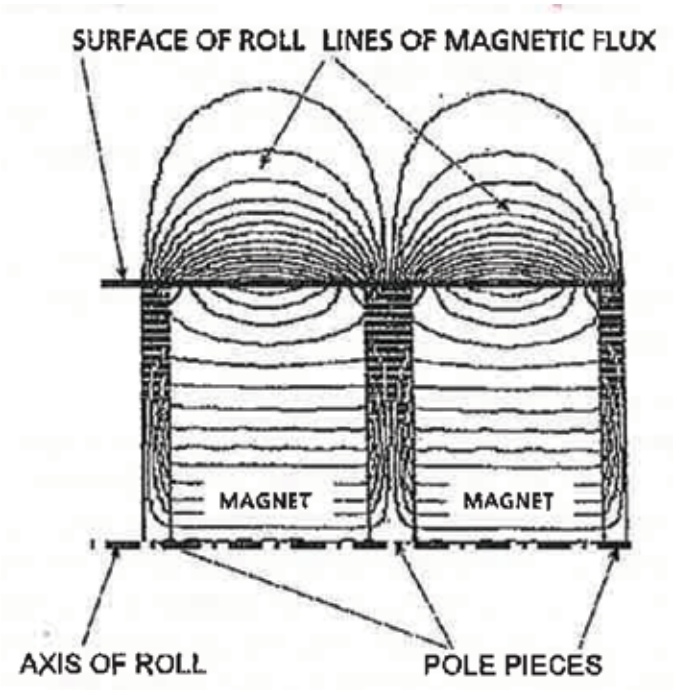

FIGURE 2. MAGNETIC FIELD OF RARE EARTH ROLL

WARNING

Under no circumstances should the construction of the Rare Earth roll itself be disturbed or modified. Disassembly of the roll would not only be dangerous to personnel because of the strong magnetic forces involved (see warning in the Introduction section), but would destroy the carefully engineered magnetic circuit, and could only be repaired by returning the roll to Eriez.

Conveyor Belt

The Stainless Steel Separator is furnished with a urethane conveyor belt with (2) cleats and sidewalls. The belt is approximately 0.051 (1.3 m) thick. Thicker belts will generally result in a reduction in field strength, which may affect separation, performance, and which may have to be balanced against longer belt life in operation.

Feed and Operating Speed

In general, the roll separation performance is based on an assumed layer of particles, one particle thick, as the feed approaches the roll. This must be achieved by careful and uniform feed to the Stainless Steel Separator itself, and by careful control of the belt speed, allowing the feed material to spread in the desired mono-layer. Since the belt speed also affects the centrifugal forces acting on both the magnetic and nonmagnetic particles passing over the roll, selection of the correct speed and feed rate depends greatly on the material characteristics, including relative densities of the magnetic and non-magnet constituents. Eriez technical experts can help greatly with this selection.

Belt speeds are variable with a normal operating range from 80 to 200 fpm (24 to 61 mpm).

Construction

An outline drawing of your Stainless Steel Separator is provided with this manual, and/or attached to the equipment itself. This should be reviewed carefully for special features not covered in the following discussion.

Overall Assembly

The Stainless Steel Separator consists of a 6" (152 mm) diameter rare earth magnetic roll and a 6" (152 mm) diameter tail pulley mounted on a combination mild steel and stainless steel frame. The frame is rigidly attached to a supporting structure at one end, while the other end is vertically supported on a releasable steady-rest. There are fork lift pockets in the supporting structure to allow for easy movement of the Stainless Steel Separator. It is also supplied with legs bolted to the supporting structure. The tail pulley is supported on bearings mounted to a telescoping take-up. Take-up is through a telescoping take-up frame with an adjustment screw.

Frame

The frame is an all-welded combination stainless steel hot rolled steel structure. The drive end is rigidly attached to the support frame, and the opposite end is supported during operation by 2 steady rests. The steady rest is a hinged arm that supports vertical load, and can be swung out of the way when necessary to clear the belt. The frame center section is open to minimize material build-up under the belt. All sizes have similar frames.

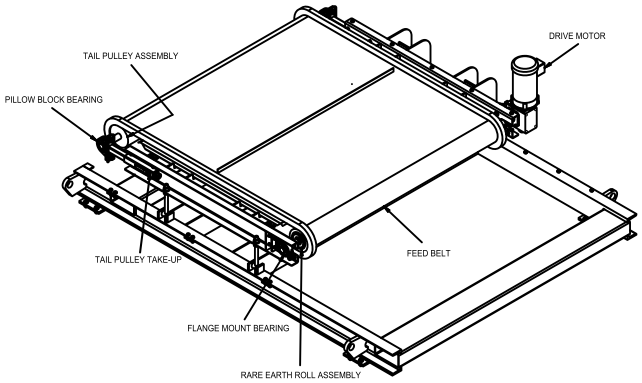

FIGURE 3. STAINLESS STEEL SEPARATOR CONSTRUCTION FEATURES

The support structure contains fork lift pockets to easily move. Legs are bolted to the support structure for easy changes.

Roll

The magnetic roll consists of stacked 6" (152 mm) diameter discs, alternating neodymium-iron-boron ceramic magnets and mild steel pole pieces. The effective width of the roll is either 20" (508 mm), 40" (1016 mm) or 60" (1524 mm) depending on the capacity of the equipment. The steel pole pieces have the same outside diameter as the magnets, but are much thinner.

The roll center shaft rides in flange mounted ball bearings, rigidly attached to the support structure. The roll is driven directly by a TEFC AC motor, with a gear reducer coupled to the shaft.

Belt

The standard belt supplied with this unit is a 0.051" (1.3 mm) thick urethane belt. This belt has sidewalls and (2) 1" (25.4 mm) high cleats.

Tensioner

The tensioner and take-up adjustment consists of a telescoping take-up assembly located on either side of the tail pulley. The tension of the belt is adjusted by the manual screw adjustment on the take-up.

Drive

The magnetic roll is driven by a single reduction worm gear motor. The motor is connected directly to the roll shaft and attached to the support structure by a torque arm. The motor is "inverter duty" to handle a variable frequency control.

The standard variable speed control is furnished in a NEMA 12 dust tight housing, and can be mounted either locally or remotely.

Chute Work

All chute work is constructed of mild steel. The discharge chute work is used to split/separate the non-magnetic and magnetic fractions. The discharge chute is adjustable to allow for proper positioning for material separation.

Installation

The unit has been fully assembled, adjusted, and tested at the factory prior to shipment. Use care when transporting and uncrating to avoid damage to the equipment. Also, take note of the cautions presented in the introduction to this manual. These precautions should be made known to all operating and maintenance personnel involved with this equipment.

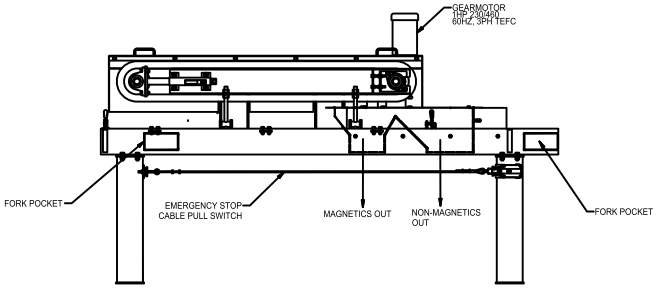

FIGURE 4. INSTALLATION CONNECTIONS

Alignment and Level Requirements

The unit is self supporting, but should be bolted into position, using the bolt holes provided, to assure continued proper alignment with feed and discharge chutes and hoppers. The unit should be installed level from side to side to within ±1/16" (1.6 mm) for 20" units, ±1 /8". (3.2 mm) for 40" units, and ±3/16". (4.8 mm) for 60" units. A level installation is important to assure uniform bed density in the product flow over the roll and to assure reliable belt tracking.

Clearances

No clearance is required at the discharge points. However, access should be provided for the purpose of clearing any plugging that may occur.

Electrical Connections

The standard Stainless Steel Separator is supplied for a 460 VAC 60 Hz three phase power supply. The roll speed is set by individual variable frequency controllers. All switches and controls are housed in a single NEMA 12 box. Unless specified otherwise, all internal connections on the machine have been made at the factory; you need only connect line power at the control box.

⚠ CAUTION ELECTRICAL HAZARD

Voltages present in the control housing can cause serious injury or death. The control panel disconnect switch should not be defeated. All electrical work should be carried out only by a qualified electrician.

Check the line voltage and current requirements stamped on the name plate of your Stainless Steel Separator panel. Verify that these agree with your available supply or run appropriate lines to the machine location. Referring to the Control Schematic and Outline drawing supplied with the machine, make the necessary line connections at the control panel.

Belt Rotation Direction

After making electrical connections, start the roll at low speed and verify correct roll and belt rotation direction. Correct electrical polarity if necessary.

Belt Tracking and Tension

Observe the unit operating at low speed long enough to be certain that the belt tracking has not been disturbed by shipping and installation. If the belt needs to be re-tracked, refer to the section on Maintenance - Belt Tracking, below.

Adjust the speed to the desired operating speed and observe the belt motion carefully to be certain that it continues to track properly.

Operation

Prior to Operation

Prior to operating the Stainless Steel Separator at any time, the following conditions should be checked.

Belt Alignment

If a belt is significantly misaligned, follow the directions in the Maintenance section below to restore alignment before operating the separator.

Belt Wear

If any belt is worn excessively, replace it, following the procedure described in the Maintenance section. Pay particular attention to the edges of the belts where fraying may occur, keeping in mind that a slight amount of fraying is normal but significant tears should be cause for replacement.

Dust Build-up

Remove and significant dust build up on the roll.

Startup and Shutdown

To prevent loss of material and/or build up of material, the Stainless Steel Separator should always be started prior to starting the feeder equipment. Start the feeder equipment only when proper roll operation — speed, belt tracking, etc. — has been verified.

For the reasons given above, the feed equipment should always be stopped prior to stopping the Stainless Steel Separator. Allow the Stainless Steel Separator to run for long enough to clear all material out of the machine to prevent migration of material to the roll surface during the machine downtime.

Operating Adjustments

Many combinations of operating settings are possible on the Stainless Steel Separator. The precise combination of adjustments appropriate to your material can only be determined by experimentation. Please contact Eriez' technical experts for assistance in setting operating settings for your specific application. Eriez can also carry out laboratory tests on your feed materials to help in optimizing these settings.

Three primary operating parameters can be adjusted to affect the separation performance of the unit. These are:

- Belt (or roll) speed
- Discharge chute position
- Feed rate

The discussion below covers, in general terms, the above three operating adjustments and their effects on separator performance.

Belt (Roll) Speed

This is the primary operating parameter affecting magnetic separation. It controls the balance between centrifugal and magnetic force as the material passes over the roll. Increasing belt speed will increase the centrifugal force, generating an expanded trajectory arc for the non-magnetics, at the expense of losing some magnetics into the non-magnetic stream as the centrifugal force overcomes the magnetic attraction at the surface of the roll.

A favorable effect associated with increased belt speed is an increase in throughput capacity for a particle layer of a given thickness.

An adverse effect associated with increased belt speed is potential greater vibration of the belt and consequent mechanical agitation of the particle layer. This effect results in a slightly increased distance between the “average” magnetic particle and the roll surface as the belt passes over the roll, and thus may decrease the effectiveness of the magnetic field.

Discharge Chute Position

A splitter position close to the roll will result in a relatively high grade magnetic product with relatively low recovery. If the desirable product is the non-magnetic fraction, a close splitter position will result in a relatively high recovery, but with some remaining magnetics in the product.

The converse is true for a splitter position relatively distant from the roll. If the desired product is magnetic, the recovery will be relatively high but the grade will be relatively low (ie: non-magnetic contamination will remain). If the desired product is non-magnetic, a distant splitter position will result in relatively low recovery of a high grade product.

The position of the discharge chute acts as the splitter. This is adjustable by sliding the discharge chute forward and backward on the support frame.

As in most separation processes, the optimum discharge chute position must be determined by experimentation using the actual feed to be processed, and taking into account the capacity, recovery, and grade requirements of your specific process.

Feed Speed

In conjunction with the belt (roll) speed, this controls the thickness of the material layer on the roll. It should be adjusted for a uniform flow across the width, with a depth that is compatible with the belt (roll) speed as discussed above. Note that the material may leave the feeder in a layer thicker than one particle, depending on the relative speed of the belt. The objective is to have a one-particle thick layer of material on the belt as the feed passes over the roll.

Maintenance

The following sections discuss maintenance of the separator itself. See the appendices and attachments for maintenance procedures and requirements for the feeders, controls, and other ancillary equipment supplied with the roll.

⚠ CAUTION
Rotating parts, moving belts and pinch points may cause severe personal injury. PROPERLY LOCK OUT THE SEPARATOR BEFORE PERFORMING ANY MAINTENANCE THAT REQUIRES CONTACT WITH THE MACHINE. To avoid eye injury, wear goggles when cleaning off dust accumulations.

Routine Maintenance

The procedures described here should be carried out at least daily (or as noted in the discussion); more often if your process demands it. The machine should be checked hourly during the first few days of operation, and at least once per shift thereafter.

Remove Dust Accumulation

On a daily basis the machine should be inspected for dust buildup on the roll or other internal components.

Dust accumulated on the roll can adversely affect magnetic performance, damage the belt by increasing wear rate, and causing mistracking of the belt.

If dust buildup is observed, it should be removed by vacuum or air blast, scraping or brushing as necessary.

Remove Tramp Iron

Inspect for and remove ferrous materials, such as nuts, bolts, or welding slag, that may not have discharged from the belt. These materials may simply roll in place when trapped on the magnetic roll, eventually wearing through the belt.

Check Belt Tracking

Verify that the belt remains essentially centered on the pulley.

Check Bearing Lubrication

The Stainless Steel Separator has four bearings, two on the magnetic roll and two on the tail pulley.

BEARINGS
The magnetic roll bearings are Sealmaster™ Type SFT. The tail pulley bearings are Sealmaster Type NP. They should be checked periodically for overheating or other signs of inadequate lubrication. They should be re-lubricated periodically according to the following table.

Temperature	Cleanliness	Greasing Interval
Up to 150˚F (Up to 66˚C)	Dirty (normal RE roll operation)	1 week to 1 month
Over 150˚F (Over 66˚C)	Dirty	Daily to 2 weeks
Any temp	Very dirty	Daily to 1 week

RE-LUBRICATING
When re-lubricating, the grease should be a good quality conforming to NLGI Grade 2. It should be free of dust, rust, metal particles, or abrasives. Approximately 3/4 oz (22 cc) of grease is required to fill the grease chamber. For best results, the grease should be added while the roll is in operation. **CAUTION: Only the grease gun should contact the machine during this procedure.** The grease should be pumped in slowly until a slight discharge is noted around the bearing seal. Note that during operation immediately following re-lubrication there may be a temperature rise of 10-30˚F (6-17˚C). This is normal, and will disappear as operation continues.

Belt Replacement

Use the following procedure to change the standard urethane belt and most other belts used on the Stainless Steel Separator:

1. Remove any surrounding side guides and guards.
2. Use adjusting screws on telescoping take-up to bring tail pulley closer to magnetic roll. This will allow belt to become loose on the conveyor.
3. Referring to Fig. 5, loosen the nuts on the (2) steady rests and then swing down.
4. The belt may now be removed easily by simply pulling it toward you. Belt must be guided over conveyor frame. IMPORTANT: If the belt is to be reused, be careful not to crease it during removal.
5. While the belt is removed, take advantage of the opportunity to clean the roll and tail pulley of any ferrous material or dust buildup.
6. Before installing the new belt, note the direction of the overlap splice, if any. The overlap should be installed “trailing.” This will reduce the possibility of catching the edge on the splitter or on ferrous material.
7. Slide the new belt into place on the tail pulley and roll. Use care not to damage or crease the belt during this procedure. Creases are generally not self-repairing, and will adversely affect the smooth operation of the roll.
8. Center the belt on the tail pulley.
9. Hinge both steady rests back into the slots in the frame. Tighten nuts to hold in place. Ensure the conveyor is level from side to side within 1/16" (1.6 mm) for 20" units, 1/8" (3.2 mm) for 40" units, and 3/16" (4.8 mm) for 60" units. Adjust by moving nuts up or down on threaded rod.
10. Follow the directions below to tension and track the new belt.

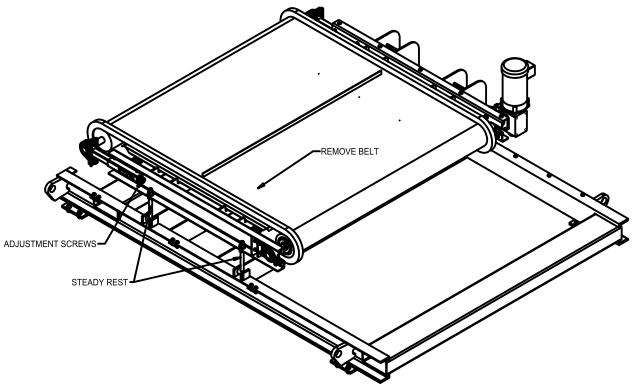

FIGURE 5. BELT REMOVAL

Belt Tensioning and Tracking

All of the belts used on the Stainless Steel Separator are tensioned and tracked similarly. The machine has been designed so that this procedure should take less than 5 minutes, including tracking time. Only one person should be required, as only one end of the tail pulley is adjusted at a time.

General Guidelines

The stresses put on the belt during tensioning can quickly damage it. Try to achieve a tension that is uniform across the width of the belt and that would be characteristic of a fairly 'loose', low pitched drum head. A symptom of over tightening is a crease that forms in the center of the belt and spirals outward. If this persists for more than a few seconds, the belt is irreparably damaged.

All belts have a break-In period to remove lumps and flat spots, and to come to operating temperature. The overlap splice may cause a slight bounce of feed material initially. This should improve with time. If it does not, check the belt for possible creases that may have occurred during installation.

There are possible contact points under the feed and other parts of the separator. The belt makes 50,000 to 100,000 or more cycles per day. Even a slight contact will wear a hole through the belt if it is allowed. Examine these points of near contact after tracking and tensioning the belt. If points of contact are found, adjust the equipment to eliminate it.

Tensioning/ Tracking Procedure

Tensioning and tracking must take place simultaneously. Use the following procedure to tension and track the belt:

1. Run the belt at slow speed.
2. Carefully watch the edges of the belt where they contact the ends of the tail pulley. The belt should follow the tail pulley edge.
3. If the belt does not remain centered, tighten or loosen the adjustment screw on the telescoping take-up on one end of the tail pulley or their counterparts on the other end of the tail pulley, to shift the belt toward the center of the pulley. Turn the nut to increase tension on the side of the belt away from which you want the belt to move.
4. Continue to make small adjustments (1/4 turn) as necessary to improve the tracking of the belt. Do not continuously tighten one side of the belt. After tightening one side, loosen the other if more tracking is needed.
5. The belt should be closely monitored (periodically) for the first hour.

Bearings

The Sealmaster™ SFT flange mounted bearings furnished on the head pulley of the separator and NP pillow black mounted bearings on the tail pulley have inside diameters ground for a sliding fit over the shaft. They are easily and securely locked to the shaft by means of self-locking, cup point, socket head setscrews. Two setscrews are furnished on each bearing sleeve, and both setscrews must be used for satisfactory performance.

To install a new bearing on a shaft:

1. Make certain that the shaft is free of burrs and foreign material.
2. Back the bearing setscrews out so that the tips are clear of the bore.
3. Slide the bearing onto the shaft to the approximate final position. Never hammer the ends of the inner race, since they are relatively soft. If necessary to apply force, use a brass bar or pipe against the inner race to drift the bearing into place. Do not tighten the setscrews at this time.
4. Mount the bearing flange securely to the supporting frame, adjusting the bearing position on the shaft as required.
5. Rotate shaft to make sure it turns freely.
6. Tighten the setscrews securely onto the shaft. Recommended torque: 126 in-lb (14.2 Nm).

Motor/Gear Reducer

Refer to manufacturer's instructions attached to the separator.

Spare Parts

The following spare parts are recommended to be held in stock:

Item	Eriez Part Number	Quantity Used
Feed belt	See outline drawing	1 per unit
Roll Bearing	225401	2 per unit
Motor/ Reducer	404601/ 470453	1 per unit
Tail Pulley Bearing	225379	2 per unit
Telescoping Take-Up	471796	2 per unit

Note: Some safety warning labels or guarding may have been removed before photographing this equipment.

World Authority in Separation Technologies

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