

# *Wet Drum Separators*

**HEAVY MEDIA AND CONCENTRATION MODELS**



**FOR AUTOMATIC, CONTINUOUS RECOVERY OF MAGNETITE  
OR FERROSILICON IN HEAVY MEDIA OPERATIONS AND  
CONCENTRATION OF FERROUS AND WEAKLY MAGNETIC ORES**



## HEAVY MEDIA AND CONCENTRATION MODELS

# Wet Drum Separators

*Eriez' Drum Separators are setting industry standards. The newest advances in magnetic circuitry design, plus over a quarter of a century of experience with solid/liquid separation, are combined in Eriez Wet Magnetic Drum Separators.*



*Construction of a wet drum magnet element*

Innovations in both magnetic circuit design and materials of construction are applied to Eriez wet drum magnetic separators. This results in maximum magnetite recovery while operating with a minimum amount of wear and maintenance. Refinements in the magnetic circuit, tank design, and drive system have resulted in further improvements in metallurgical performance and operation.

The magnetic element is the most important feature of a wet drum separator. Although there are several variables influencing magnetic separation, the magnetic field configuration is indisputably the foremost variable for high levels of magnetite recovery. Eriez designs the appropriate magnetic circuit for any given application using finite element analysis modeling techniques.

All stainless steel construction provides excellent wear characteristics. The complete tank including the feed box is fabricated from 304 stainless steel. The drum shell is fabricated from one-piece 304 stainless steel and incorporates a wear wrap. Optional stainless steel end flanges are available. Impact and high wear areas can be lined with wear resistant materials such as Nitronic 30, hot vulcanized rubber, ceramic tile or manganese plate.

### FEATURES

- **Strongest, most effective magnetic elements in the industry**
- **Ceramic and Rare Earth magnetic elements to cover LIMS & MIMS applications**
- **Stainless steel encapsulated magnetic element**
- **One piece stainless steel drum shell**
- **Abrasion-resistant aluminum or stainless steel end flanges**
- **Double-row, self-aligning ball bearings easily accessible without drum disassembly**

There are various drive options available. Drive systems include chain and sprocket, synchronous (cog) belt, and shaft mounted direct. Motors are high efficiency. Mill and Chemical duty motors and Taconite seals are also available. The standard bearing is a double-row self-aligning ball bearing that is greasable during operation.

All Eriez Wet Drum Magnetic Separators receive a complete inspection to evaluate magnetic field profile, mechanical integrity, and appearance. The separators undergo a "run-in" period to assure efficient operation of the drive system.

In a wet drum separator, the magnetic force acting on a ferromagnetic particle is predominately opposed by hydrodynamic drag force.

This feature, when properly applied, provides the vehicle of separation washing away the non-magnetic particles while the ferromagnetic particles are collected in the magnetic field. The hydrodynamic drag force is also responsible for any losses of ferromagnetics.



*All Stainless Steel Tank and Feedbox Construction*

## *Operating Features of Wet Drum Magnetic Separators*

The variables affecting the collection of ferromagnetics in a wet drum magnetic separator are:

**Magnetic field strength.** The magnetic field strength must be sufficient to effectively collect ferromagnetic minerals.

**Hydraulic capacity.** Ferromagnetic recovery is directly related to the flowrate through the separator. As the flowrate increases, the slurry velocity and consequently the fluid drag force increases which tends to detach more magnetite particles from the opposing magnetic field.

**Percent solids.** The percent solids of the feed directly affects the selectivity of the separation. As the percent solids increases, the slurry becomes more viscous minimizing the effects of the fluid drag to assist in the separation of the silica.

**Ferromagnetic content.** Any given wet drum magnetic separator has the characteristic of removing a limited amount of ferromagnetics based on the diameter of the drum, peripheral speed, and the magnetic field strength. This is referred to as the “magnetic loading”. Exceeding the limits of this magnetic loading will result in increased magnetite losses.

There are two distinct applications for wet drum magnetic separators: the recovery of magnetite or ferrosilicon in a heavy media process, and the concentration and recovery of magnetite from iron ore.



*All Stainless Steel End Flange, Shell and Wear Wrap*



*Direct Drive - Shaft Mounted Gearmotor*



*Synchronous - Cog Belt Drive*



# Wet Drums FOR HEAVY MEDIA DUTY

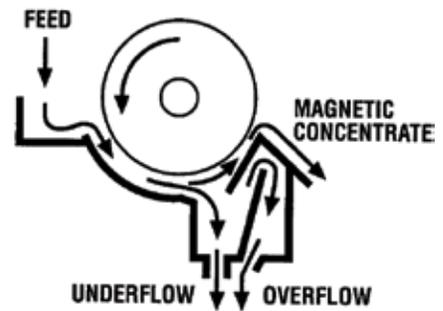
Wet drums in heavy media applications provide continuous recovery of magnetite or ferrosilicon. Eriez has set the industry standards in the heavy media industry developing both the design criteria of the magnetic circuit and the benchmark of operation. The 950 gauss Interpole magnetic element, developed by Eriez, is the most acclaimed magnet of engineering standards in the industry. Eriez has also set the benchmark for wet drum performance. The culmination of various in-plant tests has demonstrated that the separators will achieve magnetite recoveries in the 99.9+ percent. (This is based on magnetite losses of less than 1 gram/gallon of non-magnetic effluent).

The Eriez Wet Drum Magnetic Separators utilized the 950 gauss Interpole magnetic element as standard equipment. The Interpole style element utilizes a true ceramic "bucking" magnetic pole or "interpole" between each main pole. The magnetic field of the bucking elements are charged to oppose both of the adjacent main poles resulting in increased magnetic field at depth. The Interpole element allows relatively high magnetic loading resulting in higher unit capacity and improved separation efficiency.

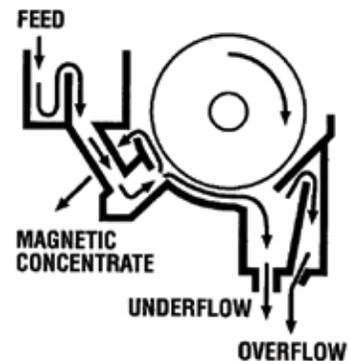
Two basic tank styles are offered, concurrent tank and counter-rotation tank. In **Concurrent Tank Style** the drum rotates in the same direction as the slurry flow in the concurrent tank style. The slurry enters the feedbox and is channeled underneath the submerged drum. The slurry then flows into the magnetic field generated by the drum. The magnetite is attracted by the magnetic field, collected on the drum surface, and rotated out of the slurry flow. This tank style results in a very clean magnetic product.

The **Counter-Rotation Wet Drum Tank Style** is preferred for heavy media applications. The drum rotates against the slurry flow in the counter-rotation tank style. The slurry enters the feedbox and flows directly into the magnetic field generated by the drum. The magnetite is attracted by the magnetic field, collected on the drum surface, and rotated out of the slurry flow. Any magnetite that is not immediately collected will pass through to a magnetic scavenging zone. The short path that the magnetic material must be conveyed between the feed entry point and the magnetics discharge lip, combined with the magnetic scavenging zone, results in high magnetite recoveries.

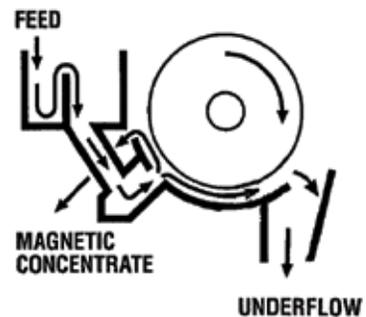
The Eriez Wet Drum Magnetic Separators are available in either the concurrent or counter-rotation tank style. The specific application warrants the selection of tank style.



*Concurrent Tank*



*Counter-Rotation Tank*



*Self-Leveling Counter-Rotation Tank*

# Self-Leveling Separator

The Eriez Self-Leveling wet drum magnetic separator represents the newest available technology. This separator combines the best engineering and operational features and provides excellent performance with ease of operation, inspection, and maintenance.

Both the concurrent and the counter-rotation tank have a full width overflow that must be maintained during operation. A deviation in the overflow level may result in inefficiencies in the operation. A new Eriez development is the counter-rotation Self-Leveling tank style. This tank has several attributes that provide operational advantages as follows:

- Self-leveling – There are no discharge spigots to adjust
- Maintains constant tank level at any flow rate
- High capacity – Tank design accommodates surges and fluctuations in feed rate
- High magnetite recovery utilizing “built-in” scavenging zone
- Ease of operation – No adjustments or monitoring required

The Self-Leveling tank has been engineered combining many features that allow ease of operation, inspection, and maintenance:

- Engineered for “hands-free” operation
- 950 gauss interpole magnetic element. The strongest magnet in the industry
- 132 degree element provides excellent scavenging resulting in high magnetite recoveries
- Synchronous cog belt drive. Quiet operation that requires no lubrication
- Greasable bearings with the grease fittings located on each end of the shaft. The bearings can be lubricated during operation
- Oversize feedbox to contain surges and fluctuations in the feed rate

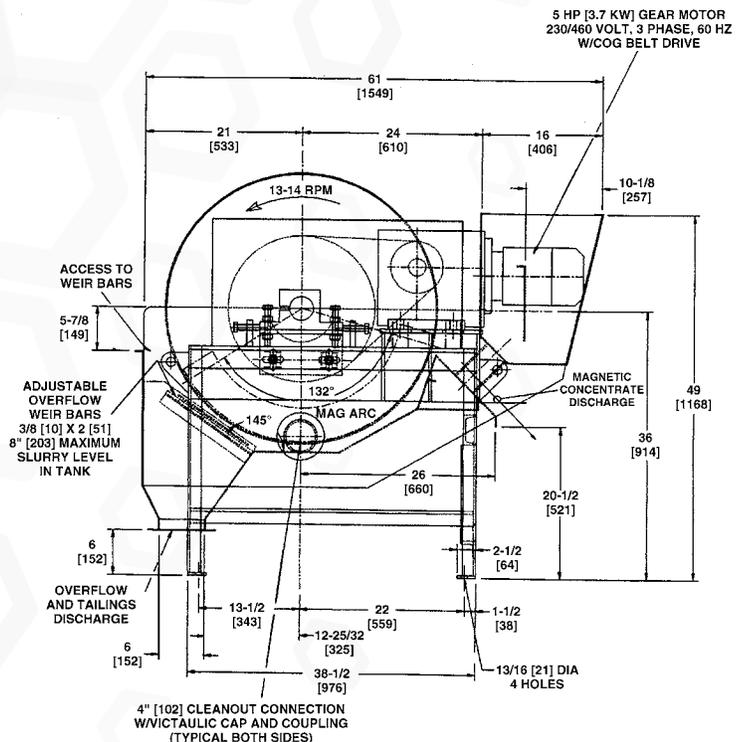
A cross-sectional view of the 36-inch diameter Self-Leveling wet drum magnetic separator is shown below.



*Self-Leveling Counter-Rotation Tank*



*Self-Leveling Counter-Rotation Tank - Drum Positioning and Magnet Adjustment*



*Cross-Section View - 36" Diameter Self-Leveling Separator*

# Wet Drums FOR CONCENTRATION DUTY

Wet drum magnetic separators are the most vital part of the upgrading process in magnetite concentration. The upgrading of primary magnetite is always accomplished with wet drum separators. Mill feed is typically upgraded to 65+ percent magnetic iron using a series of wet drum magnetic separators. The number of magnetic separation stages required to upgrade the ore is dependent on the magnetite content and the liberation characteristics of the ore.

Eriez Wet Drum Magnetic Separators are engineered and fabricated to provide reliable operation in demanding applications. The separator is designed for the continuous treatment of coarse milled ore providing a high level of availability. The tank and drum are fabricated from heavy gauge stainless steel with wear plate in impact areas. Wear areas are protected with hot vulcanized rubber. The drum utilizes heavy-duty spherical roller bearings with a B-10 life of 100,000+ hours. The drive system utilizes a Mill and Chemical Duty motor coupled to a shaft mounted gear reducer complete with Taconite Seals.

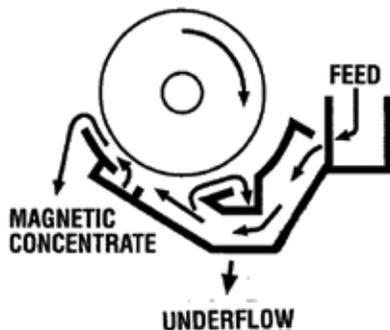
The initial separation stages, termed Cobber or Rougher, recovery magnetite from a coarse milled ore containing high levels of silicate minerals. These initial separation stages reject a substantial amount of weight prior to reprocessing the magnetite concentrate. This stage accounts for proportionately the highest loss of magnetic iron in the concentrating circuit and also provides the opportunity for the greatest improvement in recovery.

Most cobber and rougher magnetic separators are double drums (concentrate retreatment) to provide a two-stage separation and reject a maximum amount of weight. A counter-rotation style tank is always used in the cobber/rougher stage to provide a high level of magnetite recovery. The self-leveling tank in this

application provides excellent metallurgical results while operating at high capacity. In this stage, it is necessary that the magnetic element generate a “deep” magnetic field for the collection of coarse locked or composite particles. An 1150 gauss Interpole magnetic element has been designed specifically for recovering coarse ores. This is the strongest ferrite magnetic element utilized in a production wet drum magnetic separator.

Subsequent separation stages are typically conducted on magnetic concentrates after regrinding. These separation stages are termed Cleaner or Finisher. The cleaner and finisher magnetic separators are typically double or triple drums (concentrate retreatment) to produce a high grade magnetic concentrate. A counter-current or Steffenson style tank is used in the cleaner/finisher stage to provide a high degree of selectivity in the separation.

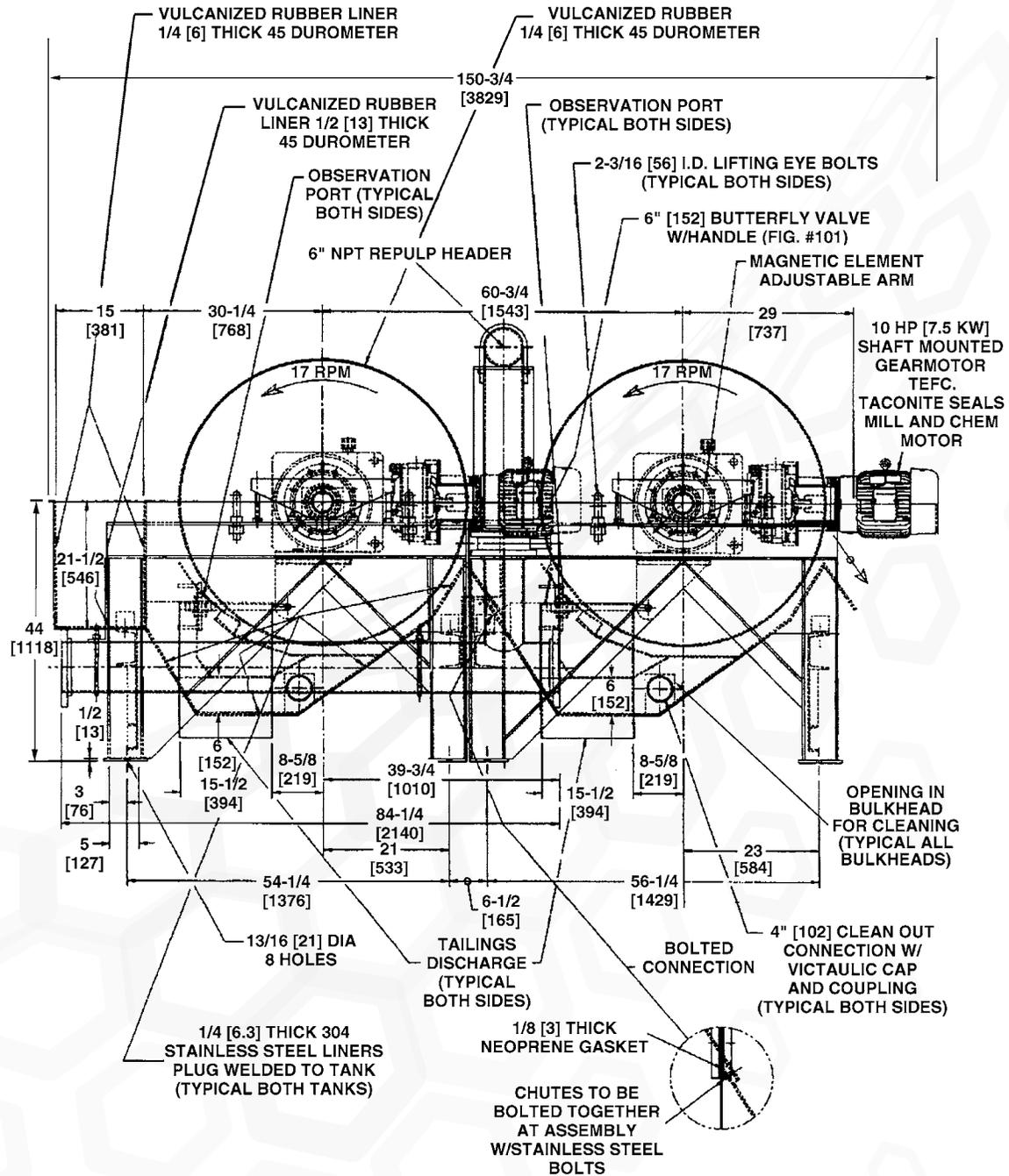
The feed enters the separator at the bottom of the tank and the drum rotates in the same direction as the slurry flow. This tank also has a scavenging zone. The nonmagnetics must migrate through the magnetic field to a full width overflow. This design, with the full width overflow, allows the tank to be self-leveling. There are no tailings spigots that must be adjusted to match the flow of the separator feed. This design is most effective for producing a clean magnetite concentrate. The magnetic element should incorporate several agitating magnetic poles to provide a high degree of cleaning. Since the finisher feed consists of fairly well liberated magnetite, extreme magnetic field strengths are not required for collection.



*Counter-Current Tank*



*Model CDA Wet Drum Undergoing “In-Plant” Testing*



<b>APPROXIMATE SHIPPING WEIGHT</b>	33,600 LBS	15,240 KG
<b>DRUM AND MAGNET WEIGHT</b>	11,200 LBS	5,080 KG
<b>TANK AND FRAME WEIGHT</b>	4,800 LBS	2,177 KG
<b>GEARMOTOR WEIGHT</b>	800 LBS	363 KG

Cross-Section View - 48" Diameter Double Wet Drum Magnetic Separator with Counter - Current Tanks

**NOTE: These drums are available in 10ft (3.05m) and 12ft (3.66m) magnetic element widths**

# Eriez Engineering Services

Eriez provides Engineering Services to cover a wide range of functions, assistance and support. Specific engineering features related to the wet drum magnetic separators are as follows:

- Design and equipment modifications incorporating specific features and options. The separator may incorporate various options and features applicable to the process.
- Equipment layout and dimensional drawings. Modifications are common to fit an existing plant or provide specific operating characteristics.
- Equipment selection, sizing, material balances, and predicted magnetite recovery. Eriez has a database for wet drum magnetic separator sizing and metallurgical performance.

Specific engineering features related to the plant performance of wet drum magnetic separators are as follows:

- In-plant mechanical inspection. Field inspection of the mechanical aspects as well as the drum and magnetic element adjustments.
- In-plant sampling of wet drum magnetic separators to assess magnetite recovery. Samples of the wet drum feed and non-magnetic product are subjected to Davis Tube test to quantify magnetite content.
- In-plant testing of production scale wet drum magnetic separators as new equipment and retrofit of existing equipment.

Based on in-plant testing, Eriez has compiled an extensive array of data relating to the operation and performance of wet drum magnetic separators. Please contact Eriez for information on your specific application.



## WORLD AUTHORITY IN SEPARATION TECHNOLOGIES

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