



## Motorized Pulleys Mounting Orientations



### Head Pulley Drive (Horizontal Mounting Surface)

Model 630H at 24" diameter and 30 HP drives elevated sinter discharge conveyor at major US steel mill. Note that mounting brackets are bolted onto upper surface of a sliding horizontal mounting plate. The sliding plate serves as a "mechanical take-up", enabling plant personnel to maintain appropriate slack side belt tension as belt stretches throughout its service life.

Technical Precaution: It is essential that Motorized Pulleys be mounted as shown on pages 86-87 of this catalog. Correct installation will ensure that Motorized Pulley will have adequate oil circulation and avoid stress-related radial load problems.



### Head Pulley Drive (Vertical Mounting Surface)

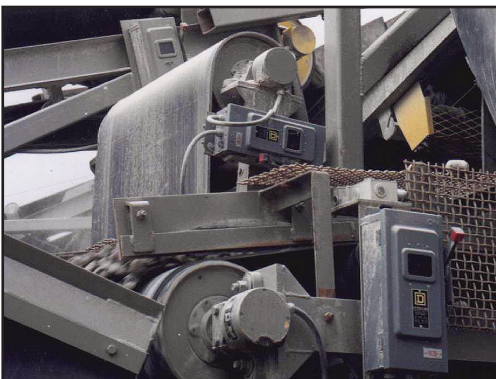
Model 400H at 16" diameter and 20 HP drives inclined bottom ash discharge conveyor of portable recycling plant at US waste-to-energy power plant. Note that mounting brackets are bolted onto vertical surface of conveyor frame.



### Boom Drive Pulley (Below Frame)

Model 800H at 32" diameter and 100 HP drives articulating boom belt to carry taconite pellets on bucket wheel reclaimer at major US rail-to-ship transfer terminal. Note that Motorized Pulley is mounted to the bottom of the horizontal steel structure. Ordinarily, it is unacceptable to mount a Rulmeca Motorized Pulley "upside down", as explained on page 87. However, this Motorized Pulley was modified by Rulmeca prior to installation to accommodate the special mounting orientation.

Technical Precaution: It is essential that Motorized Pulleys be mounted as shown on pages 86-87 of this catalog. Correct installation will ensure that Motorized Pulley will have adequate oil circulation and avoid stress-related radial load problems.



### Center Pulley Drive Nest

Mobile crushing and screening plant features three Model 320M at 13" diameter and 5.5 HP in congested center drive location. Note flexible conduit connecting terminal boxes on end of each pulley shaft with external junction boxes and manual disconnect switches.



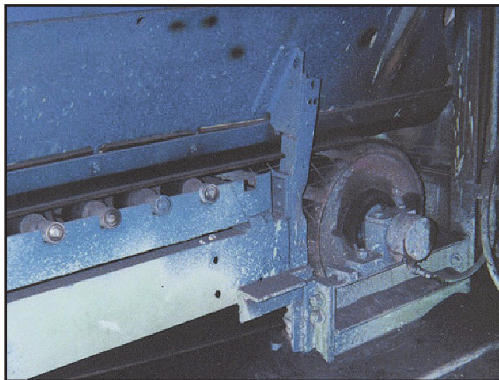
# Motorized Pulleys Hopper Feeder Drives



### Limestone Quarry

Two model 400M (16" diameter) 5.5 HP Motorized Pulleys were installed to automatically "choke feed" two tertiary gyratory crushers, working in combination with variable frequency drives (VFD) and optical sensors. Each pulley drives a 36" wide belt at a maximum speed of 120 FPM to transfer 4" minus product at 425 TPH.

Technical Precaution: When driving Motorized Pulley with VFD on 460 volt 3 phase 60 Hz power supply, always restrict frequencies to allowable frequency spectrum of 12-66 Hz to avoid torque loss and heat build-up. Filter VFD output if VFD is more than 30' from Motorized Pulley to avoid resonance-induced voltage spikes.



### Foundry for Railroad Component Castings

This model 400M (16" diameter) 10 HP Motorized Pulley transfers recycled foundry sand to mold area at 150 TPH. Conveyor makes 30 start/stops per hour. Ambient environment is hot (>104° F) and contains a high percentage of airborne abrasive particulate. Photo taken after 13 years of service.

Technical Precaution: When installing a Motorized Pulley in a hot environment (>104° F), specify optional Class H motor windings and synthetic oil. Contact Rulmeca if ambient temperature will exceed 120° F.



### Taconite Ore Processing Plant

Two limestone feeder belt drives beneath storage silo were converted from 20-year-old DC motors to Motorized Pulleys AC-powered on 460v/3ph/60Hz supply. A VFD drives each model 500M (20" diameter) 5.5 HP Motorized Pulley to a maximum of 120 FPM. Conversion enabled plant operator to eliminate exposed motors and gearboxes and replace SCRs, relays, and timer banks with VFDs in control panel.

Technical Precaution: When driving a Motorized Pulley with a VFD on a 460 volt 3 phase 60 Hz power supply, restrict frequencies to a frequency spectrum of 12-66 Hz to avoid torque loss and heat build-up. Filter VFD output if VFD is more than 30' from Motorized Pulley to avoid resonance-induced voltage spikes.



### Cement Plant

Photo shows one of five hopper feeder conveyors installed beneath aggregate mixing bins. Each 30" wide feeder belt is driven by an 8.5" diameter 4 HP Model 220M Motorized Pulley at 200 FPM. Collector belt is driven by a 15.75" diameter 10 HP Model 400M Motorized Pulley at 250 FPM.

Technical Precaution: When designing hopper feeder drives always include material shear force in power calculations. Rulmeca Corporation conveyor design software is available.





## Motorized Pulleys Dual Drives and Load Sharing



### Ore Terminal Bucket Wheel Reclaimer Belt Tension Reduction

Five bucket wheel reclaimers at major US rail-to ship taconite ore terminals were retrofitted with dual Motorized Pulleys to drive the machine's tail conveyor. Depending on power requirements, dual 120 HP, dual 100 HP, or dual 180 HP were installed. The "nested dual" was installed on return side using a "serpentine" belt wrap configuration. Total wrap angle exceeded 420°. Calculations showed that the additional 240° of belt wrap reduced slack side tension to prevent belt slippage and/or sag, T2, by 29 percent. This drop in T2 resulted in a reduction of 13% in T1, total belt tension. The retrofits resulted in a significant extension to service life of belt, pulleys, and pillow blocks.



### Limestone Quarry Belt Tension Reduction

High tension in the top side carrying strand can be reduced in inclined conveyors by using a dual drive configuration. This US limestone producer reduced maximum belt tension at the discharge (head) pulley from 27,000 lbs. to 17,000 lbs. after modifying his conveyor drive design from a single 300 HP drive with a 384 fpm belt speed to a dual drive with a 600 fpm belt speed. This will yield a significantly longer belt life because of reduced belt stress. Each of the two drives was a 150 HP, model 800H, 31.5" diameter Motorized Pulley controlled by load-sharing VFDs.

Technical Precaution: Filter VFD output if VFD is more than 30' from Motorized Pulley to avoid resonance-induced voltage spikes.



### Trona Mine Radial Stacker Elimination of Belt Slippage

Adding belt wrap when necessary is simple through the addition of a Rulmeca Motorized Pulley. Belt wrap was increased from 180° to 360° at this western US trona mine by the adding a 60 HP, model 630H, 24.8" diameter Motorized Pulley to the head of this 40-year-old radial stacker. It eliminated slippage of the 100 HP tail drive during rainy conditions. The 2,400 lb. Motorized Pulley replaced a 3,200 lb. idler pulley, requiring no structural modifications to the stacker truss.



### Ore Terminal Dock Conveyor Elimination of Belt Slippage

Since temperatures can reach -20° F at this iron ore terminal, night time frost can build up beneath the carrying strand of belt causing slippage at start-up. The installation of two 180 HP Model 800H Motorized Pulleys at the head and tail positions, with electronic load-sharing, eliminated the problem on this reversing shuttle belt, which feeds the 60 ship loader surge bins. Both drives are energized simultaneously to turn either clockwise or counterclockwise to carry material westward or eastward, respectively.



## Motorized Pulleys Bucket Wheel Conveyor Drives



### MX Bucket Wheel Reclaimer - Wisconsin

Originally built in 1964, this bucket wheel reclaimer was retrofitted with three Rulmeca Motorized Pulleys in 2004, one on the boom conveyor and two on the tail conveyor, to continue to yield a reclaiming rate of 3,000 to 4,000 TPH. Since that time, the drives have worked reliably with only one overhaul after ten years of service. The photo shows one of three bucket wheel reclaimers which were upgraded to Rulmeca Motorized Pulleys at the terminal. Electrical power is provided to the drives by a diesel generator mounted on the reclaimer chassis.

Technical Precaution: When using labyrinth seals periodically purge grease through seals to prevent grease-born grit from attacking shaft oil seals.



### FAM Bucket Wheel Excavator - South Carolina

FAM designed and built this 1,000 TPH excavator for an international cement producer in 2002. The excavator is still in active service. The 50' long boom conveyor and 100' long discharge conveyor each use a Model 800H Motorized Pulley at 31.5" diameter and 100 HP to drive a 54" wide belt at 600 FPM. FAM has been using Motorized Pulleys as excavator belt drives for more than 30 years.

Technical Precaution: When using a Motorized Pulley on an articulating conveyor that inclines up and down use a brake to prevent material from rolling "down-hill" when conveyor stops. External brake shaft option is available from Rulmeca. See pages 68 and 73 for drawings of external brake shaft.



### MX Bucket Wheel Reclaimer - Wisconsin Summer

This is one of three bucket wheel reclaimers outfitted with Rulmeca Motorized Pulleys in 2004. The machine feeds taconite ore from terminal stockpiles to lake ships at a rate of 3,000 to 4,000 TPH.



### MX Bucket Wheel Reclaimer - Minnesota Winter

Built in 1976, this bucket wheel reclaimer is one of two machines retrofitted with Rulmeca Motorized Pulleys in 2015 because aging conveyor drives could only deliver a reclaim rate of 1,500 TPH. This drop in reclaim rate directly increased vessel load times. In addition, unscheduled stoppages of the reclaimers' conveyors caused significant delays in ship turnaround time. After installing one Rulmeca Motorized Pulley on the boom and two on the discharge conveyor, each at 180 HP, the machine immediately delivered a reclaim rate exceeding 4,000 TPH.

Technical Precaution: When using Motorized Pulleys in non-continuous operation in freezing conditions, order an optional Rulmeca internal heater or run "trickle voltage" through motor to facilitate start-up. See page 100 for circuit diagram. If neither of these options is possible, use lower viscosity oil in wintertime.



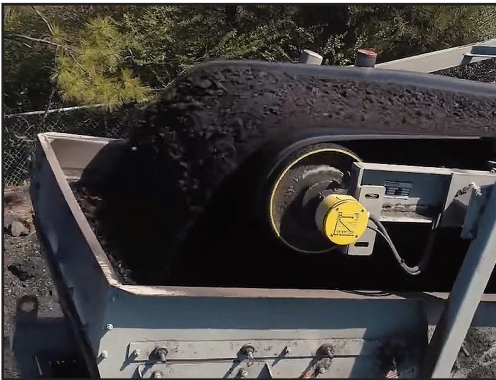


## Motorized Pulleys Mobile Crushing/Screening Plant Conveyor Drives



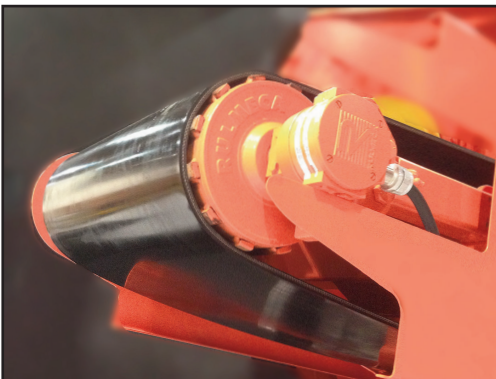
### “Double-Double” Cross Belt Drives

Mobile crushing/screening plants must adhere to size and weight restrictions to be legally transported on US highways. The drive nest on this “double screen plant” features four model 320M (13” diameter) Motorized Pulleys at 5.5 HP, which capture two cuts from the left screen and two cuts from the right screen. Since their weight is 30% less than equivalent exposed drives, they help limit the total weight of the plant. Drive, skirt seal, and belt cleaner maintenance is simplified through the use of Motorized Pulleys because motors and gearboxes are enclosed within each pulley and metal safety guarding is unnecessary.



### Screen Feed Drive

This plant incorporates a 20 HP (16” diameter) model 400M as its screen feed conveyor drive. Its compact size and light weight enable the plant operator to easily move the plant from site to site on US highways. Centering the belt drive weight between the conveyor’s two support beams avoids an overhung load and permits a lighter less costly support structure. Adhering to the 14’ height, 12’ width, 100’ length, and 150,000 lbs limitations enable plant operators to minimize the cost of redeploying plants throughout the US.



### Cross Belt Drive with “Beater Bars”

This cross conveyor belt not only incorporates a model 220M (8.5” diameter) at 4 HP as its drive, it also includes optional steel “beater bars” onto the surface of the pulley. These bars are an ideal solution to problem of handling sticky RAP (recycled asphalt product) when a HSI (horizontal shaft impact crusher) plant is used in road resurfacing projects.



### Cross Belt Drive with Internal Backstop and Electronic Sensors

This cross conveyor belt is steeply inclined (rather than horizontal) to increase the pile size adjacent to the mobile crushing/screening plant. Therefore, it incorporates a mechanical backstop (indicated by the arrowhead) to prevent material roll-back in the event of a conveyor stoppage when fully loaded. Note also that the compactness of the model 220H (8.5” diameter) Motorized Pulley streamlines the mechanical take-up and the optical sensors added to the drive system.

Technical Precaution: It is essential that the identity of each of the three phases of the power supply be determined before attaching power supply wires to the pulley to prevent the motor from driving against the backstop. The identity of each of the three phases of the motor is clearly labeled.



## Motorized Pulleys Conveyor Tail Drives



### Mobile Crushing/Screening Plant in Rock Quarry

The tail-mounted model 400M (16" diameter) 15 HP Motorized Pulley drives the 36" wide screen feed belt in tandem with an identical 15 HP head-mounted drive, at 384 fpm. As shown in the photo, the tail drive is mounted in a "Sliding Pedestal" mechanical belt take-up to tighten the conveyor belt as it stretches.

Technical Precaution: When mounting a Motorized Pulley in a screw take-up always make sure that pulley centerline is perpendicular to belt centerline to avoid overstressing internal bearings. Also, insure that the power cable festoon is long enough to accommodate the full travel of the pulley in the take-up.



### Tunnel Reclaim Conveyor at Cement Plant

This model 630H (24" diameter) Motorized Pulley at 50 HP is mounted in the tail of a 550' long inclined reclaim conveyor and works in conjunction with an identical model 630H in the head position, 138' above the tunnel. The conveyor is fed by six vibrating feeders and moves limestone to the transfer tower via a concave vertical curve. When the concave conveyor was started empty with the original 75 HP head pulley drive, the belt would bounce up 4' and damage the belt and feeder support structure. The installation of a head-and-tail drive eliminated belt bounce completely. Due to a high water table, the tunnel flooded three times during the first 12 years of operation, with no deleterious effect on the Motorized Pulley.



### Bucket Wheel Excavator at Cement Plant

This crawler-mounted bucket wheel reclaimer was installed in 2002 to excavate marl from a pit adjacent to the producer's cement plant. It uses a tail-mounted model 800H (32" diameter) 100 HP Motorized Pulley to drive the 54" wide boom conveyor belt at 600 fpm. The externally-mounted brake prevents material from "rolling backwards" when the boom conveyor is deenergized. Since the conveyor can articulate upwards and downwards to a 16° maximum inclination, it is impossible to use a mechanical backstop.

See pages 68 and 73 for drawings of external brake shaft option.



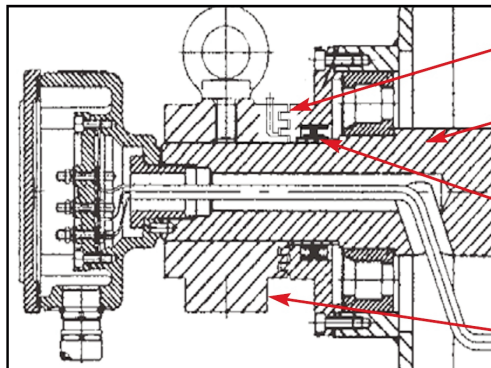
### Mobile Crushing/Screening Plant in Gravel Pit

Similar to the plant shown above, this portable plant features a diesel generator, gyratory crusher, vibrating screen, and five conveyors, which are screen feed, recirculating belt, two cross belts, and one under screen belt. The photo shows a model 400M (16" diameter) 15 HP Motorized Pulley, which drives a 36" wide screen feed belt at 384 fpm in tandem with an identical 15 HP head-mounted drive. Note that: (1.) the drive pulley is mounted in a "Sliding Pedestal" mechanical belt take-up and (2.) the power cord has a festoon long enough to accommodate pulley movement as the belt stretches.





# Motorized Pulleys Labyrinth Shaft Seals



- Grease Barrier**
- Shaft**
- Oil Seals**
- Mounting Bracket**

### Purpose of Labyrinth Seals:

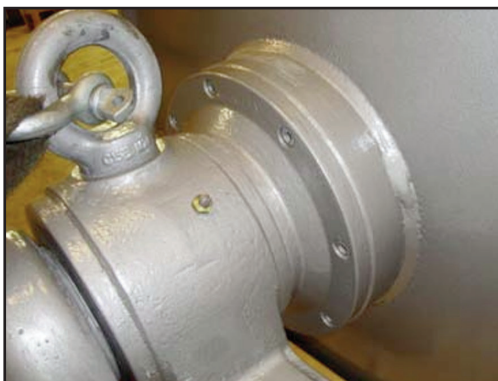
Rulmeca labyrinth seals provide an extra barrier of protection for shaft oil seals. They protect the IP67 oil seals against contamination by forming a toruous grease-filled path for corrosive and abrasive material.

Technical Precaution: Note that grease-packed labyrinths extend shaft oil seal life compared to standard seals, as long as contaminants are purged from the labyrinths. Shaft oil seal life will be compromised if contaminants are permitted to attack oil seals.



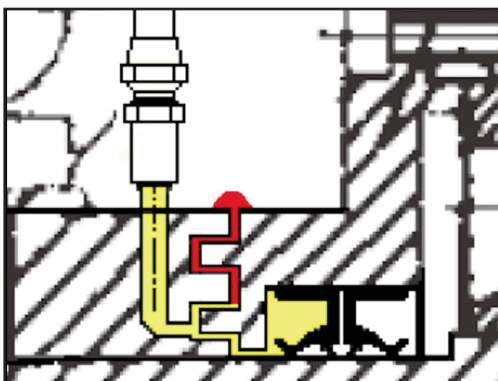
### Small Pulley Labyrinth Seal:

Photo shows grease nipple and exterior of labyrinth seal option for Motorized Pulley models 220M, 220H, 320M, 320H, 400M, and 400H. Labyrinth seal consists of one lip and groove formed between stationary labyrinth seal plate and rotating bearing cover. Grease may be purged manually, using grease nipple, or automatically, using Labyrinth Seal Grease Canister.



### Large Pulley Labyrinth Seal:

Photo shows grease nipple and exterior of labyrinth seal option for Motorized Pulley models 500H, 630M, 630H, 800M, and 800H. As shown below, labyrinth seal consists of two lips and grooves formed between stationary mounting bracket and rotating bearing cover. Grease may be purged manually, using grease nipple, or automatically, using Labyrinth Seal Grease Canister.



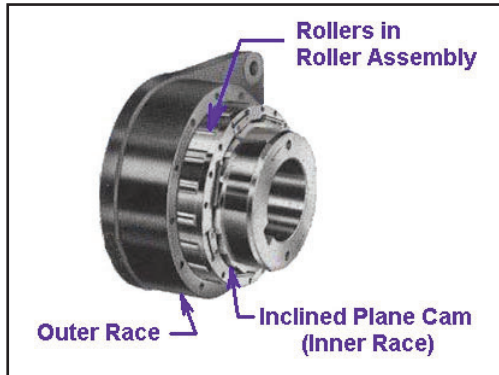
### Contamination Prevention:

Diagram shows positions of lips and grooves for Motorized Pulley model 500H and larger. These grooves must be completely filled with grease and purged to prevent contamination from attacking oil seals on pulley shaft.

Technical Precaution: It is essential that contamination be prevented from migrating through the labyrinths into the oil seal chamber. Grease canisters provide a continuous flow of grease outward by maintaining a positive pressure within the canisters. Canisters must be replaced when grease is depleted. Canister labels are designed to record dates.



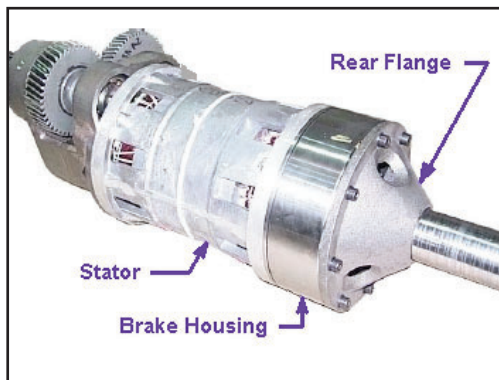
# Motorized Pulley Options Mechanical Backstops and Brakes



## Mechanical Backstop Exploded View

Rulmecca's mechanical backstops are built into the Motorized Pulley to limit pulley rotation to one direction (either clockwise or counterclockwise.) The backstop's keyed inner race is fixed to the motor rotor and the outer race is bolted to the motor stator frame. This yields two advantages: (1.) the backstop has all of the mechanical advantage, which can be as high as 100:1, and (2.) it is protected in a hermetically sealed environment.

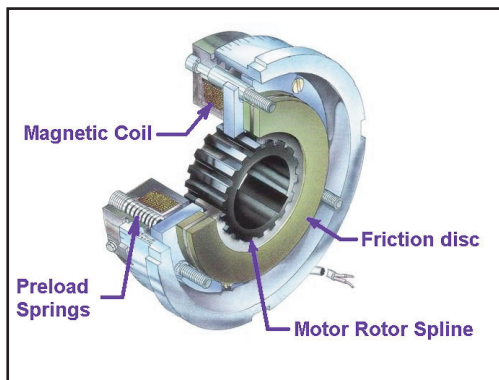
Technical Precaution: The identity of each of the three phases of power should be determined before attaching power supply wires to the pulley to prevent the motor from driving against the backstop. The identity of each of the three phases of the motor is clearly labeled.



## Rulmecca Internal Brake/Motor/Gearbox Assembly

Spring-loaded electromagnetic brakes are designed to release when power is applied to the brake coil. This is a "fail safe" feature. They clamp shut when brake power is removed (either during normal operation or during an emergency loss power.) Photo shows 320H model. Note that this option requires additional internal space and larger minimum Roller Length.

Technical Precaution: Control circuit for motor and brake must be designed to stop pulley motor before brake clamps shut and start pulley motor after brake is released. Brakes are DC-powered and supplied with AC to DC rectifiers to be mounted in a remote panel (by others). Control circuit must be designed to kill motor power in the event of loss of brake power. If this provision is not made, motor can possibly "power through" clamped brake.



## Rulmecca Internal Brake

Rulmecca internal brake is designed to function primarily as a belt holding device for reversing and/or articulating conveyors. The brake is not intended to be a conveyor stopping device. The brake's keyed spline is fixed to the motor rotor and the brake's housing is bolted to the motor stator frame. This yields two advantages: (1.) the brake has all of the mechanical advantage, which can be as high as 100:1, and (2.) it is protected in a hermetically sealed environment.

Technical Precaution: Control circuit must be designed so that motor and brake never work against each other. Brake should never be clamped shut when motor is on except for "emergency stop." Motor should never be powered on (including "jog" command) when the brake is clamped shut.



## Example of External Brake (South Carolina—USA)

Available in models 500H and larger, Rulmecca external brake shaft option extends motor rotor shaft through hole in non-rotating pulley shaft for attachment of external brake (by others). This hydraulically-actuated double-shoe brake (protective cover removed for photograph) prevents conveyor roll back when fully loaded belt is stopped.

The external brake option provides one of the two key advantages available with the internal brake option. Brake has all of the mechanical advantage of the drive (as high as 100:1 ratio) because it is fixed directly to the motor rotor shaft. It is, however, exposed to the environment.

See pages 68 and 73 for drawings of external brake shaft option.