

APPENDIX H

Wemco® Hydrogritter Separator



WEMCO

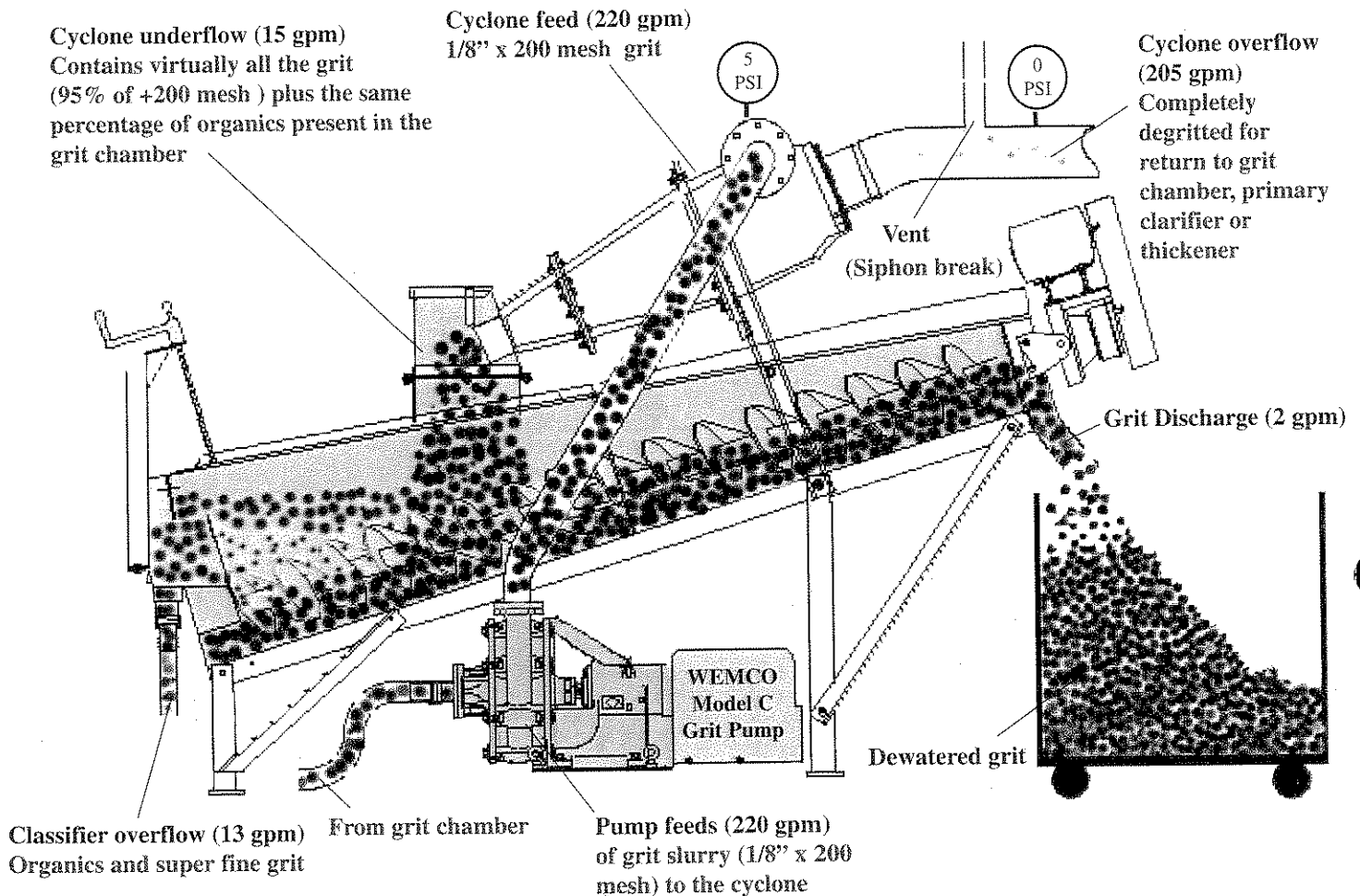
Hydrogritter®

The Proven Grit Removal & Dewatering SYSTEM

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PROCESS DETAILS

The WEMCO® HYDROGRITTER® has three major components - a pump, a cyclone separator/concentrator, and a dewatering/washing classifier. The pump pulls grit from the grit chamber or other source and feeds it to the cyclone separator. The grit is then captured/concentrated and discharged into the spiral classifier, where it is washed and dewatered. The system automatically generates a low moisture grit suitable for final disposal.



HOW IT WORKS—MASS BALANCE

Step 1- Assume the grit chamber (or primary clarifier underflow under certain circumstances) is able to capture grit from 1/8" to super fine 200 mesh. A rugged, abrasion-resistant WEMCO® Torque-Flow® pump, designated as the Model C, pulls this grit from the grit chamber as a slurry and feeds it to the cyclone separator at a pressure of 5 psi. In this example, the flow rate is 220 gpm, which allows grit withdrawal rates of over 1-1/2 tons per hour from the grit chamber at only a 1% concentration.

Step 2- The cyclone takes the 220 gpm from the pump and captures virtually all the grit it contains. It then concentrates this grit into underflow at the bottom of the cyclone (the apex), yielding a flow rate of 15 gpm. The balance of the flow, 205 gpm, is completely degritted and exits the top of the cyclone through the vortex finder. From there it can flow by gravity to further treatment.

Step 3- The 15 gpm grit concentrate from the cyclone underflow discharges to a specially designed spiral classifier where the grit is allowed to settle. The settled grit travels up the spiral conveyor, where it is dewatered and then discharged as a low moisture product ready for final disposal. In this example, the final product volume is 2 gpm. The 13 gpm balance, containing light organics and grit finer than 150 mesh, flows over a weir at the end of the classifier where it can be piped to further treatment.

—WEMCO® Hydrogritt

The Hydrogritter components are designed as a system to optimize each produce long-term, high performance grit removal - automatically -

WEMCO MODEL C TORQUE-FLOW® PUMP —*The industry standard in grit pumping for over 40 years!*

The Model C's job is to pump the abrasive, destructive grit slurry to the cyclone without clogging or wearing out. It is superbly designed to do so, and features:

- A recessed impeller that pumps pipe-sized solids—truly clog-free performance.
- Slurry pump design for maximum abrasion-resistance.
- 650 Brinell *Ni-Hard* material with 1" thick wear sections.
- Cup-type impeller that actually improves the pump's hydraulic performance as wear occurs.
- Robust mechanical design for years and years of trouble/maintenance-free performance.

WEMCO CYCLONE —*Efficient grit separation & concentration.*

The cyclone's job is to both concentrate the grit and reduce the volume of liquid so that a smaller and more economical/efficient classifier can be used. The slurry from the pump is converted to rotational motion as it enters the cyclone inlet head. The resulting centrifugal force acts on the grit particles, driving them to the cyclone wall where they migrate down the decreasing diameter sections of the unit, eventually discharging through the cyclone apex. The degrittied effluent exits the top of the cyclone through an opening called the vortex finder and is returned to the plant.

Since the cyclone must also handle concentrated grit, its design, just like the Model C pump, is built to handle it:

- The interior of the cyclone is completely lined with heavy-sectioned natural or neoprene rubber for maximum abrasion-resistance - just like they are for mining applications.
- The efficient involute inlet head requires only low pressure feed from the pump because it minimizes turbulence and short circuiting. Cyclone pressure is directly related to the pump's speed, so low inlet pressures result in low pump speeds and less pump wear.
- A quick disconnect on the apex discharge assembly allows easy and rapid access for inspection or in case an oversized object needs to be cleared.

WEMCO CLASSIFIER —*Optimum grit capture and dewatering. Built for decades of service.*

The classifier's job is to wash, dewater, and discharge the grit captured by the cyclone. Grit from the cyclone's apex is introduced into the pool area of the classifier at a specific point, selected so that grit coarser than 150 mesh will settle, but organics and finer grit will stay in suspension and be discharged over the weir. The spiral conveyor moves the grit from the pool area at the lower end of the machine up to the discharge point at the top, allowing it to dewater as it transverses the dry incline area. The dewatered product is discharged at a high enough elevation that most any receiving container can be used, making final disposal convenient. The classifier is also built - just as the Model C pump and cyclone are - to handle tough grit.

- Bullet-proof power train. The spiral is completely supported by bearings at the top and bottom ends.
 - Exclusive grit-proof lower bearing requires only yearly inspection, no periodic maintenance required.
 - A hand-wheel lifting device raises the spiral for easy and convenient inspections without draining the tank.
 - Cyclodrive® roller reducer--provides unmatched reliability and overload/shock tolerance. Again, no periodic maintenance, only yearly inspection.
- Heavy-walled spiral shaft, with protective wear shoes, up to 3/4" *Ni-Hard* in larger sizes.
- No tank wear. Since the spiral is completely suspended between two bearings, it can operate with a bed of sand between the screw and the tank, improving dewatering, and eliminating tank wear common with shaftless conveyors.
- No need for installed spares! Forty years of absolutely reliable service has proven there is no need for the added cost of an installed spare classifier.

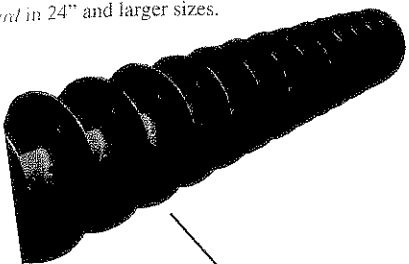
ter. The Proven Grit Removal & Dewatering System

Each piece of equipment - both mechanically and hydraulically - to consistently
 ly - with unmatched reliability, and low operation and maintenance costs

CONSTRUCTION DETAILS

Mining-Proven Spiral

Large, heavy-duty pipe shaft for maximum robustness. Welded flights, with replaceable wear shoes-- up to 3/4" Ni-Hard in 24" and larger sizes.



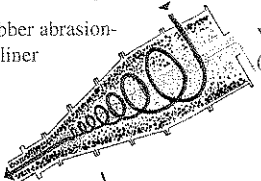
Cyclone Detail

High-efficiency inlet design

Thick rubber abrasion-resistant liner

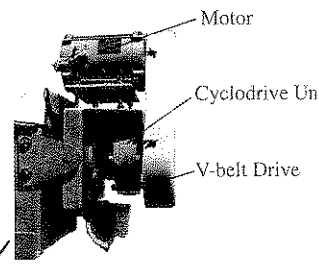
Vortex finder (Overflow)

Apex (Underflow)

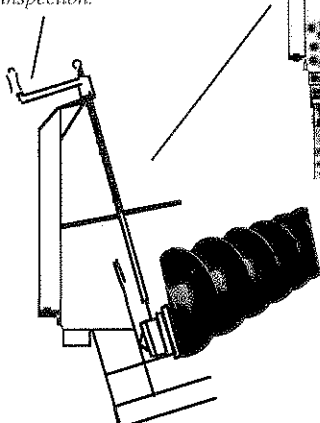


Cyclodrive® Speed Reducer

Designed for shock loads to 500% of design. No documented overload failures in over 800 installations.



Hand wheel lifting device to raise spiral/bearing for easy inspection.



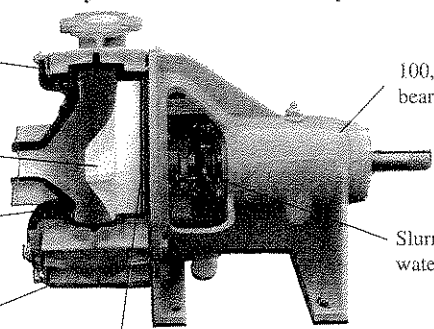
Lower Bearing

Exclusive WEMCO grit-proof, oil-filled bearing requires no external lubrication, only annual inspection.

WEMCO® Model C Pumps

The Industry Standard For Over 40 years!

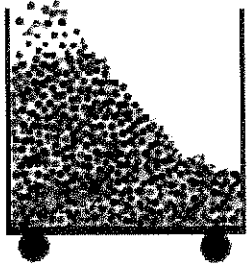
Extra thick two-piece case
 Fully recessed, cup-type impeller
 Up to 1-1/2" case thickness at wear points
 Heavy-duty Ni-Hard parts, 650+ Brinell hardness



100,000 hour minimum bearing life
 Slurry seal--no flush water required

Replaceable Ni-Hard wear plate

No tank wear. Spiral runs on "bed" of grit.



WEMCO® Hydrogritter®

The Proven Grit Removal & Dewatering SYSTEM

Process Benefits

- **Protect downstream equipment from grit damage**
 - No grit build up in digesters.
 - Downtime and grit removal costs eliminated.
 - Eliminates premature failure of pumps, heat exchangers and piping.
- **Proven ability to remove fine (+150 mesh) grit**
 - All components engineered as a system to consistently remove unwanted grit.
 - 200 mesh capture capability with special designs.
 - Designs available from 1/2 to 200+ MGD.
 - Complete system responsibility from WEMCO--not just individual components.
- **Unit located for convenient grit disposal into truck, dumpster, etc.**
 - Since grit is pumped to the Hydrogritter, it can be placed at an elevation high enough to dump grit into truck, etc.
 - Can be placed at any convenient plant location, allowing greater design flexibility.

Equipment Benefits

- **Clean, reliable, automatic grit removal**
 - No exposure to grit by plant personnel.
 - Grit only briefly exposed to atmosphere, so odor is minimized.
 - Optional design available with airtight covers and provisions for vacuum exhaust.
 - Needs no operator attention.
 - Protects downstream equipment from wear & abrasion.
- **All components are mining-proven for maximum reliability to provide the most cost-effective trouble-free system available**
 - Components are "system engineered" for high efficiency.
 - 25+ year design life.
 - Low capital cost.
 - Model C Grit Pump--True clog-free pumping, cup-type impeller, 650+ Brinell wear parts.
 - Rubber-Lined Cyclone--Maximum abrasion-resistance.
 - Spiral Classifier--Cyclodrive speed reducer and grit-proof bearing require no maintenance -only annual inspection. No tank wear - spiral runs on "bed" of grit. So reliable that no installed spare is necessary!

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