

Detailed Information Package

TeaCup[®]

Advanced Grit Removal & Classification



Industry leading performance that increases as flows increase.

Wastewater Information Package - Introduction

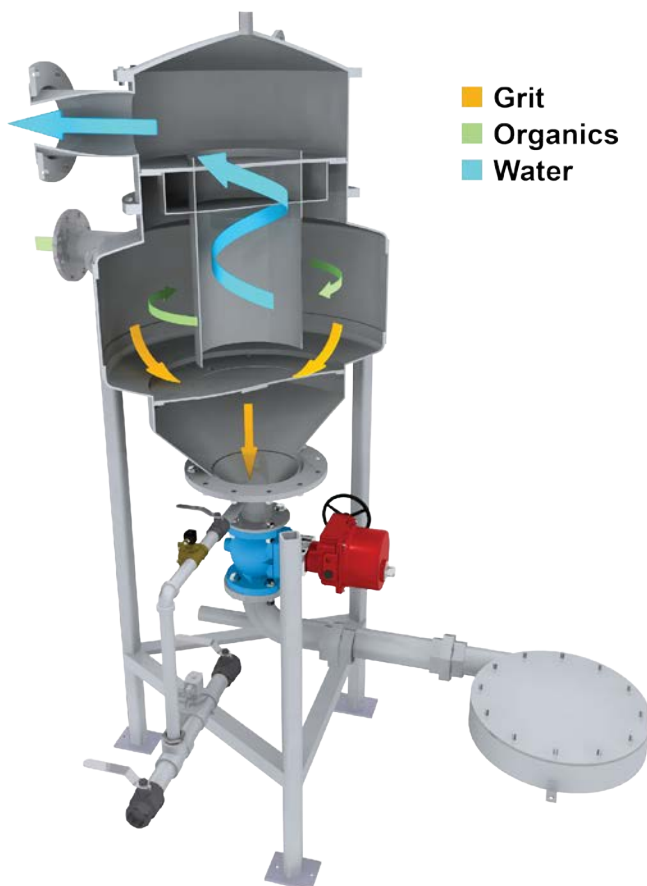
The TeaCup® is a free vortex centrifugal separator used to capture, classify, wash and remove fine grit, sugar sand, silt, snail shells, river sand, and high density fixed solids from slurries. The TeaCup® can be used to treat dilute wastewater or concentrated grit/organic slurry from other grit removal processes. The TeaCup® is "all-hydraulic" with no internal moving parts. The TeaCup® classifier was developed in the 1970's as an adaptation of the principles explored by Dr. George Wilson in development of the original Swirl Concentrator. Further research and development led to significant enhancements. The TeaCup® has found numerous applications in the water, wastewater, and industrial effluent treatment industries. The first full scale system was installed in California in 1977. Today there are over 600 TeaCup® units installed worldwide.

TeaCup® Process Description

Flow is typically pumped to the unit and enters the vessel tangentially at a controlled rate and velocity. In most applications it is recommended that the unit be operated continuously. Flow exits the center top of the TeaCup at an increased velocity. This discharge configuration generates the free vortex creating centrifugal velocities in excess of 20G and a thin predictable boundary layer. Heavier grit is forced to the outside perimeter while lighter grit is held in suspension until it falls by gravity into the boundary layer which sweeps captured grit into the collection cone at the bottom of the unit. Organics are separated from the grit through the classification process and size based boundary layer discrimination.

The degrittied slurry water containing the organics is forced to the center of the unit in order to exit. Once discharged, the organic laden slurry can be returned for biological processing. The concentrated grit slurry containing <20% VS is periodically fluidized with plant water and is purged from the system automatically on a timed basis. As flows increase in the TeaCup centrifugal forces also increase, resulting in improved removal efficiency. Controls are adjustable and fully automatic.

TeaCup® Process Illustration



TeaCup® Technical Details

	Imperial	Metric
Flow Range:	0.1-10 Mgal/d	4.4-438 L/s
Unit Sizes (Diameter):	24, 32, 56, 72, 96 in.	0.6, 0.8, 1.4, 1.8, 2.4 m
Inlet (Diameter):	3-24 in.	8 cm - 0.6 m
Outlet (Diameter):	4-30 in.	10 cm - 0.8 m
Weight (dry):	650-5600 #	300-2540 kg



TeaCup® High Performance Grit & Snail Shell Removal

Technical Details

The TeaCup is available as a freestanding vessel, typically installed above grade. Sizes range from 2-8 feet (0.6-2.4 m) in diameter. All wetted parts are made of 304 or 316 stainless steel. Valves, a pressure gauge, and either a relay logic or Programmable Logic Controller (PLC) control panel are provided to allow automatic control of grit discharge. A plug valve, pressure regulating valve, solenoid, and pressure gauge are supplied for the fluidizing line which is typically 1" (2.5 cm). A motorized plug valve and flow regulating vortex valve are supplied for the grit underflow. Grit transfer from the TeaCup can be accomplished by gravity flow (if HGL allows) or by a grit transfer pump.

- The unit is constructed of stainless steel
- Solenoid valves are brass
- Ball valve is bronze

Depending on treatment objectives, various options for grit dewatering are available. Manual dewatering with a Decanter dewatering bin is a low cost option for plants treating less than 7 Mgal/d (438 L/s). The Grit Snail unit is recommended for plants that desire automated grit dewatering or with flows greater than 7 Mgal/d (438 L/s).

Applications

- Grit collection and washing
- Grit washing and classification
- Protect plants with highly efficient downstream processes such as Cannibal® systems, fine bubble aeration, centrifuges, digesters, etc.
- To protect advanced biological processes such as BNR, MBR, ENR, and SBR
- Snail shell removal from trickling filter plants
- Sediment removal from drinking water plant intake

Key Features

- The tangential influent connection creates centrifugal force which creates the free vortex
- The vortex finder directs degritted effluent away from the outside wall towards the center so it can exit free of grit
- The lower baffle plate shields the collected grit in the grit pot, preventing the re-suspension of separated solids



Advantages

- Small footprint
- High efficiency fine grit removal - 75 micron (µm)
- Enclosed system for better odor control
- Increased grit removal efficiency at higher flows carrying higher grit loads
- Low organic content (VS) of classified grit
- Solids surge capacity
- Low wall velocity minimizes abrasive wear
- All-hydraulic design with no moving parts ensures long component life with minimal wear
- Stable operation with a single unit for a turndown ratio up to 4:1 (peak to average)
- No mechanical components make the unit virtually maintenance-free
- Sized at peak flow for peak grit load
- Low non-potable water requirements
- Simple to install and operate
- Manufactured in 304 or 316 stainless steel for long product life

Design Considerations

- Plant water is used to fluidize the grit prior to discharge
- Grit transfer from the TeaCup can be accomplished by gravity flow (if HGL allows) or by a grit transfer pump
- In most applications it is recommended that the unit be operated continuously
- The TeaCup is typically mounted on the Grit Snail clarifier. Up to two TeaCup units can be mounted above a single Grit Snail depending on sizing
- A minimal access platform may be desired to allow inspection access to the top of the TeaCup unit



Grit Collection, Washing, and Classification for Over 40 Years

The TeaCup effectively removes organics from fine and light grit, as small as 75 µm. Utilizing accelerated gravity to achieve forces in excess of 20G, the TeaCup washes and retains virtually all grit captured by any bulk grit system. Unlike conventional cyclones, which were originally designed for the mining industry, the TeaCup separates organics from the grit through the classification process and boundary layer discrimination sending organics back to biological processes. Additionally, the larger unit diameter provides volume to hold and process grit during wet weather events when grit volumes increase significantly. Once dewatered, grit processed by the TeaCup contains less than 20% VS and is suitable for landfill. The perfect complement to the fine grit removal technologies provided by Hydro International, the TeaCup captures 95% of all grit 75 µm and larger (2.65 SG).

The TeaCup can also be used to treat screened influent, separating grit from the incoming flow and organics from the grit in a single process. Other applications include snail shell removal from trickling filter plants and sediment removal from industrial flow streams or surface water, prior to water treatment processes.

Why Pay More for Advanced Grit Removal

- Advanced Grit Removal
(Removes 70-90% of total grit load)
 - Higher equipment cost
 - Lower installation cost
 - Smaller footprint
 - Slightly higher total installed cost
- Conventional Grit Removal Costs / Impacts
(Removes 30 - 50% of total grit load)
 - Aeration basin cleaning (\$25-200K)
 - Digester cleaning (\$50-500K)
 - Clarifier rebuild (\$50-400K)
 - Centrifuge repairs (\$25-250K)
 - Process offline for cleaning (\$20-250K)
- Any single Grit Impact could quickly pay for the additional cost of an Advanced Grit Removal system





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