Oldcastle Infrastructure™
A CRH COMPANY

HeadCell®

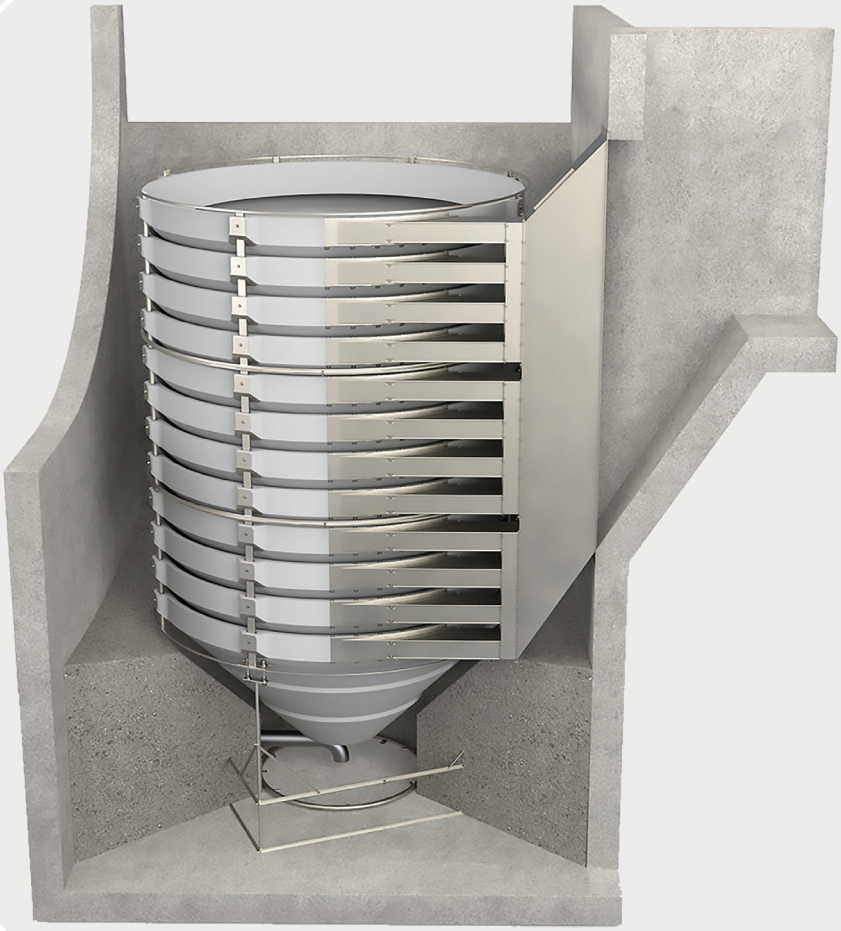
Advanced Stacked Tray Grit Separation

Engineered by Hydro International®

HeadCell®

Best performance in the smallest footprint of any grit separation system.

The HeadCell® is the ideal grit separator for both new and retrofit applications. The HeadCell® is a stacked tray grit separator that can be sized to remove fine grit over a wide range of flows with less than a foot (30 cm) of headloss. Engineered by Hydro International, the small footprint HeadCell® has proven its unparalleled performance in a wide variety of operating conditions with independently verified results.



Performance

- Removes 95% of particles equal to or greater than 75 micron (µm) at the design flow rate
- Less than 5% volatile solids and greater than 90% total solids when used with Oldcastle washing and dewatering equipment

Capacity

- Sized for peak flow at peak grit loads
- Wide turndown capabilty
- Modular and expandable combinations to fit any size plant

Configurations

- The HeadCell® is typically placed in a square concrete tank downstream of influent screening eliminating the need for a long approach channel and complicated concrete design and construction. Inlet and outlet orientation and location can be configured to meet many design requirements
- The HeadCell® may fit into existing basins which can significantly reduce total installed cost. A retrofitted HeadCell® system can increase flow capacity and improve grit capture in the same footprint
- Configured to work with Oldcastle washing & dewatering for a complete grit system performance guarantee

Design Notes

- Short settling distances eliminate inefficiency and increase grit capture
- Large surface area effectively uses plant space
- Evenly distributed influent eliminates short circuiting
- Continuous boundary layer flows over hydrophobic surfaces minimizes grease build-up and keeps trays clean
- All-hydraulic design with no moving parts ensures a long product life
- Design headloss is 12” (30 cm) at peak flow. Alternate designs for lower headloss are available

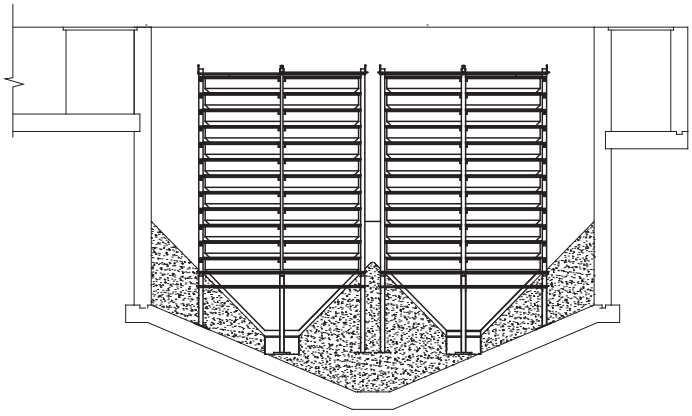
Applications

- New wastewater treatment plants
- Treatment plant retrofits
- Sediment removal pretreatment for potable water
- Grit removal for industrial applications
- Pre-treatment for MBR and any other advanced processes

Benefits

- Large surface area in a small footprint
- No moving parts or external power source
- Less than a foot (30 cm) of headloss at peak flow
- Double treatment capacity in the same footprint as conventional equipment
- Economical to own and operate
- Easily accommodates high turndown ratios
- Proven design with nearly 1,000 units installed

Two HeadCell® Units Retrofitted Into An Existing Grit Basin



How it Works

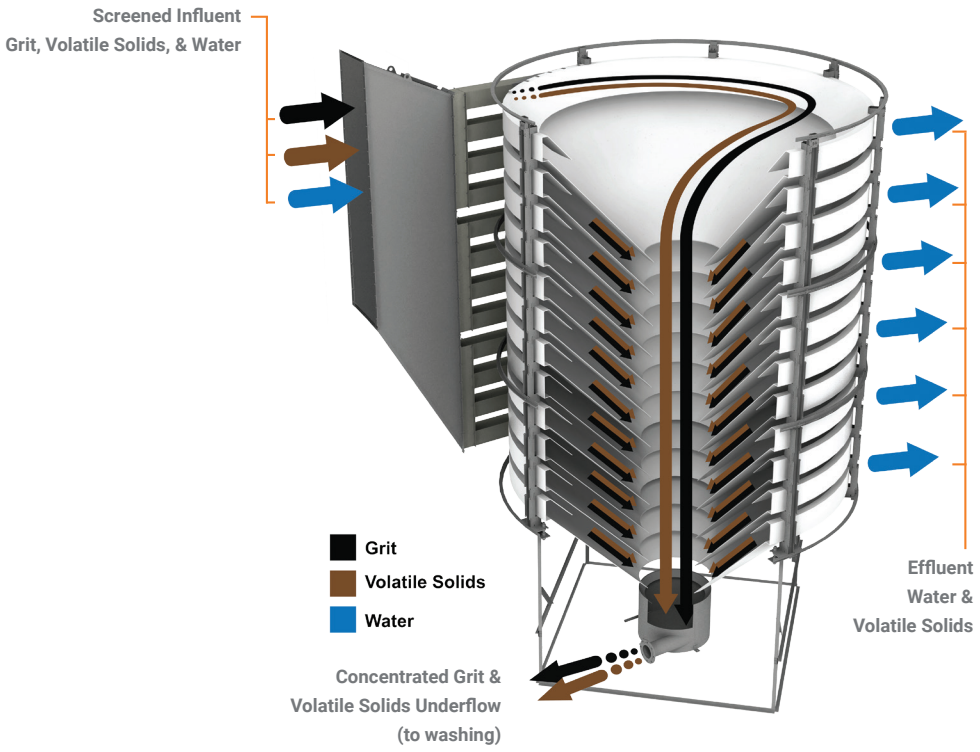
The stack of hydraulically independent polyethylene trays are submerged in a concrete chamber. Screened sewage enters the influent duct and passes into the grit chamber. The influent duct directs the flow into the high efficiency distribution header to evenly distribute the influent tangentially into the modular multiple-tray system.

Tangential feed establishes a vortex flow pattern causing solids to fall into a boundary layer on each tray. Grit settles out by gravity along the sloped surface of each tray and then solids are swept to the center opening which allows them to fall to a common collection sump. Degritted effluent flows out of the trays, over a weir and into an effluent trough.

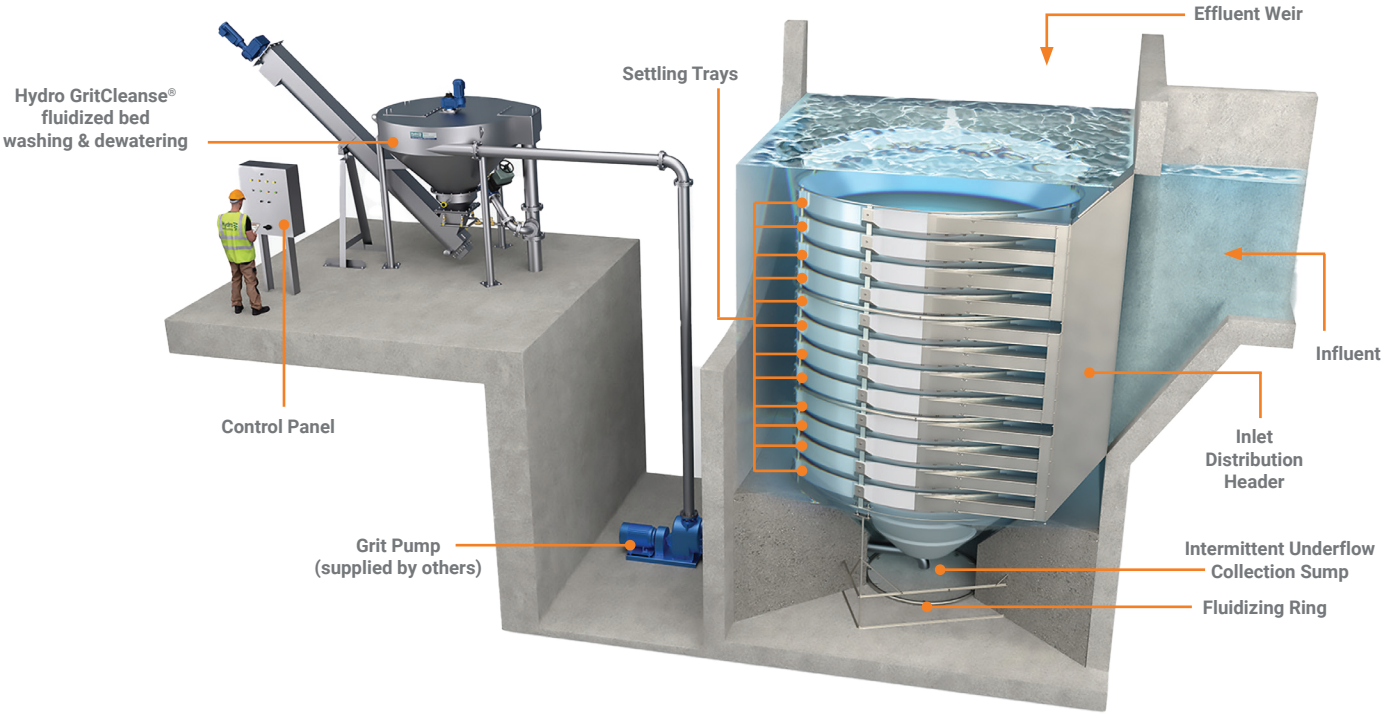
The settled solids are pumped from the grit sump to an open vortex grit washing system like the OpTeaCup™ and then dewatered by either a Grit Snail® or SpiraSnail® or sent to a combined washing & dewatering system like the Hydro GritCleanse®.

Visit the HeadCell® product page to learn more. HeadCell®

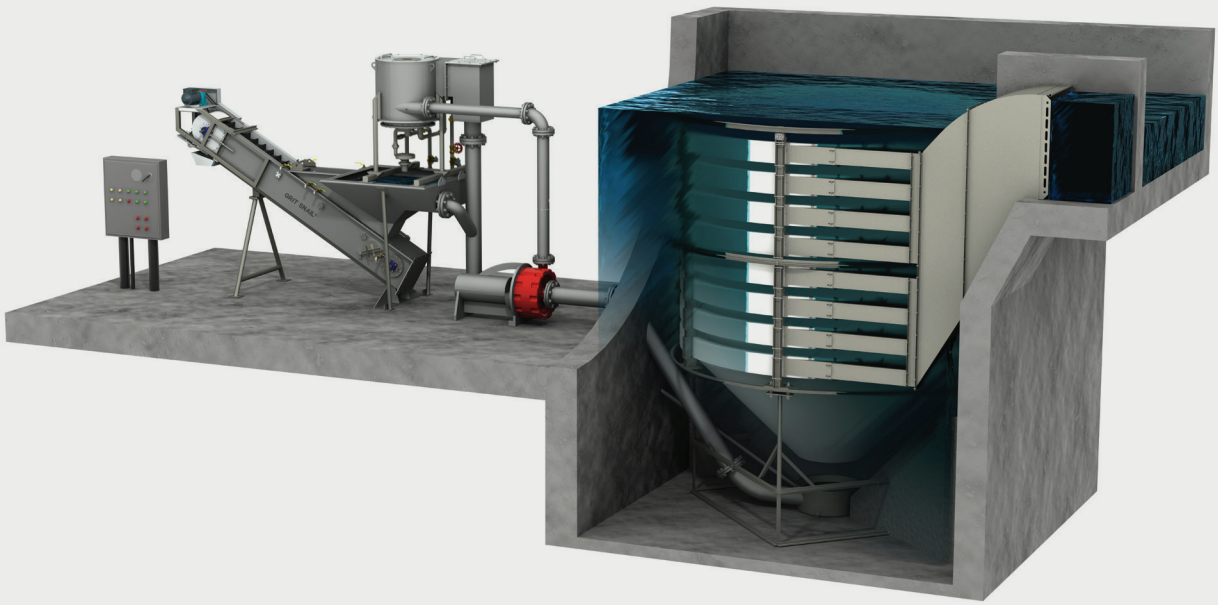
HeadCell® Flow Pattern



HeadCell® (in concrete tank)
Grit Separation



HeadCell® Configured for Continuous Operation w/ SlurryCup™ & Grit Snail®



Case Study

Headworks Grit Removal & Screenings Upgrade Increases Plant Treatment Capacity

Owner
Turkey Creek STP | First Utilities District (FUD) of Knox County

Hydro Equipment
One (1) 12' (3.7 m) Diameter 12 Tray HeadCelll® Grit Separation System

One (1) Hydro GritCleanse™ Fluidized Bed Grit Washing and Dewatering System

Plant Flows Before Upgrade
8 Mgal/d (30 MLD) Average Flow
32 Mgal/d (123 MLD) Peak Flow

Plant Flows After Upgrade
Projected 2043 Average Flow 10.5 Mgal/ (40 MLD)
Projected 2043 Max Month Flow 15 Mgal/ (57 MLD)
Peak Flow: 44 Mgal/ (167 MLD)

Objective

An outdated grit basin was allowing excessive grit to deposit throughout the STP. This unchecked grit was particularly problematic for the recently installed fine bubble aeration and jet aeration system and needed to be stopped.

Solution

A HeadCel® / Hydro GritCleanse™ system, fine front flow perforated belt screens and clever plant engineering design allowed them to re-use existing structures to reduce project costs and provide significantly better performing grit removal and screening and increase their treatment capacity.

Background

The Turkey Creek STP is owned and operated by the First Utilities District (FUD) of Knox County. FUD is a progressive and well managed utility district, notable for having one of the lowest sewer rate fees in the region while also carrying no debt. This is only possible through effective management and forward thinking.

The Turkey Creek STP primarily accepts sewage from the local community of Farragut, TN. Farragut is a bedroom community to Knoxville with minimal industrial sewer loading contributions. Additional waste comes from a leachate dumping station that operates in cooperation with the local landfill in a trading scheme for dewatered solids from their centrifuges.

The Situation

As part of a plant evaluation process, it was determined that improving solids capture in the headworks would minimize the accumulation of inert material throughout the rest of the plant. The existing grit removal system, an aerated grit basin, had been letting a substantial amount of grit through even at current flow rates. This was most notable in the oxidation ditches, where substantial volumes of grit had accumulated, seen when drained.

The plant could also increase hydraulic capacity for future expansion by upgrading their headworks facility. Plant flow is expected to continue to grow steadily, the average flow had already increased by nearly 30% in the 7 years before the plant evaluation.

In recent years, both fine bubble diffuser aeration and a jet aeration / mixing system had been added to the plant. Both of these processes are particularly vulnerable to grit. Grit settled on fine bubble diffusers, increases the energy required for the blowers to push through it. Grit accumulation would reduce both the performance and capacity of the jet aeration mixing system. Furthermore, removing grit from a floor lined with diffusers is significantly more difficult and costly than removing it from a basin with a flat floor.

On-Site Grit Testing

An independent grit testing firm was contracted to evaluate the characteristics of the grit entering the plant. Grit testing was performed once during the summer and once during the fall to capture data related to seasonal flow variations. On the first day of the summer test, approximately 89% of the grit was larger than 297 micron in size, while the second day found close to 75% of grit to be larger than the 297 micron size range.

This test result would indicate that sizing a grit system for a target cut point size of 297-300 micron would be ideal. However, part of the testing included grit settling velocity evaluation. Lab and field analysis of actual municipal grit finds that it settles much differently than clean sand due to inherent differences in drag, density, and shape. Attached organic materials, fats, oils, soaps, and greases commonly found in wastewater also reduce the settling velocity. When using actual settling velocity it was found that no more than 55% of the influent grit behaved like 300 micron or larger clean sand.

Settling velocity had an even larger disparity between the summer test and the fall test. Fall test results showed that less than 7% of influent grit settled like 300 micron or larger clean silica sand particles. To remove at least 90% of the grit during typical operation, a system capable of removing 75-106 micron grit and larger would be required.

Selecting Options

After a market evaluation of available grit removal technologies Oldcastle Infrastructure's Hydro International line of Advanced Grit Management® technologies were selected. A HeadCell® stacked tray grit separation unit paired with a Hydro GritCleanse™ fluidized bed grit washing and dewatering unit were chosen for a number of reasons. Both technologies have independently verified performance in capturing the 75-106 micron grit found in the site analysis. Together they offer the benefit of single supplier performance accountability for the entire grit removal process. Additionally, the HeadCell® needed just a third of the footprint required for the aerated grit system it was replacing.

Other technologies evaluated were mechanically induced vortex units and replacement in kind. In the end, proven performance and reliability were the major drivers behind the decision to pursue HeadCell® and Hydro GritCleanse™ technologies.

The overall project also included the addition of an independently verified, class leading, high performance plate screening system, piping upgrades to increase capacity to match the new screens and grit system, as well as an upgrade to their centrifuge equipment. The project result is a state-of-the-art headworks facility that will provide exceptional performance and total plant protection for many years.

Proving Performance

A post-installation performance test was conducted on the Hydro GritCleanse™ by an independent testing firm showing across three separate tests that the system averaged 95% removal of ≥ 75 micron grit, even better than the 106 micron specified.

Quality of accumulated grit in the dumpster was also tested, showing over 90% of total solids removal with less than 5% volatile solids. The original grit system produced a sloppy, wet grit that was very unpleasant to be near. The Hydro GritCleanse™ produces a much cleaner and drier grit output than the grit system it replaced.

An additional benefit has been reduced landfill costs through reduced water and organics sent to the grit dumpster. Before, they were sending their grit to landfill at least once a week, frequently twice. Now that they have only grit in the dumpster they are typically only dumping once every other week, and the landfill is happier to take material without free liquid coming with it.

Before the plant upgrade the plant was rated for 8-9 Mgal/d Average Flow and 35 Mgal/d Peak Flow capacity and the upgrade has allowed them to increase their capacity to 10.5 Mgal/d Average Flow and a Peak Flow 44 Mgal/d.

Due to the simplicity of the new grit system, with a robust and low maintenance design, overall operation has been very easy for FUD. In the 2 years since the grit system began operation they have required no mechanical maintenance, just routine preventative maintenance. Plant staff are pleased with the system and the improved performance has been notable.

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