

Fox Lake, IL

HeadCell Retrofit Improves Performance & Increases Capacity

Wastewater Case Study Project Profile

Objective

The aerated grit system at Fox Lake was due for replacement. The plant needed a replacement that would retrofit into existing structures and improve performance.

Solution

The flexible design of the HeadCell® allowed the plant to retrofit into the existing basins, saving the plant space and reducing construction costs by using existing channels and concrete.

The Problem

Fox Lake's existing aerated grit removal system was at the end of its useful life and needed to be replaced. There were two requirements for the replacement: they wanted to retrofit the new equipment in the existing area and to eliminate grit deposition in the grit basin which was very difficult to remove.

Steve Vella, Fox Lake's plant Supervisor, saw the HeadCell® at WEFTEC in Chicago. He liked the stacked tray concept, and thought it would be the ideal solution to their plant's grit problem. He had seen similar operational principles in lamella systems. The stacked tray design would allow them to increase their surface area which would increase their grit system performance, while staying within the existing area used by the AGB.

The Solution

In order to get the performance required to prevent grit from depositing within the plant they needed to double the surface area for settling grit. The stacked tray design of the HeadCell® allowed them to significantly increase their surface area while staying within their existing footprint.

An isolation wall was poured to section off a portion of the old aeration basin making a dry pit for the grit pumps. The rest of the basin was used to house the HeadCell® trays. A SlurryCup™ and Grit Snail® replaced the old cyclone / screw washing and dewatering system.

Testing The Existing System

Prior to taking the aerated grit basin (AGB) out of service, a grit study was performed on it. At the design peak flow, the aerated grit basin should have been removing 225 micron (μm) grit. At lower flows the AGB should have performed even better, unfortunately it did not. Testing was performed during low flow conditions of only 1.2 Mgal/d (53 L/s) when the aerated grit basin should have been removing all sand particles 50 μm and larger. The data revealed that the separator was only capturing 58% of incoming grit. To make matters worse, the cyclone / screw washing and dewatering

Plant Equipment

- Two (2) 9' (2.7 m) 12 Tray HeadCell®
- One (1) 32" (0.8 m) SlurryCup™
- One (1) 2 yd³/hr (1.5 m³/hr) Grit Snail®

Project Parameters

- 8-9 Mgal/d (30 - 34 MLD) Average Day Flows
- 22.5 Mgal/d (85 MLD) Design Peak Flows

system was retaining just 17% of the material delivered to it. This further reduced the overall system efficiency to only capturing 10% of influent grit.

Testing The New System

Testing on a day with flows of 10 Mgal/d (38 MLD) proved the new HeadCell® system to be 88% efficient overall. The HeadCell® grit collection chamber was 95% efficient and the SlurryCup™ and Grit Snail® washing and dewatering system retained 93% of the grit delivered to it. The new system provided a significant performance improvement over the previous AGB.



The Result

Steve is very happy with the new grit removal system which has been in operation since 2005. The grit basins were recently drained for a typical 6-month inspection and Steve was pleased to report that "the HeadCell trays were clean, the bolts and frame looked to be in good shape."

Upgrading for the Future

In 2010 Fox Lake installed a second HeadCell®, SlurryCup™, Grit Snail® system to treat peak flows that exceeded the 25 Mgal/d (95 MLD) capacity of the original system. The second system treats up to 12.5 Mgal/d (47 MLD) and is used in conjunction with the original HeadCell® system to treat the peak wet weather flows.

	Aerated Grit Basin w/ Cyclone / Screw	HeadCell® / SlurryCup™ / Grit Snail®
Separator Capture	58%	95%
Washing / Dewatering Capture	17%	93%
Overall System Capture	10%	88%
Grit Quality	5 lb Fixed Solids / ft ³	65 lb Fixed Solids / ft ³
Aerated Grit Basin Design - 225 micron		
HeadCell® System Design - 100 micron		

* IWEA 2005, J. Boldt

The Ideal Grit Removal System

The HeadCell® is a modular, multiple-tray grit concentrator that removes grit as small as 75 µm with minimal headloss. The high-efficiency flow distribution header evenly distributes influent over multiple conical trays. Tangential feed establishes a vortex flow pattern where solids settle into a boundary layer created on the surface area of each tray. This captures the grit allowing it to fall by gravity to the center underflow collection chamber. These settled solids are continuously pumped to a SlurryCup™ washing and classification unit which delivers the washed and concentrated slurry to a Grit Snail® dewatering system.

The SlurryCup™ uses a combination of an open free vortex and the boundary layer effect to capture, classify, and remove fine grit, sugar sand, snail shells, and high density fixed solids from grit slurries, and both primary and secondary sludge.

The Grit Snail® captures fine grit and abrasives by providing sufficient clarifier area to retain 75 µm particles. A slow-moving, cleated belt gently lifts grit from the clarifier pool without re-suspending captured fine grit particles, which would allow them to escape with the clarifier overflow.

