

Council Bluffs, IA

Project Profile

Objective

Replace outdated aerated grit basin to improve removal of fine loess sand and reduce digester cleaning in their existing tanks and sludge dewatering centrifuge repair.

Solution

A HeadCell® was retrofitted into the existing aerated grit basin significantly reducing overall installed project costs. SlurryCup™ and Grit Snail® systems provided clean grit suitable for landfill disposal.

Council Bluffs, Iowa, is a city of 60,000 located along the Missouri River's east bank, just across from Omaha, Neb. The three major railroads that cut through the city helped to establish it as a 19th century industrial stronghold. Today, Council Bluffs still has a sizeable industrial/agricultural presence, with ConAgra, Tyson Foods, American Games and Barton Solvents operating plants. Several casinos sprouted up in the early 2000s, diversifying the mix, and Google is building a \$600 million data center on the outskirts of town.

The Council Bluffs Water Pollution Control Plant has handled all of the community's wastewater treatment needs since 1974. Most of the original equipment is still in operation, including the existing pretreatment facilities, the primary clarifiers and the two-stage trickling filters that culture bacteria on rock media to decompose organic solids. The plant added an activated sludge basin in 1997 to increase treatment capacity in the future. It can handle 18 million gallons per day for maximum daily flows and 30 million for peak flows.

The plant used its original headworks through 2003. The prior systems consisted of two bar screens with one-inch openings and two aerated grit basins. In the grit basin, centrifugal blowers and diffused aerators suspended the biological particles, grit fell to the bottom of the basin and a chain-and-flight mechanism moved the

Plant Equipment

- Four (4) 12' 7 Tray HeadCell®
- Two (2) 32" SlurryCup™
- One (1) 4 yd³/hr Grit Snail®

Project Parameters

- 6.5 MGD Average Flows
- 18 MGD Current Peak Flows
- 30 MGD Future Peak Flows
- 95% removal of all grit 75 micron and larger

grit onto bucket elevators, then to a belt conveyor, and finally into a collection container for disposal.

Plant Supervisor Hank Pangelina said the old grit-removal system allowed too much of the fine loess sand from local hills that trickled into the waste stream to pass through to the aeration basins. "We weren't satisfied with the grit removal we were getting," said Plant Supervisor Hank Pangelina. "Too much was getting through, and it was creating a lot of wear and tear on the centrifuges downstream. We were spending thousands of dollars a year maintaining the centrifuges, and still they were wearing out faster than they should. We decided it was time for an upgrade."

Plant operators went through an evaluation process and settled on a new gravity-forced vortex grit-removal system. The



HeadCell® System

"The cost savings and innovative nature of the HeadCell® really tipped the scales in favor of this option."

- Keith Hobson, Fox Engineering

system consists of four HeadCell® grit-removal units, two SlurryCup™ grit-washing units and one Grit Snail® dewatering escalator. The system is provided by Hydro International's US Wastewater Division, based in Hillsboro, OR.

The Council Bluffs wastewater staff looked at three alternatives before choosing the HeadCell® option. Another vendor's gravity-forced vortex system, featuring a mechanical paddle that sweeps grit particles into a center pit, was rejected because the system didn't target the sub-100-micron fine grit the City wanted to remove and required a longer influent channel than the plant could provide. A second proposed system also targeted the fine grit particles. But the significant headloss needed to operate the unit would have required additional pumping – either through pump upgrades or the construction of another in-plant pumping station.

The HeadCell® forced vortex system offered a sizeable upgrade in grit-removal efficiency – at a significant savings in concrete costs plus the promise of lower operating costs going forward. “The cost savings and the innovative nature of the HeadCell® units really tipped the scales in favor of this option,” said Keith Hobson, vice president of Fox Engineering Associates of Ames, Iowa, which consulted on the project for the City.

The HeadCell® is a modular, multiple-tray grit concentrator that removes grit as small as 75 microns 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 on each tray which moves it down to the center underflow collection chamber. These settled solids are continuously pumped to a Eutek 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 50-micron 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 over flow.

The four HeadCell® units – each 12' diameter with 7 trays – fit into the existing 20-foot-wide grit basins with some modifications for flow distribution. A portion of the old grit basin was no longer needed and provides pre-aeration of the incoming flow prior to the biological process. During average flow conditions only one half of the system is operated.

“The fact that it was more compact was very important,” Pangelina said. “The HeadCell® stacks fit right into our two tanks. Our engineers are pretty creative. They did a nice job of retrofitting our existing facility. If we had to tear that up, it would have cost multi-millions.”

Since the HeadCell® has no moving parts, it operates without any control requirements and minimal maintenance. The SlurryCup™, Grit Snail®, grit pumps and grit dewatering belt require normal maintenance and operation checks. Pangelina said the system has worked well and saved the city a significant amount of money.

“It's performing really well,” he said. “One of the indicators we had was, in the anaerobic digesters we haven't seen grit. When you take a digester down and clean it out, you can see it. We used to have 3 feet of grit. Now we have very little.”

The wear and tear on the equipment isn't a problem anymore either, Pangelina said. Before Council Bluffs installed the Hydro International system, he said, the staff had to take the centrifuges down several times a year to repair abrasive damage or erosion on the scroll. Since then, he said, they've only had to repair the scroll once.

“We've seen a number of paybacks,” the plant supervisor said. “There's less wear on the centrifuge, I don't have to take the digester off line and clean it. We didn't have to build another pump station and maintain it. All in all, this system has done what we wanted at a very reasonable cost.”



SlurryCup™ / Grit Snail® System at the Council Bluffs Plant

“We've seen a number of paybacks. All in all the system has done what we wanted at a very reasonable cost.”

- Hank Pangelina, Plant Supervisor