ABSTRACT

*(From paper presented by **Keith Hobson, P.E., BCEE**, at the WEFTEC in Washington, D.C. November, 2005)*

AN INNOVATIVE GRIT REMOVAL PROCESS FOR THE CITY OF COUNCIL BLUFFS WWTP PROVIDES FINER GRIT REMOVAL AT LOW HEAD LOSSES

The Problem

The Council Bluffs Water Pollution Control Plant (WPCP) has been operating at its existing location since the mid 1970's to treat the City of Council Bluff's sanitary wastewater. This project included the evaluation, replacement, and upgrade of preliminary treatment facilities that were in need of extensive improvements due to significant structural and equipment deterioration from age and corrosion. In addition, the existing grit facilities were in need of upgrade to provide more efficient grit removal and reduce operational problems.

Goals and Objectives

The primary goal of this project was to replace the existing aerated grit removal equipment and system with a more efficient system. The grit particles in the area around Council Bluffs include a very fine silt particle contributory from the Loess Hills development near the Missouri River. The existing aerated grit removal system could remove particles down to a size of 300 micron. However, these finer silt particles would pass through the existing grit removal process and settle in downstream tanks, reducing their effective capacity. The goal of this project was to remove particles smaller than 100 micron.

The project objectives also included installing the new grit facilities within the existing plant structure and hydraulics. The major limiting factor of this requirement was the available hydraulic head of about 12 inches. Grit removal would be required at peak flows of 30 mgd.

Evaluation

Several grit removal technologies were investigated to meet these requirements. Various vortex (free and forced) grit removal systems have proven to remove grit particles at these smaller particle sizes. Free vortex systems could be implemented but would require multiple smaller units and would not remove the smaller particles. A forced vortex system could be used for grit

removal of particles down to 50 micron but would require re-pumping of the wastewater to meet the hydraulic requirements.

A newer innovative grit removal system was also evaluated. This headcell technology could remove particles down to 50 micron and only required less than 12 inches of hydraulic head. However, at the inception of this project, there were only two installations of the headcell technology. They were both on relatively small treatment facilities as the technology was developed and tested. The Council Bluffs project would be the first implementation of the larger diameter (12 feet) units for grit removal.

Based on this evaluation, the decision was made to use the new headcell technology for finer grit removal. The system could be installed in the existing structure and provide for the flows and grit removal requirements identified.

Implementation

The headcell technology consists of concentric cones submerged in a basin with an inlet flow device to split flows to the individual grit removal cones. Four headcell units were designed and installed on this project with each unit containing seven grit removal trays at 12 feet diameter. The headcells are designed to remove grit down to a size of 75 micron at peak flows and down to 50 micron at normal flows. This removal is for much smaller particles than the old aerated grit system. In addition, the percentage of grit removal captured is much greater than the old system.

Other portions of the system include stainless steel channels to deliver the flow to the four headcell units, grit pumps to transport the grit dewater conveyor to dewater the cleaned grit prior to disposal.

The project has been constructed and operating successfully since October 2004.

Summary

This is the largest headcell installation in the world handling a peak capacity of over 30 million gallons per day.

This paper will present the findings of the study leading to the implementation of the headcell technology and a description of how the headcell technology is effective in removing and capturing the grit particles. The successful installation and operation of the equipment will also be presented. Additional grit removal data is being collected on the effectiveness of the units and will also be included.

The new headcells are removing particles smaller than 50 micron at normal flows. This significant improvement keeps additional solids out of downstream clarifiers and digesters where grit particles collect. By keeping these grit particles out of the treatment process, equipment is maintained longer due to less abrasion and basins are kept cleaner to maintain their full capacity.

Keith Hobson, P.E., BCEE is the author of this abstract as well as the full paper and presentation given at the WEFTEC, the annual conference of the Water Environment Federation (WEF) in Washington, D.C. in November of 2005. Please contact Mr. Hobson for more information about this project.

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