

### Project Highlights

- Former paddle wheel-type grit removal system became inoperable shortly after start-up
- Grit King system was chosen as the replacement grit removal device
- The low headloss Grit King fit the shallow hydraulic profile
- Pre-installation factory testing showed that the Grit King removed >95% of grit down to 106 microns
- Post-installation in-field testing confirmed that the Grit King removed >95% of grit down to 106 microns



Figure 2 - The former paddle wheel-type grit removal system

**“The Grit King® is certainly meeting all of our expectations.”**

**Martin Cieszko,  
General Contractor**

### NC Air Station Launches Grit King to Defend Against Fine Grit



Figure 1 - The former paddle wheel-type grit removal system upstream of Pump Station 4259 had been inoperable for a number of years. The frustrated client sought a replacement grit removal system that would be effective, low maintenance and reduce wear and tear on the lift station pumps.

The previous grit removal system at Marine Corps Air Station (MCAS) Cherry Point Pump Station B4259 – a paddle wheel-type device installed circa 1990 – experienced operational efficiency problems almost immediately after startup and eventually failed to perform at all. Even though the other components of the lift station complex, including an automated bar screen, grit classifier, wet well and pumps, were functioning normally, the paddle wheel grit removal system had been inoperable for a number of years.

Insufficient grit removal can create expensive and maintenance-intensive problems for a wastewater treatment plant. Grit has been shown to cause the premature attrition of treatment plant equipment, including pumps and other mechanical equipment. Records from MCAS Cherry Point show that there were frequent pump maintenance issues at Pump Station B4259 during the time that the grit removal system was inoperable.

In June 2003, MCAS Cherry Point issued a Request For Proposal (RFP) for a design-build project to replace the grit system. The replacement grit removal system would have to remove 95 percent of grit down to 106 microns in diameter, at flows up to 10 million gallons per day (MGD). The RFP also stipulated that after in-field start-up,

field testing would be conducted to ensure that the new grit removal device was meeting the 95 percent removal performance specification. Cieszko Construction Co. (CCC) of Trent Woods, N.C., formed a design-build team consisting of CCC as the prime contractor with McKim & Creed, PA, also of North Carolina, as the engineer.

The design process started immediately after award and took approximately one year, as the design-build team faced a significant challenge retrofitting the existing set-up. The project required integrating the new equipment into an existing flow line, and strict pre- and post-installation performance testing measures were required by the client to ensure product performance. Most manufactured grit removal devices could not operate within the limits of the drainage system's low operating head. The design-build team sought to design a reliable system that would last for at least 20 years. The team aimed to reduce costs incurred by MCAS CP by maximizing the re-use of the existing grit removal facilities and use of American-made system components, and by minimizing energy requirements for the new grit removal system. The team also aimed to control odor problems through efficient removal of organics and minimize the environmental impacts during the construction phase.

# Grit King®

## Marine Corp Air Station - Cherry Point

## Case Study

### Wastewater



Figure 3 - The chamber of the former grit removal system (right) was turned into a flow channel for the new Grit King® system (left)



Figure 4 - The new Grit King® system was started up in October 2006



Figure 5 - In-field performance testing confirmed that the Grit King® system removed more than 95% of sediments down to 106 microns

Ultimately, the team chose to implement as its grit removal device a Grit King® hydrodynamic vortex separator supplied by Hydro International Inc. of Portland, Maine. Pete Duty & Associates of Durham, N.C., acted as the local sales agent.

Before installation could begin, the design process encountered a delay due to a lack of accurate flow and grit characteristic data provided by the client to support the design calculations. To overcome this problem, the design-build team performed a detailed preliminary engineering evaluation, consisting of a hydraulic assessment of the pump station, grit sampling and analysis, chemical sampling and analysis, pre-fabrication factory testing and reporting.

The most critical parameter determining the design was establishing the particle size distribution of the grit within the wastewater influent to the pump station headworks. Five grit samples were collected from various sampling points within the MCAS Cherry Point wastewater system. The grit analysis revealed that the particle size distribution of grit in the MCAS CP wastewater contained a relatively larger percentage of fine particles than was originally expected. The grit analysis enabled Hydro International to accurately size the Grit King separator to ensure compliance with the 95 percent removal performance specification.

In April 2005, prior to finalizing the design of the new grit system, Hydro International carried out the pre-fabrication factory testing of the proposed Grit King unit at the company's hydraulics testing facility in Portland, Maine. The factory testing, which was independently witnessed by the engineer, showed that the proposed Grit King would remove up to >95 percent of the 106 micron particles of the MCAS Cherry Point grit at an Instantaneous Peak Flow (IPF).

Construction on the project began in January 2006. Concrete was poured into the chamber of the former paddle wheel-type grit removal system to convert it into a flow splitting chamber. Influent flows entered the front half of the chamber, where they were conveyed into the Grit King. The degrittied effluent of the Grit King was returned to the back half of the chamber, where it then flowed out to the pump station located a short distance downstream. Construction was completed in September 2006, and the newly installed grit chamber and its auxiliary equipment was started up without incident on Oct. 17, 2006.

The final in-field performance testing of the grit chamber was conducted on November 29, 2006, by CCC, the engineer and Hydro International representatives. The results showed the new grit chamber performed well above the required 95 percent removal of sediment 106 microns and greater. These results were obtained even without the expected 5 to 10 percent limits of error which could easily be realized with the method of sampling used for this testing.

As part of the design build contract, the general contractor is handling the operation and maintenance of the new grit removal system for the first year after start up. Feedback on the system's operation thus far has been positive. "There have been no repairs required since start-up," general contractor Martin Cieszko said. "We find that most rags or objects that get through the bar screen are removed by the Grit King as well as the sand. It is certainly meeting all of our expectations."

The maintenance crew at MCAS Cherry Point will take over maintenance of the system in October 2007.