

Reducing Energy Costs and Eliminating Pump Station Water Hammer

A Case Study

BACKGROUND

The Houghton Lake Sewer Authority (HLSA) reduced pump station operating costs, solved a long-standing water hammer problem, and decreased maintenance requirements at their largest pump station.

The pump station has two 150 hp. pumps that deliver 4,200 gpm into a 24 inch forcemain. The station was designed with pneumatically actuated pump control valves. The valves were intended to slowly open and close during each pump cycle thereby reducing water hammer. However, the valves often failed to fully close, resulting in backflow and shorter pump cycle times. The valves were also prone to mechanical failures causing water hammer forces in the pump station.

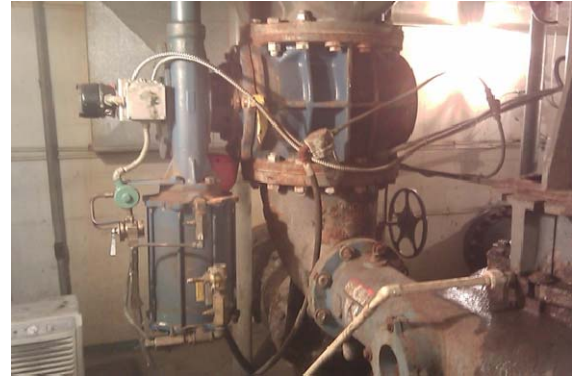


HLSA Main Pump Station

These problems resulted in significant maintenance requirements by the HLSA staff.

PROJECT APPROACH

Gosling Czubak worked with the HLSA operators to modify the piping and pump control system. The goal was to operate the station more reliably and reduce the potential for water hammer. Working closely with a team of contractors selected on qualifications, Gosling Czubak listened to the needs of the HLSA staff and cooperatively developed solutions that were reliable, cost effective, and easy to maintain.



Old control valve

THE SOLUTION

The solution involved three key components. First, the pneumatic pump control valves were replaced with a hydraulically modulated surge control check valve. Second, each pump motor was fitted with a new Variable Frequency Drive (VFD) to allow variable speed start up and shut down modes. Third, a new programmable controller was installed with a custom program that could operate the station in either an "on/off" mode, or a continuous-variable speed mode to match incoming flows.



New pump control valve





RESULTS

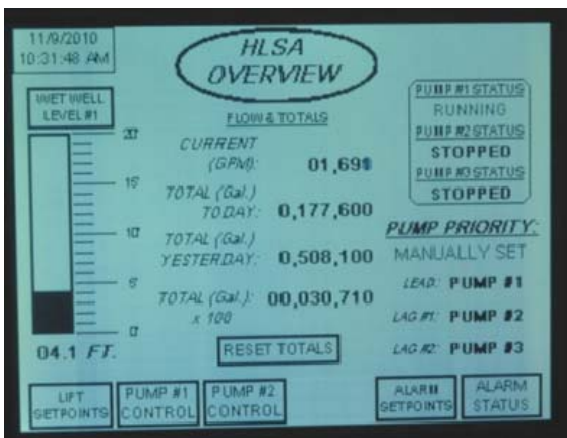
The combination of these strategies provided a reliable and effective solution to prevent water hammer and reduce power costs at the station.

The owner-designer-builder team cooperative effort allowed the construction work to proceed without interruption of service or by-pass pumping.

HLSA staff report that the power cost savings have been significant. Additionally, the maintenance needed at the pump station was reduced substantially. Brett Yardley, the HLSA Superintendent, said that "The station is very reliable – we don't worry about it anymore. Now only need to make routine visits to the station. The emergency repairs and station checks that used to be required due to motor tripping or other malfunctions have been virtually eliminated."



New 150 hp. motor variable frequency drives and programmable logic controller



Touch screen control panel

For more information about the benefits of variable speed motor controllers and reducing water hammer at pumping facilities, contact: Mark Hurley, P.E. or Doug Coates, P.E. at Gosling Czubak Engineering Sciences, Inc.

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Gosling Czubak
engineering sciences, inc.

Gosling Czubak
1280
Business Park Dr.
Traverse City, MI
49686-8607

Telephone:
231-946-9191
1-800-968-1062

Fax:
231-941-4603

Website:
goslingczubak.com