

A solution for clogging pumps

New pumps eliminate clogging, cut energy bills, stop emergency visits, reduce pump wear, improve worker safety, and relieve concerns for basement flooding

Mike Gerszewski and Jim Fischer



Jake Schlafer and Josh Georgenson, collection system maintenance operators with the Village of Hartland, Wis., make an emergency service call to service a clogged pump. Mike Gerszewski

“The alarm is sounding again; must be another clogged pump!” was a common middle-of-the-night refrain in the Village of Hartland, Wis. Emergency calls had become the norm.

Frequent problems plagued the village’s lift stations. Of greatest concern were frequent emergency service calls to remove debris from clogged pumps. Unscheduled service calls had become a major expense as overtime hours and unplanned maintenance costs snowballed. This problem alone gave the village of 9000 people ample reason to look for a solution, but the solution – a new type of pump – also would provide other benefits.

Cleaning leads to recurring messes

Pump clogging was the village’s main concern. Unscheduled service calls arrived at all hours of the day at a rate of three to four per week. Each call meant a minimum of 4 person-hours. And often, these calls took place after hours, requiring time-and-a-half pay for both the time worked and the time traveled to the site.

Once onsite, the responding crew first used a crane to lift the pump out of the station. Next, the crew members manually, using hand tools and rubber gloves, removed the clog from the pump suction area. Then they used the crane to lower the pump back into place and reconnect it. After that, they made a trip back to the shop to clean and disinfect the equipment and tools as well as dispose of the material removed from the pumps.

The Village of Hartland has six operators working at a time to respond to these calls. In addition to being tedious and repetitive work, the clogged pumps took away time required to complete other maintenance tasks and led to overtime charges.



Clogged lift station pumps were common in Hartland until the village switched to a different type of pump. This pump’s inlet, where flow normally would enter, is plugged with disposable cleaning wipes.

Mike Gerszewski

As the crews worked to clear the clogs, they began to investigate and examine the clogging materials. They found that the main cause of the problem was disposable wipes and nonwoven sheet materials.

At one station, in particular, a group of newly built homes was found to be a significant source of offending materials. Some more investigation revealed that cleaning services were flushing disinfectant wipes and other types of cleaning wipes down the drains rather than disposing of them properly.

Luckily, quick response times by the village’s operators prevented any basement backups, but the constant concern was worrisome.

Additionally, clearing the pumps raised health issues for the personnel removing so much hazardous, stringy debris from the pump impellers at such a frequent rate. The operators became concerned about their increased risk of exposure to pathogens and hazardous waste.

A different style of pump

To try to prevent these clogs, the village in 2003 tested a new type of pump at one of its pump stations plagued with continual clogging problems. The village replaced two multi-channel-equipped submersible pumps with two 3.7-kW (5-hp) pumps equipped with self-cleaning impellers and pump housing.

The impeller on the new pump has backswept leading edges that shed rags and stringy material. Instead of being perpendicular to the approach flow, as the original Wright brothers airplane wing was to the air flow, the impeller leading edges are swept back, like modern airline jet wings – except with even more back-sweep. This orientation enables the stringy material to be washed away



After a history of clogging problems, the Village of Hartland, Wis., first tested a new type of pump at its Crystal Drive Lift Station. The new equipment eliminated the clogging problem and unexpectedly used less energy.

Jim Fischer



By switching to a different type of pump, the Village of Hartland, Wis., eliminated frequent clogs and reduced energy consumption at the Arlene Drive Lift Station by more than 60%. Jim Fischer

by the incoming flow, which is nearly parallel to the leading edges. The flow forces stringy material to the end of the leading edges, and the pump housing has a groove that channels the stringy material away.

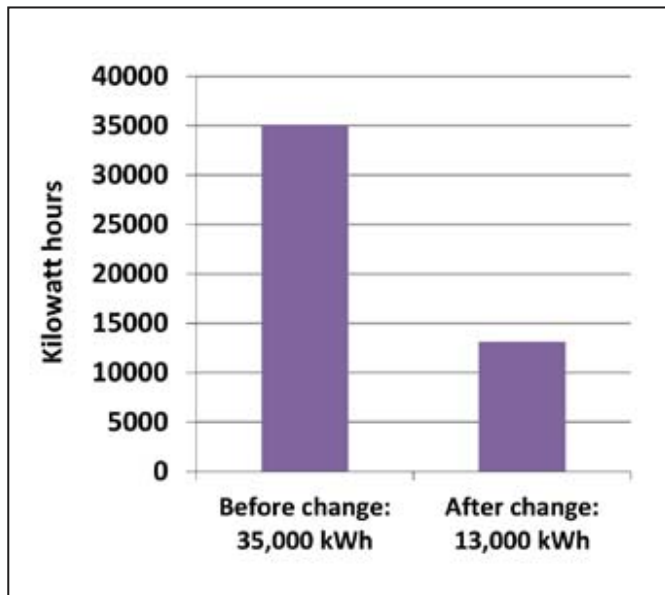
The new type of pump immediately eliminated the clogging problem at the pump station.

Encouraged by this success, in 2005 the village replaced pumps at another problem-laden station and again achieved the same positive result: no more clogs or emergency service calls.

Additional benefits

The goal of the project was to resolve the pump clogging problem, but a review of the pump stations' energy bills revealed an unforeseen benefit: dramatic energy reductions (see figures 1 and 2, below).

Figure 1. Annual energy consumption at the Arlene Drive Lift Station



At the 3.7-kW (5-hp) Crystal Drive Lift Station, electric costs dropped from \$1780 per year to \$883 per year – a \$897-per-year savings. At the 15-kW (20-hp) Arlene Drive Lift Station, electric costs dropped from \$4200 per year down to \$1960 per year – a savings of \$2240 per year. (All of cost savings are corrected based upon the volume pumped through each station.)

These savings are due to sustained high efficiency of the new pumps from not becoming clogged with stringy material. The old pumps did not sustain their efficiency during operation. When the leading edge of an impeller has a buildup of rags and stringy material, the efficiency drops because flow cannot pass freely. Efficiency drops to zero when the pumps are fully plugged.

The new pumps' elimination of clogs also removed the stress being placed on the village's maintenance budget.

A profitable change

The new pumps delivered several valuable benefits to the Village of Hartland:

- Unscheduled service calls to fix clogged pumps were eliminated. This saved time and the maintenance budget.
- The risk for basement backups from pump clogging was eliminated.
- Worker safety was improved, as personnel no longer had to clean the hazardous stringy material from the pump impellers. The stringy debris contains hazardous waste and blood-borne pathogens that are a health risk.
- Energy bills at each lift station were cut by more than 60%. The energy savings paid for the new pumps in 3 years.
- Pumps now last longer because of reduced wear.

These benefits convinced the village to convert three additional lift stations – five in all – to use this new type of pump.

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Figure 2. Annual energy consumption at the Crystal Drive Lift Station

