

Mixing It Up in Michigan

Mixer replacement at community utility treatment plant is expected to yield increased performance and dramatic energy savings.

The Ypsilanti Community Utilities Authority (YCUA) was formed in 1974 when the Charter Township of Ypsilanti and the City of Ypsilanti combined their respective water departments. YCUA purchases water from the Detroit Water and Sewerage Department and distributes it to about 112,000 people. The YCUA wastewater system includes more than 200 miles of collection sewers, more than 60 miles of interceptor sewers, almost 23 miles of sanitary force mains, 32 pump stations, and the wastewater treatment plant. The wastewater treatment plant provides tertiary treatment and disinfection before discharge to the Lower Rouge River. The design treatment capacity of the wastewater treatment plant is 51.2 mgd.

Scope

YCUA employs a total of 30 mixers in its aeration tanks as part of an anoxic nutrient removal process, and the mixers were failing.

The mixers were old, inefficient, and starting to fail, so YCUA elected to replace them with Flygt 4320 mixers with the help of local Xylem distributor, Kennedy Industries.

Three Flygt 4320 mixers were installed and three more are on order as plant personnel take down a tank at a time, a process that is expected to take several years before completion. Each tank is drained, the old mast is removed with the old mixer, and then a new tripod mast with the 4320 is installed.

Solution

Before deciding on the 4320s, Kennedy Industries along with YCUA operations and maintenance personnel performed an extensive energy study of the aeration mixers. The old mixers varied by manufacturer, horsepower, thrust, and input kW to operate. The goal of this study was to evaluate the mixers in terms of both performance as well as energy usage.

Over a couple of weeks Kennedy and YCUA personnel installed an Acuvim 2 W power monitor on one of the 4320 mixers at the plant and on each of the other manufacturer's equipment for comparison purposes. The mixers were monitored at five-minute intervals and all electrical data was transmitted via cellular modem and sent to Kennedy's servers so that YCUA could view the results in real time on a secure web site.



Installing the 4320 mixer



4320 mixer inside the tank

Customer: Ypsilanti, Michigan
Challenge: Failing Mixers
Solution: Upgrade to low-speed variable thrust 4320 technology

Results

Performance of the new mixers was quite impressive:

- Xylem’s Flygt 4320 mixer averaged .610 Input kW, or 5,343.6 kWh per year (\$427.48/year).
- An existing competitor mixer averaged 4.776 Input kW, or 41,837.76 kWh per year (\$3,347.02/year).
- Another existing competitor mixer averaged 6.246 Input kW, or 54,714.96 kWh per year (\$4,377.19/year).
- An existing old style Flygt 4650 direct drive mixer averaged 6.920 Input kW, or 60,619.20 kWh per year (\$4,849.53/year).

Energy Savings Comparison

Model	kW Power	kWh/Year	Cost to operate per year \$	10 year cost of operation
Flygt 4320	.610	5,343	\$427	\$4,274
Competitor 1	4.776	41,837	\$3,347	\$33,470
Competitor 2	6.246	54,715	\$4,377	\$43,772
Flygt 4650	6.920	60,619	\$4,849	\$48,495

When looking at ten-year energy costs based on \$0.08 per kWh, the 4320 would use \$4,274 resulting in a savings of \$29,196 to \$44,221 per mixer replaced. And what’s more, the 4320 is currently operating at 22 rpm. If YCUA would further reduce the speed to 16 rpm, the power required would reduce to just 0.24kW or \$1,681.90 over 10 years. These results do not take into consideration any changes in electrical energy costs over this time span. However, the cost of electricity increases each year, so the savings are likely to be even greater than reported here.

Launched in 2015, Xylem’s Flygt 4320 mixers are built with IE4 equivalent permanent magnet motors and integrated intelligent speed control. These features enable the mixer to generate the needed thrust, while consuming as little as 50% of the power of a compact submersible mixer. The new motor/drive combination also gives operators the ability to dial in any speed/thrust needed (up to 3,400 Newtons) with the press of a button on the convenient tank side control panel. Furthermore, the mixers require maintenance only once every two years, or 16,000 hours.

Three propeller sizes are available, each in two- or three-blade versions: 55, 79, and 98 inches for a range of mixing applications. Power options can be selected from two, four, and eight kW.

So for the next several years Ypsilanti Community Utility Authority personnel will be busy doing at least two things – upgrading to Flygt 4320 high-efficiency mixers and saving a lot of money on their energy costs.

By any measure, these potential energy savings are nothing short of incredible and could easily approach \$1 million over a decade.



Submersible mixer drops in easily from truck to tank



Mixer control fits easily onto existing panels - showing “STOP” during installation

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