

# Integrated Overvoltage Protection in the IQ SENSOR NET

THE INSTRUMENTS IS STILL TICKING - TWO EXAMPLES FROM USA AND GERMANY

## Example 1: Cedarburg, USA

The old adage is that lightning never strikes the same place twice. But if it does, the team at the Cedarburg Wastewater Treatment Plant won't be concerned about their water quality monitoring system. After all, they've seen it before, after a 2014 strike blew out one of their aerator drives and its motor, but required only a reboot of their WTW IQ SENSOR NET 2020 wastewater process monitoring system - to get it up and running again.

"It was a freak thing we'd never had any experience with before," Cedarburg wastewater operator Nick Meurer recalls of the storm, which blew through on August 19, 2014. "It was a pretty good-sized storm—it knocked out communications in one of our buildings. We had a WTW DO probe in the second ring of an oxidation ditch. The lightning probably struck the channel, spread across the water and collected on the probe."

Lightning bolts can pack 100 million to 1 billion volts and can heat the surrounding air up to 60,000 degrees Fahrenheit. Meurer says the voltage probably traveled from the DO probe to the controller through the network cable, temporarily knocking out the 2020 controller. The strike also destroyed the aerator drives in a building 50 yards away.



The FDO® (optical dissolved oxygen)

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## Back in action

The motor and drive for one of Cedarburg's six aeration units were destroyed. But the 2020 controller was back up and running promptly and continued to provide reliable data without expensive repairs or replacement, says Mark Duerr, instrumentation sales manager for Cedarburg-based Mulcahy Shaw Water, who helped the wastewater plant team design and install its WTW system.



Team member holding an FDO® probe (Optical DO)

The plant had upgraded to the IQ SENSOR NET a few months before the storm, Duerr says, installing the 2020 XT controller and running six new sensors into it:

two optical FDO® 700 IQ probes to measure dissolved oxygen; two IFL 700 IQ interface sludge blanket level probes, a ViSolid® TSS (total suspended solids) probe and a SensoLyt® ORP (oxidation/reduction potential) probe. In all, the 2020 universal controller is capable of networking and controlling up to 20 individual sensors, so Cedarburg can easily add additional measurements in the future—all that's required to expand is a new cable and probe.

By replacing traditional style analog probe/transmitter instruments with the networked, digital IQ SENSOR NET system, Duerr says, the City of Cedarburg saved money on hardware. As it turns out, they also set themselves up for a quick recovery from a strike from Mother Nature.

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“Entering settings into the 2020 XT is easy, Meurer adds. “It’s user-friendly,” he says. “The user interface of the 2020 XT is easy to navigate, especially compared to the instruments we had from the ‘90s and early 2000s. It’s a graphic interface, it tells you specifically what you’re dealing with, and there’s a lot more screen to work with.”

Managing the probes is easy, too. The FDO® 700 is an optical sensor so there are no membranes or electrolyte to replace. Instead, the probe uses a sensing cap that has a 2-year warranty.

The replaceable cap on the FDO® 700 probe sends its coefficients to the 2020 XT controller automatically when it is installed on the sensor probe, so there is no need for calibration or manual entry of calibration coefficients.

Additionally, the unique angled cap design eliminates interferences from aeration bubbles hitting the sensor.

Also, since the probe is detachable from the cable, the cap can be replaced in seconds, in the comfort of a sheltered location.

In fact, Meurer says he has spent just a little extra time on the lightning-blasted DO probe, checking its calibration a couple of times since the storm to ensure that it’s in working order. It’s been right on target, he reports.

Otherwise, the only maintenance he has had to perform on the WTW DO probes has been wiping the sensor caps and membranes with a cloth once a month and periodically changing the caps, which is called for by plant protocol when the warranties expire. In fact, the sensor caps work fine after the expiration of the warranty period until, at some point, the luminescent material becomes depleted and the probe is no longer functional. That can be verified with a simple sensor test routine. In practice, FDO® 700 probe sensor caps have been known to last up to three or even five years, he says.



FDO® Dissolved Oxygen Probe

### High overvoltage protection

Despite the dramatic circumstances, the IQ SENSOR NET system at the Cedarburg plant performed exactly as designed. WTW recognized the risks faced by probes and controllers in wastewater treatment plants, where they are typically mounted on metal handrails or steel posts and directly wired to thousands of square feet of open water.

A fuse in the 2020 power supply module protects the controller, but a key element of WTW’s overvoltage protection system is the network cable.

The WTW network cable is not conventionally grounded—it’s a ‘floating ground’ system. Additionally, the conductors are wrapped in a braided metal shield, unlike the foil shields that are popular in thirdparty cables. That sets the standard for overvoltage protection.

Duerr says that WTW’s lightning protection is unique in the industry.

The team at the City of Cedarburg’s wastewater treatment plant is convinced that they’re ready even if lightning does strike twice.



He says the Cedarburg story is still making the rounds among amazed wastewater treatment staffers in the region. But he figures new stories will crop up soon. "Until you see something like this happen, you say, 'what's the chances?'" Duerr notes.

"But then you see it."

These systems are essentially lightning rods out there. You're always in an open tank. You're just waiting for something to happen. Sooner or later, something will."

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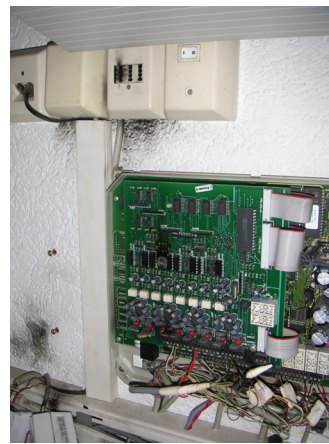
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### Example 2: Biblis, Germany

On Tuesday, 29th July 2008 an incident occurred at 1:40 p.m. during crane work on the construction site at the waste water treatment Biblis. The swivel arm of a remote-controlled tower crane became entangled in a high voltage line.

Fortunately, no one was injured. There was, however, substantial material damage. Smaller conflagrations, caused by the intermittently electrified building crane, were extinguished by the fire department immediately.

During this incident 380 kV came into contact with the electrical equipment on the site. Almost all measuring and communication equipment was destroyed!



### The IQ SENSOR NET withstood

It continued working as usual when the energy supply was restored!

Testing of the system revealed that none of the components had suffered any damage, neither the multi voltage power supply units, nor output modules or individual sensors!



### Overvoltage protection in numbers

Are you interested in the values for surge immunity of the IQ SENSOR NET systems?

Then please feel free to contact us.

[xylemanalytics.com](http://xylemanalytics.com)

Do you have further questions?  
Please contact our  
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