Case Study: AAQUA NV

Cost savings and flexible, robust systems improve industrial wastewater treatment

Opto 22

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THE CHALLENGE

Whether you call their factory a slaughterhouse or an abattoir, processors of animal meat products know they have a serious problem with wastewater.

Slaughterhouse wastewater contains large amounts of blood, fat, and hair, plus microorganisms (some of which cause disease), detergents and disinfectants used for cleaning activities, sometimes chloride from salting skins, and often veterinary pharmaceuticals.

If the blood from just one cow carcass is directly discharged into a sewer line, the effect on the sewer system would be the same as the total daily sewage produced by 50 people.

Obviously this is not waste that should go directly into municipal water systems. So the factory has just two options: pay to have their wastewater treated elsewhere, or treat it themselves.

But treating wastewater at the slaughterhouse itself is expensive and complex, involving a series of processes: filtering, dissolved air flotation (DAF), sedimentation, and aerobic and anaerobic treatments.

Treating slaughterhouse wastewater is expensive and complex.

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>
> **– Marc Feyten, AAQUA NV**

AAQUA NV understands these problems thoroughly. The Antwerp-based company has specialized in engineering and constructing industrial wastewater treatment plants since 1999, with customers all over the world.

Slaughterhouses are just one type of industrial wastewater customer that AAQUA serves.

"Wastewater treatment is a burden and cost for our customers," says Marc Feyten, CEO, AAQUA NV. "It is a byproduct of their commercial activity which they are obliged to deal with. We try to keep their cost and time investment as low as possible."

Where possible, the company also adds value to customer waste, either by recycling wastewater to drinking water quality or by capturing the energy in the water to reduce fuel costs. Their Blue Heat Recovery Operation (BLUE-HERO®), for example, uses wastewater as a heat source. It can heat process water (typically 12°C) up to 45°C and higher, and reduces customers' CO_2 footprint as well.

Aerobic biological treatment is often a crucial step in purifying treated water, and the AAQUA-SBR (sequencing batch reactor) has become well known for efficient aerobic treatment in a variety of industries.

The whole process is automated and requires only simple maintenance. The pre-processed wastewater moves into a large low-loaded reactor containing microorganisms, and oxygen is injected in controlled quantities. The action of the microorganisms produces carbon dioxide and new biomass, with relatively low amounts of sludge and no need for a separate sludge clarifier.

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A Sequencing Batch Reactor (SBR) provides aerobic biological treatment, a crucial step in the purification process.

THE PROBLEM

Since wastewater treatment is a cost, companies in the industry often try to cut costs at an automation level. Especially for smaller companies, remote monitoring, extensive SCADA, and more complex steering algorithms are the first to go.

AAQUA NV decided to take a different approach, looking for ways to cut costs while still providing robust automated systems. This approach would provide more value to customers and also differentiate the company in its field.

Between 1999 and 2005, the company developed systems using micro PLCs, such as Siemens LOGO! and Mitsubishi and Omron PLCs, often with the assistance of a third-party subcontractor. But in 2005 AAQUA decided to offer automation themselves. A small company at the time, AAQUA had just six people, none of them automation engineers.

To meet their needs, they looked for an automation system that was Ethernet based, flexible, reliable, offered remote access, and was easy to learn.

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AAQUA knew another automation company that had worked with Opto 22 products and recommended the system's robustness. Meeting Opto 22 Distributor Mulder-Hardenberg at a trade show, they learned that Opto 22 SNAP PAC controllers were Ethernet based and provided an easy method for remote monitoring. They also learned that Opto 22 has a good reputation for supporting legacy products and offering end-of-life solutions.

The SNAP PAC System seemed easy to learn, although there were no training centers near AAQUA's location in Belgium. The Opto manuals and website provided a good starting point, and they found that setting up a basic system was not difficult.

THE SOLUTION

Thirteen years later, AAQUA is still exploring the possibilities of Opto 22 products and adding new features to their system.

Today, AAQUA's typical wastewater system includes a SNAP-PAC-R2 rack-mounted controller, a 16-module mounting rack, and between 100 and 300 I/O channels. Taking advantage of higher density modules saves space on the rack.

SNAP-IDC-32 input modules and SNAP-ODC-32 output modules each provide 32 channels in a small footprint, with a breakout board to make wiring easier.

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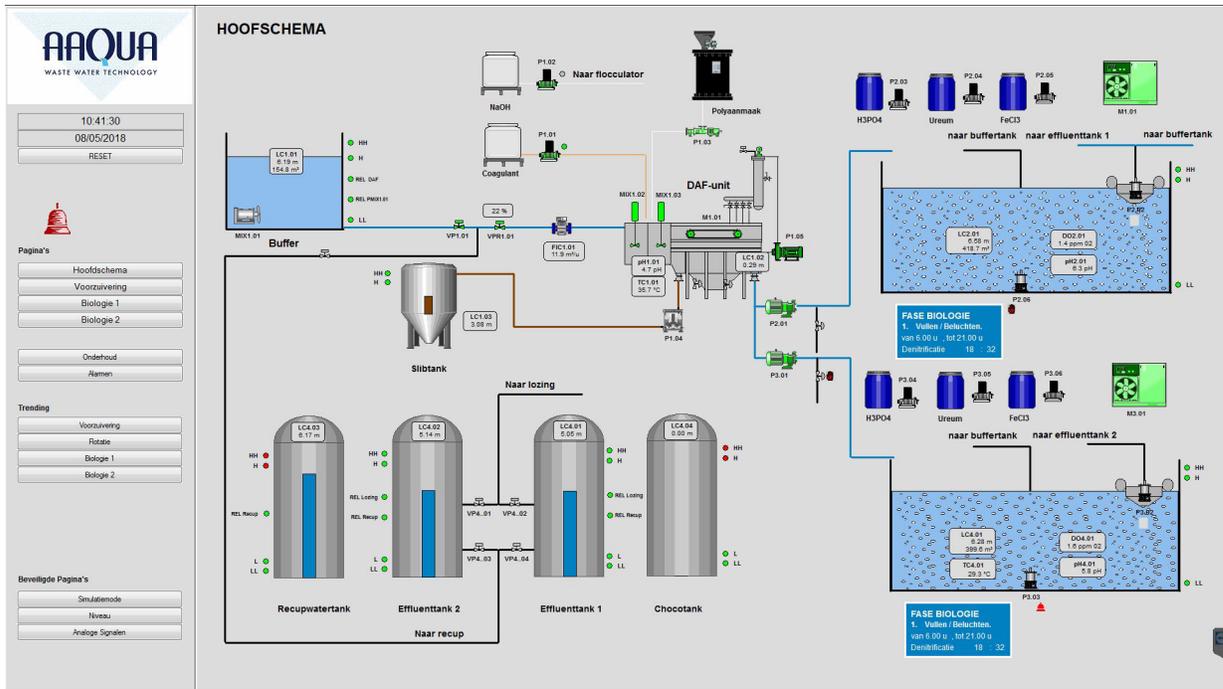
AAQUA builds a custom HMI for each customer's system.

SNAP-AIMA-4 and SNAP-AIMA-8 analog input modules offer 4 or 8 channels of -20 mA to +20 mA current input.

In addition, SNAP-ODC5MA discrete output modules facilitate troubleshooting with manual/auto switches for each channel. And for analog output, the SNAP-AOA-23 provides 4-20 mA current output. All of these I/O modules have proven their reliability and quality in wastewater treatment environments, and most are guaranteed for life.

Opto 22's free PAC Project Basic Software Suite requires no licensing or support fees and provides control programming plus a traditional Microsoft Windows HMI. Control programming is flowchart based, and AAQUA uses the optional scripting to implement more complex algorithms for system control. The HMI typically runs on an industrial NUC-based PC or a touchscreen PC.

The system logs all important parameters and creates trends for all the key issues in monitoring an industrial wastewater system, including influent flows, oxygen levels, pH, and redox (oxidation-reduction) reactions.

Trending provides the data AAQUA needs to analyze and adjust systems for efficiency. In some cases they program the SNAP PAC controller to send emails directly to customers for information or action.

Because the SNAP PAC controller communicates natively via Modbus/TCP, the system is integrated with other equipment used in wastewater treatment, including Danfoss drives and Siemens, Endress & Hauser, and other third-party equipment.

Remote System Access

All of AAQUA's installations are connected to the internet, primarily for remote access and configuration. By remotely accessing their systems using TeamViewer or Ixon, the company can help clients by phone while preventing unnecessary transport cost and time.

Marc Feyten, CEO, AAQUA NV

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In most cases this access uses the client's network environment, but AAQUA is exploring the possibilities of using Node-RED and Ignition Edge in the future for moving data using industrial internet of things (IIoT) technology.

With about 70 installations over 13 years, AAQUA is pleased with the Opto 22 system's proven robustness and simplicity. The harsh environments these systems run in often include corrosive hydrogen sulfide (H2S) and ammonium fumes, but the Opto 22 system handles these environments without any major problems.

"Opto 22 lasts a long time, where other hardware crashes," says AAQUA CEO Feyten.

LOOKING AHEAD

AAQUA's ability to save their customers money while providing a reliable automated system for wastewater treatment has differentiated them from others in their field. Their flexible systems offer real value to slaughterhouses and to a variety of other industries needing to treat the wastewater resulting from their processes.

Looking to the future, AAQUA plans to explore the possibilities of Opto 22's *groov* EPIC® controllers, which offer real-time control plus data handling, connectivity, and visualization in an industrial package. The EPIC's built-in IIoT technologies, including Node-RED and Ignition Edge, offer new ways of remotely accessing systems and moving and analyzing data—all of which will make wastewater treatment even more effective and efficient.

ABOUT OPTO 22

Opto 22 was started in 1974 by a co-inventor of the solid-state relay (SSR), who discovered a way to make SSRs more reliable.

Opto 22 has consistently built products on open standards rather than on proprietary technologies. The company developed the red-white-yellow-black color-coding system for input/output (I/O) modules and the open Optomux® protocol, and pioneered Ethernet-based I/O.

Opto 22's groov EPIC Edge Programmable Industrial Controller offers real-time control, connectivity, data handling, and visualization in an industrial unit.

In early 2013 Opto 22 introduced *groov* View, an easy-to-use IoT tool for developing and viewing mobile operator interfaces—mobile apps to securely monitor and control virtually any automation system or equipment.

Famous worldwide for its reliable industrial I/O, the company in 2018 introduced *groov* EPIC® (edge programmable industrial controller). EPIC has an open-source Linux® OS and provides connectivity to PLCs, software, and online services, plus data handling and visualization, in addition to real-time control.

All Opto 22 products are manufactured and supported in the U.S.A. Most solid-state SSRs and I/O modules are guaranteed for life.

The company is especially trusted for its continuing policy of providing free product support, free online training, and free pre-sales engineering assistance.

For more information, visit opto22.com or contact **Opto 22 Pre-Sales Engineering**:

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