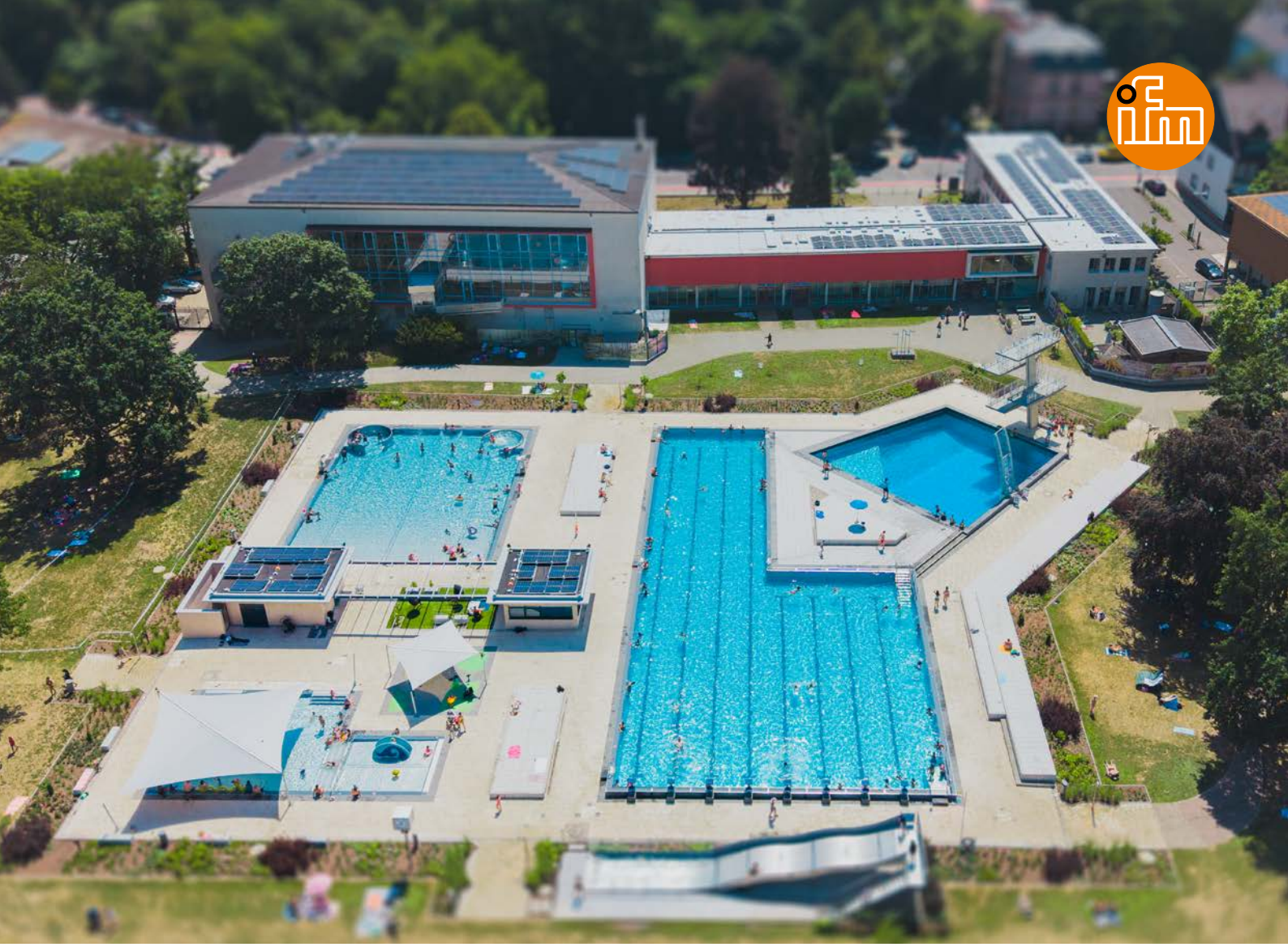


DIGITALLY CONNECTED SWIMMING FUN

IO-Link and ifm sensors are modernising swimming pool technology

As part of the modernisation of the outdoor pool at the Heinrich-Fischer-Bad in Hanau, Aqua Consulting is relying on IO-Link and sensors from ifm, making swimming pool technology more transparent and efficient.

Behind the scenes, complex technology is at work to ensure that bathers can enjoy a refreshing dip on a hot summer's day without a care. The water must be continuously circulated, filtered, disinfected and, where necessary, heated. Levels, pressures, flow rates and water parameters must remain within the defined limits and setpoints at all times.

This is exactly where Tino Krebs Aqua Consulting GmbH comes in: the engineering firm plans the technical building systems for swimming pools, from heating, ventilation and filtration technology to electrical systems and pool water technology, as well as measurement and control technology.

One of the company's recent projects was the modernisation of the outdoor pool area at the Heinrich-Fischer-Bad. The combined indoor and outdoor swimming pool dates from the 1960s; the last major refurbishment of the outdoor pool's water treatment system took place in 1983. The aim of the current project was therefore not only to modernise the technology, but above all to improve the energy efficiency of the outdoor pool.

From one pool to another

The basic principle of water treatment is easily explained: the water used by bathers flows via the overflow channel into the raw water tank. From there, pumps convey the wate-r to the filtration plant. At the Heinrich-Fischer-Bad, multilayer suction filters containing sand and activated carbon are used. After filtration, the water is disinfected and, if necessary, heated before being returned to the swimming pool via inlets in the pool floor. This creates a continuous cycle that must operate reliably around the clock.

To ensure that this cycle runs safely and efficiently, the control system requires a continuous supply of reliable information from the plant. This information is provided by numerous sensors, most of which are from ifm.



A look at the pool water treatment system in the basement of the main building: the open suction filters can be seen on the left. Numerous valve actuators are connected to the control system via IO-Link.

Sensors as the eyes and ears of the system

One example is level measurement in the open suction filters. Raw water and filtrate pumps must be coordinated to ensure that the water level remains within a defined range. If too much water is supplied, there is a risk of overflowing; if too much is pumped out, the filter could run dry.

"If we didn't have level sensors here to monitor the water level, in the worst-case scenario we could end up with a flooded basement," explains **Martin Philipp**, project manager at Aqua Consulting.

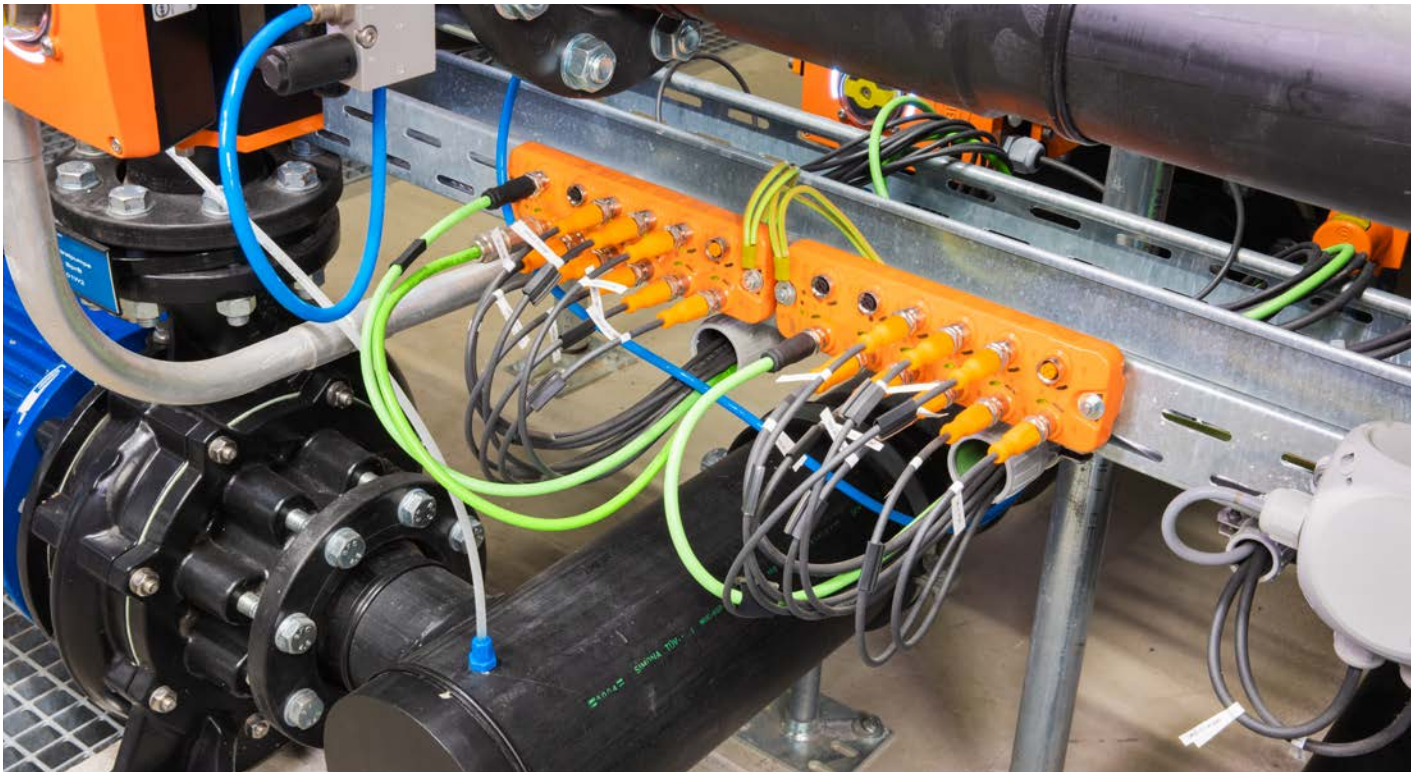
Flow, pressure and temperature sensors, as well as flow monitors, are equally important. Flow rates, for example, provide an important basis for adapting water treatment to actual demand. The dosage of pH adjusters, chlorine and flocculants also depends on the respective flow rate.
Flow monitors also perform safety-related tasks: if the circulation comes to a standstill, chlorine gas disinfection, for example, must also be stopped.

IO-Link instead of a tangle of cables

However, Aqua Consulting went one decisive step further with the modernisation. The numerous field devices, such as sensors and actuators, were no longer to be wired predominantly in a star configuration, with long cable runs to the control cabinet. Instead, the new outdoor pool technology was systematically designed around IO-Link.

The connected field devices are integrated into the automation system via IO-Link masters. This simplifies cabling while also opening up new possibilities for parameter setting, diagnostics and maintenance, advantages that are particularly evident in a large, technically complex facility such as the Heinrich-Fischer-Bad.

Even components that do not have native IO-Link capability, such as certain valve flaps, were integrated into the system via appropriate IO-Link interfaces. This means that the benefits of digital communication can also be used with conventional switching or purely analogue field devices.



Decentralised IO-Link masters collect the signals from the connected sensors and actuators, reducing the length of the cables running to the control cabinet.

For **Martin Philipp**, the effort involved in conventional installation was a key factor in his decision to take this new approach: *"IO-Link is an innovation designed to significantly reduce both the amount of cabling and the programming effort required."*

This is a particular advantage during installation on site. Pipes, pumps and other mechanical components are installed first, with the electrical cabling often coming towards the end of the process. Changes made shortly before completion can then create additional time pressure. Simpler installation with fewer cables significantly reduces the workload during this crucial phase immediately prior to commissioning.

Short distances, less effort

The water play area at the outdoor pool shows just how big the difference can be. Several diaphragm valves for water spray nozzles are situated close together, while the control cabinet is about 20 metres away.

In a conventional installation, numerous individual cables would have had to be laid over this distance. Instead, the IO-Link module was installed locally, close to the valves. **Martin Philipp** sums up this pragmatic solution: *"We simply installed the module on site. Short distances, minimal effort, and the job was done."*

This example illustrates a key advantage of the IO-Link concept: instead of wiring each individual field device all the way back to the central control cabinet, the connection point is brought closer to the process.

More than just digital connectivity

However, the real added value of IO-Link goes beyond conventional cabling. In addition to process values, device and diagnostic data are transmitted to the control system via digital communication.

In the case of valve flaps, for example, information on opening and closing times, movement patterns and other operating parameters can be analysed. Changes may indicate that a valve is no longer working properly.
"The diagnostic data enables operators to identify potential problems at an early stage: We need to keep an eye on this; a fault may be developing," explains **Philipp**. Ideally, this means that spare parts can be procured before an actual failure leads to an unplanned plant shutdown.



The pressure sensor measures the level of the backwash water tank via hydrostatic pressure.

> We simply installed the module on site. Short distances, minimal effort, and the job was done.
>
> *Martin Philipp,*
> *Project Manager at Aqua Consulting*

In addition, remote maintenance is possible because the pool water system is integrated into a bus system. Via remote access, the relevant plant engineer or programmer can access the plant's technical systems as required and provide support to the operator.

See what's working – and what isn't

Digitalisation also makes day-to-day operation more transparent. Coloured status indicators on the modules provide technical staff with a quick overview. At a glance, they can see whether a component is working properly or whether there is a fault.

This may sound like a minor detail, but it can make day-to-day troubleshooting considerably easier. In the past, when a fault was reported, staff might first have had to check the control system to identify which field device was affected and then locate where it was installed. With the help of IO-Link, faults can be pinpointed much more quickly.

Data as the basis for efficient operation

This high level of transparency also helps to adapt operation more effectively to actual demand. After all, an outdoor pool requires a different water treatment capacity on a hot public holiday, when the pools are full, than on a cool, cloudy morning with just a few early swimmers.

At the Heinrich-Fischer-Bad, the water treatment system can be operated at reduced capacity while complying with the prescribed water quality limits. Instead of running pumps continuously at full power regardless of actual demand, the flow rate can be reduced. This in turn reduces the required pump output and therefore energy consumption.

Sensor technology provides the necessary data for this. For example, the water parameters are monitored continuously. The condition of the filters is also clearly shown: pressure readings provide an indication of the level of contamination and help the operator to assess when backwashing is required. Where analogue manometers had to be read manually in the past, the information is now available in digital form.

Pressure sensors monitor the level in the open suction filters, providing important information for safe pump control.



Cost-effectiveness starts with the right application

Less cabling means less installation work. At the same time, IO-Link solutions require additional components such as masters and modules. For Aqua Consulting, the question is therefore not: IO-Link or conventional cabling? Rather, the aim is to choose the most technically and economically viable solution for each part of the plant. *"We should make full use of technologies wherever it makes sense to do so,"* summarises **Martin Philipp**.

IO-Link is particularly beneficial in situations where there are many sensors and actuators, where long cable runs can be avoided, or where additional diagnostic information offers tangible added value. In the case of individual, remote field devices, however, conventional cabling may still be the more sensible solution.

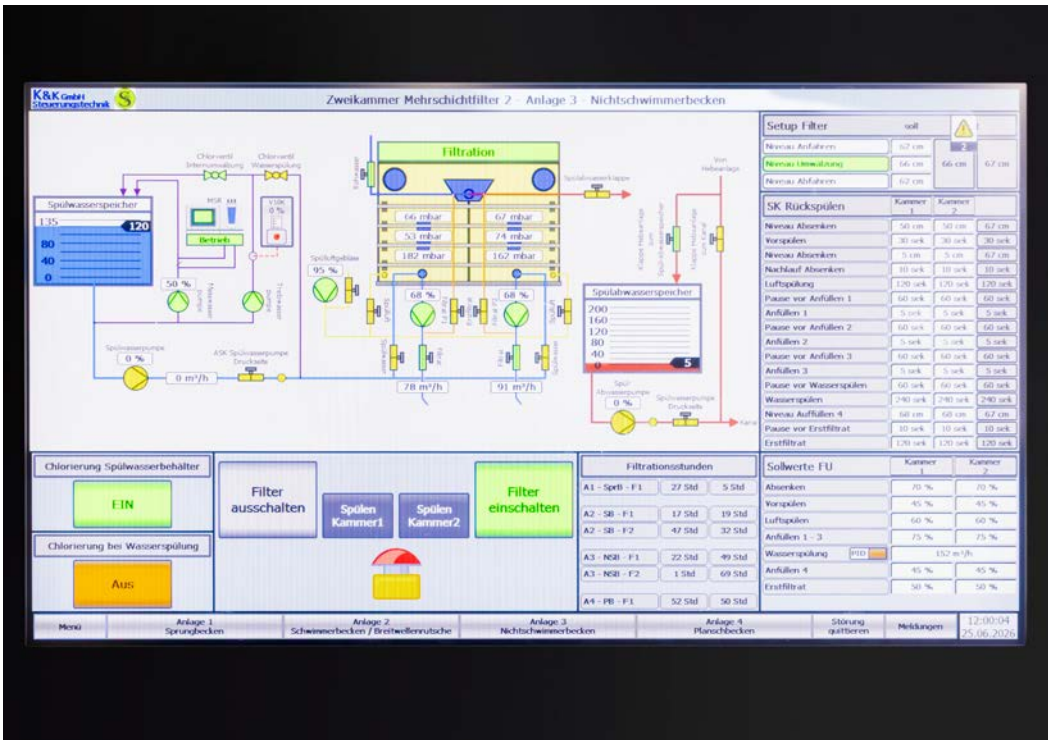
Breaking new ground together

Throughout the project, automation specialist ifm not only supplied the majority of the sensors and the IO-Link infrastructure. Support in implementing the technology also played an important role.

Aqua Consulting and ifm joined forces early on in the project. IO-Link was still uncharted territory for several of those involved. ifm therefore not only supported the engineering firm, but also included operators, plant engineers and contractors in the process, explaining how IO-Link works and how it would be implemented in the project.

This support paid off. *"I don't think it would have gone so smoothly otherwise, because IO-Link was, in a way, uncharted territory for everyone involved,"* says **Philipp**.

This also meant that the typical challenges encountered on site could be addressed quickly. According to Philipp, any missing components or additional connection parts required were supplied within a few days.



The operator can see all the relevant process data at a glance on the control panel, from the condition of the filters to the quantity and quality of the backwash water.

CONCLUSION

The modernisation of the Heinrich-Fischer-Bad demonstrates that IO-Link can also be used outside traditional industrial environments. Digital communication also offers tangible benefits in swimming pool technology: less cabling, flexible decentralised installation concepts, additional diagnostic capabilities, faster troubleshooting and greater transparency regarding the system status.

Sensors from ifm provide the crucial process information required. IO-Link masters and modules transmit data from the field level to the control system, while also making additional information available.

For Aqua Consulting, IO-Link is therefore not an end in itself. What matters is the tangible benefit.
Or, as **Martin Philipp** puts it: *"Every swimming pool is unique; every swimming pool has its own particular challenges."*

At the Heinrich-Fischer-Bad, digital connectivity has provided exactly the right solution in many areas.

ifm.com/cnt/heinrich-fischer-bad

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