Fourth treatment stage for the Halzhausen Waste Water Treatment Plant

Optimised pump technology ensures effective water treatment

The building for the fourth treatment stage was finished in 2019. In the foreground: secondary clarification

Active carbon filters for the fourth treatment stage arranged in six lines, each with two filter tanks, Qmax is 90 l/sec

Frequency-controlled standard pumps are used for feeding the sand and coal filters and for backwashing

The Oberes Lonetal Waste Water Association (AZV Oberes Lonetal) operates a waste water treatment plant (WWTP) in Halzhausen that serves the localities of Nellingen, Amstetten and Lonsee. The plant is designed for a capacity of 24,000 PE, and it meets all legal requirements for waste water treatment. At the end of 2017, the association was faced with deciding whether to upgrade the WWTP and implement a fourth treatment stage. The reason for this was twofold: firstly, the extension of the discharge permit issued by the administrative district office in accordance with water legislation and, secondly, the geological conditions in the Swabian Alb. Halzhausen is located in a karst area. Treated waste water is fed into the receiving water of the Lone river and quickly penetrates through the upper layers of earth to the groundwater. Anthropogenic trace substances therefore have no opportunity to "settle", meaning the risk of groundwater contamination cannot be ruled out. Given that this groundwater is a source of raw drinking water, this means there was virtually no choice about whether to implement a fourth treatment stage in order to ensure the best possible waste water treatment.

Anthropogenic trace substances pose a threat to the environment

For the first time, "endocrine disruptors" have been detected in numerous animals as part of a Swiss research programme. Despite highly sophisticated technical measures, these chemicals can enter the groundwater via treated waste water and then end up in humans via the food chain. According to the 2008 publication of the German Association for Water, Waste Water and Waste (DWA), micropollutants in waste water can be assigned to the following groups of substances: pharmaceuticals, industrial and household chemicals, plant protectants and pesticides, personal care products, fragrances and disinfectants, additives in waste water treatment and textile treatment products. The level of these trace substances can only be reduced with more stringent treatment (fourth treatment stage). Conventional treatment processes are not sufficient for this purpose.

Sand and active carbon filters remove anthropogenic trace substances

The Halzhausen WWTP has a conventional design for waste water treatment. It is equipped to carry out the usual process steps of aerobic/anaerobic waste water treatment followed by secondary clarification.

The treated waste water is fed by gravity from the clarifier to a collection sump. Constant monitoring allows the control system to activate pumps depending on the volume of waste water. The sand filters (two filters) are fed via two lines operated by four pumps. Before the waste water is fed into the sand filters, the required flocculant (ferric chloride) is added via five dosing pumps. After this treatment stage, the waste water enters the storage shaft for the active carbon filters. The phosphate level, turbidity and SAC of the waste water are measured at the same time. The downstream active carbon filters comprise 12 tanks that are arranged in six treatment lines. Each line has a maximum capacity of 15 l/sec. Depending on the waste water generated, the filter sections can react flexibly. If the maximum input is reached, a gate valve ensures that there is no overloading of the filter sections. After these process steps, the now fully treated waste

GRUNDFOS

Possibility in every drop

Five DDA 30-4 AR dosing pumps are used to add ferric chloride

Checking the dosing pumps used. Right: Karl Steck, Operations Manager, left: Maik Wötzel, Sales Representative at Grundfos

Facts and figures

Construction project:	Pump technology for a fourth treatment stage
Customer/Operator:	Abwasserzweckverband Oberes Lonetal
Location:	Halzhausen WWTP, Lonsee
Built and installed:	2019
Plant construction:	EUQUO KGN GmbH & Co. KG, Nellingen
Process engineering planning:	iat Ingenieurberatung GmbH, Stuttgart
Pump technology:	Grundfos GmbH, Schlüterstr. 33, Erkrath, Germany

Customer benefits:

- Pump technology entirely from a single supplier
- Compact technology/design
- Easy to service
- Large control range between Qmax and Qmin
- Optimum safety combined with optimum energy efficiency
- Quiet pump operation, reduced noise

water is discharged into the receiving water via an outflow shaft. A sampler is used to measure the turbidity, pH and SAC of the discharged waste water. Separate pumps are used for backwashing the active carbon filters. Water for backwashing is extracted from the outflow shaft. The backwash water (active carbon filter) is returned to the treatment process.

Pump technology for the fourth treatment stage: everything from a single supplier

Various process steps are used to treat the waste water in the fourth treatment stage. Each treatment phase requires a special pump system that is optimally tailored to that process step.

The following pumps are used for this purpose:

1. Feeding the sand filters
   Five NKGE 125-100-200/175 pumps
   Q = 134.5 m³/h
   H = 7.9 m
Second Feeding the active carbon filters
   Six NKGE 125-100-200/196 pumps
   Q = 91.5 m³/h
   H = 10.9 m
3. Backwashing the sand and active carbon filters
   Each filter has one NKGE 125-100-200/211 pump
   Q = 161.7 m³/h
   H = 12.7 m

Key feature: All the pumps are regulated, and the housing and impeller are both made of stainless steel. The filters used are fed according to the parameters of the waste water generated. There is a very large control range between Qmax and Qmin (this is also a reason for the relatively high number of tanks). The pump technology fully and – most importantly – reliably covers this control range while guaranteeing optimum energy efficiency. This is not possible with conventional pump systems.

4. Five DDA 30-4AR dosing pumps for adding ferric chloride
5. S1.100125.75 with single-channel impeller and bottom support ring, as an emergency pump for backwashing from sand and active carbon filters. Backwashing the activation zone.

The pump is only used if the screw pump provided for this purpose malfunctions or is overloaded.

NKGE standard pumps for various fields of application

When it comes to pump technology, it is now more important than ever to find the right pump for the specific use case in question. This is especially true when different volumes of water need to be processed for operational reasons. In this case, there was a large control range between Qmax and Qmin. Conventional pump technology is often overwhelmed in this scenario. The NKGE is a non-self-priming, single-stage centrifugal pump with volute pump housing and back pull-out design. It has an axial suction port, a radial discharge port and a horizontal shaft. The standard version has housing made of cataphoretic-coated cast iron or (as in this case) stainless steel 1.4408. The flanges and sealing systems comply with DIN EN 1092 and EN 12756. Another notable feature is the low-vibration sleeve coupling for easy motor disassembly (back pull-out design). The highly efficient IEC standard motor, in conjunction with the frequency converter, corresponds to efficiency class IE5. All pumps are statically balanced before delivery and tested on the “wet” test bench.

Advantages of these pumps:

- High-efficiency motor
- Wide performance range
- Compact design
- Very high corrosion resistance
- Easy maintenance (back pull-out)
- Optimal duty point adjustment

GRUNDFOS GmbH
Schlüterstr. 33
D-40699 Erkrath
Tel. +49 211 929 690
Infoservice@grundfos.com
www.grundfos.de

GRUNDFOS

0823/WU/4014826-BrandBox