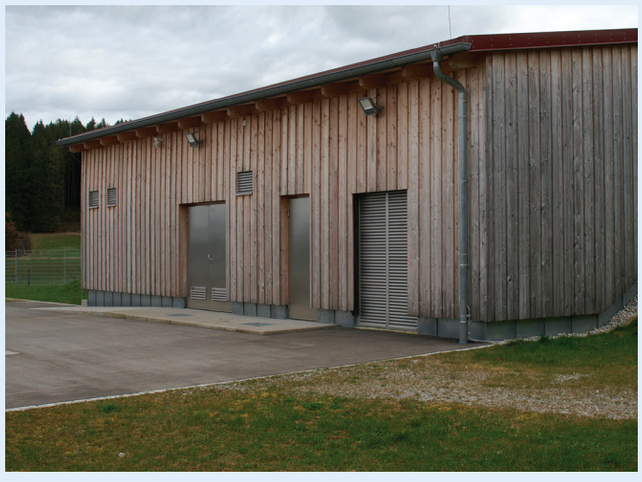
Construction of a second water supply system

Stadtwerke Schongau – it's always good to have a backup

The initial situation

Schongau is a town in Upper Bavaria that forms part of the Weilheim-Schongau district. The majority of the town – in particular the historic old town (Altstadt) – is located on the west bank of the Lech river in the Pfaffenwinkel region. In order to supply the inhabitants, local craft businesses and industry with fresh drinking water, the municipality founded its own company: Stadtwerke Schongau. At the time, the drinking water was supplied mainly via a pipe network in Schwabsoien. Two wells and an elevated tank are also located here. To be able to continue to secure the water supply in the event of faults with the connecting pipes, the elevated tank or the well and to ensure sufficient water reserves (in terms of both quantity and quality), the decision was made to create a "backup".



The underground reservoir comprising a technical building and two water chambers, each with a capacity of 500 m³, was completed in 2022

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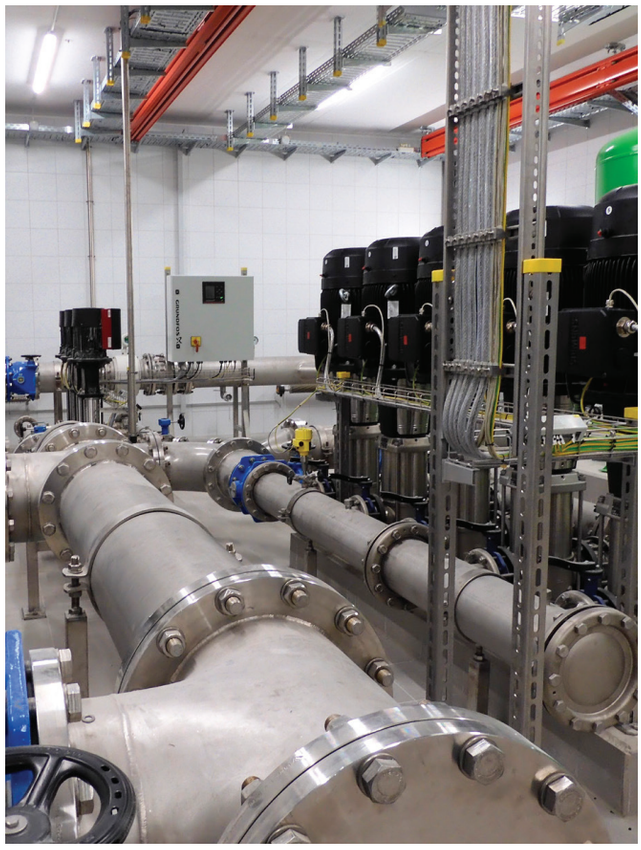
Possibility in every drop



The connections to the two pressure boosting systems and the diaphragm expansion tanks are located in the basement of the underground reservoir

The solution

The second water supply system will not only improve the security of the town's supply but also provide the neighbouring communities with fresh water.

The project-planning stage was well under way in 2015 and the first construction phase began in the following year. Three groundwater wells were built in the Bavarian state forest in the Denklingen district. At a depth of around 35 m, water can be extracted from these wells at a rate of approximately 80 l/s. The water is of such high quality that water treatment is not necessary. It can be fed straight into the pipe network from the wells. The high-pressure water pipeline required for this was built between a planned underground reservoir and Schongau during the first construction phase, which began in 2018. Work on the supply pipe (DN 400), which measures approximately 9 km in length, was finished in 2019. The three underground transfer structures (connections to the municipalities) were then built in the following year.

In the second construction phase, three high-pressure pipelines (route length of 3 km) were laid between the wells and the planned underground reservoir. The underground reservoir itself was completed in a third construction phase in 2020. It also includes a technical building and two water chambers, each with a capacity of 500 m^3. In 2021/22, the fourth construction phase saw all of the machinery and systems technology installed. The facility was commissioned in the spring of 2023.

The Hydro MPC CRNE 64-3 booster system with five vertical pumps and external control

Pump and systems technology used

Water extraction

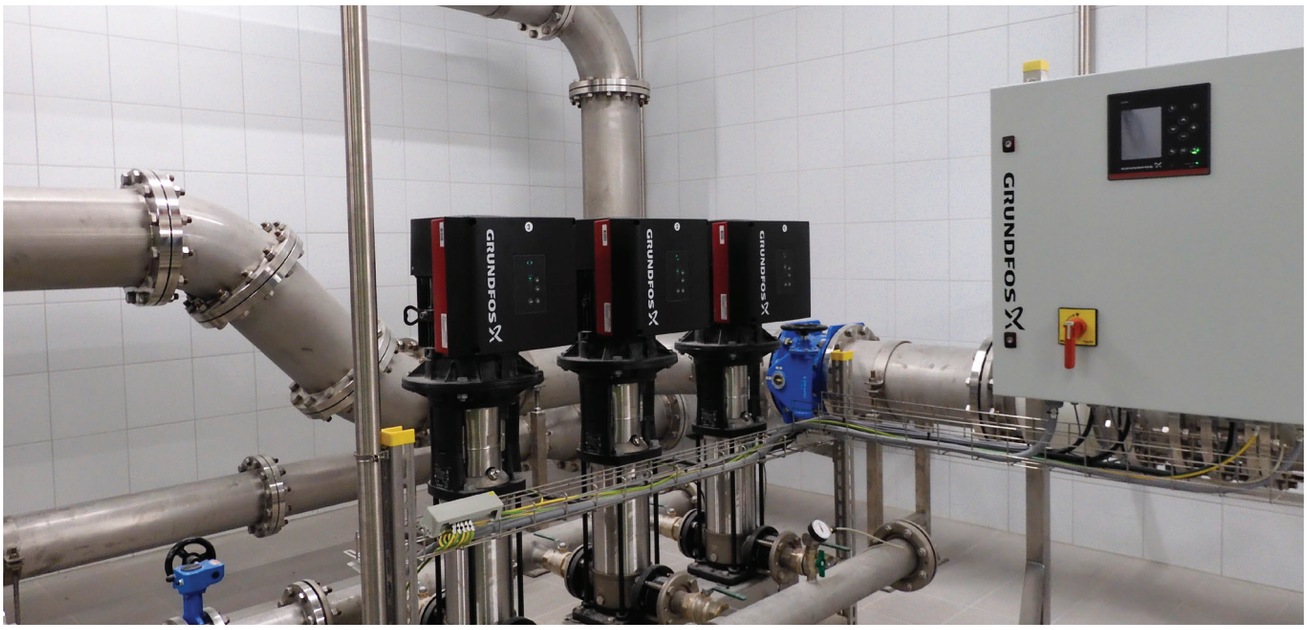
- SP 125-3AA, 22 kW with PT100
- SP 95-48, 15 kW
- SP 77-38, 9.2 kW
- Each SP pump includes cooling jacket, sealed cable and upper flange

Water distribution/Pressure boosting

- Hydro MPC 5 CRN 64-3
- Hydro MPC 3 CRIE 15-7
- Four diaphragm expansion tanks, 2,000 l, PN16

Other pump technology

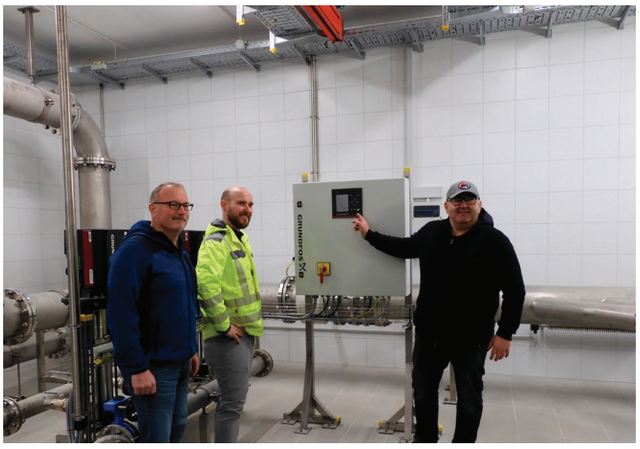
- Four Unilift AP35.40.061V pumps for basement drainage



The Hydro MPC CRIE 15-7 booster system with three vertical pumps for continuous water supply

"Intelligent" systems technology and control technology make all the difference

In order to guarantee a high level of operational reliability whilst at the same time ensuring that the systems technology operates as efficiently as possible, forward planning that takes into account all eventualities – depending on the initial situation – is required. In this case, installing two pressure boosting systems formed the basis of this. The Hydro MPC 3 CRIE 15-17 system ("small pressure boosting system"), one of these systems, is designed for continuous base load operation. CR series pumps are particularly energy-efficient. Significant changes have been made to their hydraulic system to increase efficiency. The impeller, in particular the impeller blades, have been optimised with laser technology, significantly increasing their efficiency. Thanks to the modular design, the individual pump components can be combined with each other in a variety of ways, allowing a customised solution to be created for virtually any task. In addition to the aforementioned features, all CR pumps boast sophisticated technology, high-quality materials and low-wear bearings. Another key feature is the unique cartridge mechanical shaft seal, made of highly wear-resistant materials. Thanks to the cartridge design, the sealing elements can never be incorrectly assembled. The delicate sliding surfaces never come into contact with greasy fingers or dirt. This significantly reduces the chance of failure due to improper installation. The CRIE model is a specification of the CR series. It is a vertical, multistage centrifugal pump with integrated frequency converter. All of its wetted parts are made of stainless steel 1.4301. The suction and discharge ports are opposite each other (inline design). CRIE pumps are equipped with a three-phase, air-cooled permanent magnet synchronous motor (PMSM).



Monitoring the pump technology – from left to right: Bernhard Sedlmeier, Water Engineer at Stadtwerke Schongau; Dipl.-Ing. (TUM) Florian Hiemer, Technical Plant Manager at Stadtwerke Schongau; Maik Wötzel, Senior Sales Engineer at Grundfos GmbH

Customer benefits:

- Pumps and process and control technology all from a single supplier
- Reliable water supply
- Significant reduction in maintenance and service
- Efficient operation of the individual components
- Low noise level
- Energy-optimised pump control at the point of optimum efficiency

Facts and figures

Project:	Second water supply system in Schongau
Location:	Abwasserzweckverband Oberes Lonetal
Time:	Project planning started in 2015, commissioned in December 2022
Owner:	Schongau, Stadtwerke Schongau
Customer:	ITG Süd KG, Markt Schwaben
Planning:	WipflerPlan Planungsgesellschaft mbH, Pfaffenhofen a.d. Ilm
Systems technology:	Pumps and plant construction Reitinger GmbH, Nuremberg
Pump technology:	Grundfos GmbH, Schlüterstr 33, Erkrath, Germany

In terms of energy efficiency, the motor is rated IE5 in accordance with IEC60034-30-2. Electronic speed control enables continuous adjustment of the motor speed – and thus pump performance – to meet the current demand.

Key technical data:

Motor power:	7.5 kW
Rated flow:	20.5 m^3/h
Rated head:	114.4 m
Max. operating pressure:	16 bar
Number of pumps:	3 x CRIE pumps

The pressure boosting system for base load operation comprises three CRIE pumps. The individual pumps are switched on as needed (alternating pilot pump). In the past, the pumps were activated after reaching a certain load limit following a rather inflexible approach, but this is uncommon nowadays. Instead, the "intelligent" system calculates the optimal economic operation of the individual components. In the event that the first water supply system (pipe network/elevated tank in Schwabsoien) fails or is disrupted, the second pressure boosting system (large pressure boosting system) can be activated. This comprises five CRN 64-3 pumps and can feed water into the pipe network (via the elevated tank) at the maximum extraction rate (Q = 80 l/s) at a head of 110 m. The pumps used for this purpose are identical to those of the “small pressure boosting system” in many respects. However, the CRN pumps are equipped with a three-phase, air-cooled asynchronous motor. An external frequency converter assumes control of the system using the same control system as system 1.

Key technical data:

Motor power:	30 kW
Rated flow:	77 m^3/h
Rated head:	76 m
Max. operating pressure:	16 bar
Number of pumps:	5 x CRN pumps

With this systems technology, the “interaction” of the individual components is particularly important. Both pressure boosting systems are customised so that they can carry out specific tasks. This not only increases operational reliability but also ensures energy efficiency, thereby reducing energy costs.

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

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