

EFFECTIVE AND OPTIMISED RAW WATER INTAKE

Use less energy and reduce
operational costs at the well field

BUILDING ON A PROVEN TRACK RECORD

Pumps for groundwater abstraction

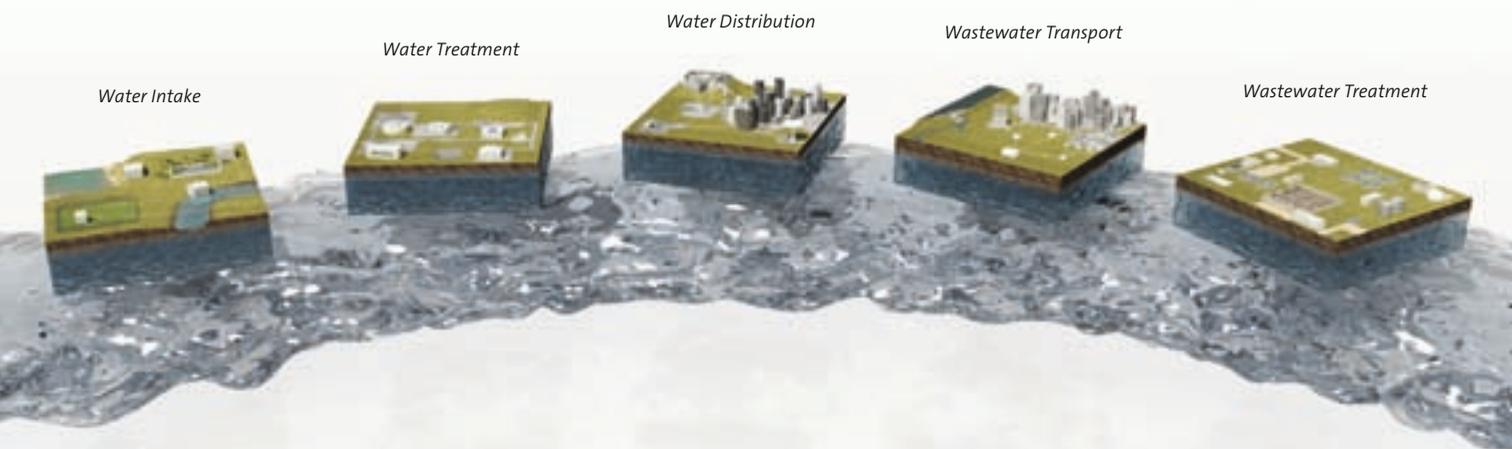
Grundfos offers a large and complete range of submersible multi-stage SP pumps for all well types, designed to suit all groundwater abstraction applications.

Sourcing raw water is the first step in any water supply system. From installation to everyday surveillance, the uniquely easy operation offered by Grundfos SP pumps helps you get water to the surface at the cheapest possible price with a total solution that offers sustainable and trouble-free operation and energy optimisation for cost efficiency.

With our high-efficiency pumps and motors, we can go further than most to bring water to life in a financially and environmentally sustainable way. Our insight can be applied to addressing the key issues of safeguarding water resources, meeting consumer needs and ensuring cost-effective infrastructure.

Over the years Grundfos has pioneered numerous innovations that have become or are becoming industry standards. Grundfos will continue to be at the forefront in promoting and facilitating energy efficiency and sustainable technology. It is these innovations that will enable water abstraction infrastructure to meet future challenges and regulations.

Our commitment is to play a strong part in the bigger picture, to ensure the reliable and efficient supply of clean, safe water that households and businesses depend on.



Read more about the Grundfos Water Utility applications on www.grundfos.com/water-utility

KEY ISSUES OF GROUNDWATER ABSTRACTION

The favoured source

Groundwater is a favoured source for municipal water supply systems, offering a stable source based on natural filtration through the earth's sub-surface.

Correct groundwater abstraction is central for ensuring the highest levels of energy optimisation and sustainability, which in turn is reflected in reduced lifecycle costs. This is no easy task, considering that the hydraulics involved make groundwater abstraction the most complicated part of water supply. This complexity is because natural processes such as the flow of groundwater in aquifers interact with technical installations such as wells, pumps, pipes and valves.

Reliable water supply requires a consistent abstraction of water. Optimising this process means bringing together a number of areas of specialisation in the well field, such as the groundwater reservoir, the abstraction wells, the submersible pumps chosen, the raw water pipeline system, and the groundwater quality.

These are complicated processes and especially for larger well fields it can be difficult to get a full understanding of how all these areas interact.

Proven expertise

The sustainability of drawing water from a source over time requires that the pumping solution not only is cost effective, offers trouble-free operation and is energy optimised, but also protects the groundwater source for future abstraction.

Grundfos has decades of experience developing controller and monitoring systems for pumping solutions and manufactures its own pumps and motors for all well depths and flow requirements. This ensures a perfect match with hydraulics, motors, electrics, and all other mechanical components that make up a comprehensive pumping solution, ensuring the best possible efficiency point.

Grundfos pioneered the implementation of frequency converters in pumping operations and has refined numerous functionalities that cater specifically to pumping conditions.



Pumping groundwater from the aquifer.



OPTIMISING THE WELL FIELD

ENERGY OPTIMISATION AT WELL FIELDS

Energy optimisation is within reach

Accurate measurement, analysis and modelling, correct material choice and corrosion protection of submersible pumps and the guaranteed efficiency of Grundfos pumps all contribute to the ultimate goal of achieving long-term energy optimisation at the well field.

A typical well field for groundwater abstraction consists of 5 to 10 wells, but can be much bigger, if sub-surface conditions allow. Wells can vary greatly in depth, yield and water quality, and these and other issues must be taken into consideration when evaluating the energy consumption for abstracting groundwater. A well field may have been used for many years, and a number of legacy issues may affect the current performance of the well field.

Typical problems encountered at a well field may be that the pumps used are too big or too small, the water table level

may be lowering, requiring the pumps to manage greater head, and there may be issues with the water speed and pressure in the pipes network.

These issues may result in inefficiency, increased costs, and the need to protect the water table. Grundfos looks closely at the entire well field operation and through increased efficiency can achieve energy savings with a quick pay-back time. Experience has shown that half of all the savings in energy consumption that can be made in a municipal water supply are to be made in the well field.

installed groundwater pumps match these conditions. By measuring the installed groundwater pumps, the measured data can be utilised for model calculations that simulate the actual situation.

The simulation is also utilised for an optimised situation, where pumps have been chosen to optimise the energy consumption, taking other necessary conditions into consideration, such as water quality, a balanced water drawdown and spare capacity for fire fighting.

It has been shown that there are plenty of energy savings to be obtained. Even well fields equipped with the latest technology might show high saving potentials due to the fact that the groundwater pumps are wrongly sized.

To optimise the well field, there may be a need for newer, more efficient Grundfos SP pumps, replacing oversized pumps with smaller pumps and equipping pumps with Grundfos CUE frequency converters where necessary.

These changes will in many cases also result in a more balanced water drawdown, protecting the water table.

The lower specific energy consumption will mean less kWh for each m³ of water abstracted from the well field.

You can always contact Grundfos for greater detail of the well optimisation process.



Recent well field optimisation projects

The Birkerød project and its potential implications for the water supply sector in Denmark are presented in greater depth on page 10 in this brochure.

DENMARK, BIRKERØD

Yearly groundwater abstraction: 1,400,000 m³/year

BEFORE:

Yearly energy consumption: 260,000 kWh
Specific energy consumption: 0.19 kWh/m³

AFTER:

Yearly energy consumption: 187,000 kWh
Specific energy consumption: 0.13 kWh/m³

IMPROVEMENT: 28%
YEARLY SAVINGS: 73,000 kWh

DENMARK, VOJENS

Yearly groundwater abstraction: 560,000 m³/year

BEFORE:

Yearly energy consumption: 128,000 kWh
Specific energy consumption: 0.23 kWh/m³

AFTER:

Yearly energy consumption: 84,000 kWh
Specific energy consumption: 0.15 kWh/m³

IMPROVEMENT: 34%
YEARLY SAVINGS: 44,000 kWh

POLAND, KOSCIAN

Yearly groundwater abstraction: 1,380,000 m³/year

BEFORE:

Yearly energy consumption: 455,400 kWh
Specific energy consumption: 0.33 kWh/m³

AFTER:

Yearly energy consumption: 207,000 kWh
Specific energy consumption: 0.15 kWh/m³

IMPROVEMENT: 54%
YEARLY SAVINGS: 248,400 kWh

POLAND, JELCZ-LASKOWICE

Yearly groundwater abstraction: 915,000 m³/year

BEFORE:

Yearly energy consumption: 245,000 kWh
Specific energy consumption: 0.27 kWh/m³

AFTER:

Yearly energy consumption: 112,000 kWh
Specific energy consumption: 0.12 kWh/m³

IMPROVEMENT: 55%
YEARLY SAVINGS: 133,000 kWh

RESISTANCE TO CORROSION AND SAND-WEAR BUILT-IN

Durable, efficient and resistant

The Grundfos range of submersible pumps is recognised for high efficiency and reliability. Made entirely of corrosion-resistant stainless steel, the SP pumps are ideal for groundwater abstraction.

Grundfos helps you match the stainless steel build quality of the SP pump to the groundwater conditions. With a superb build quality and utilising our proven abilities with hydraulics, Grundfos pumps ensure reliable operation without pump failure, and are designed to withstand wear from sand. Depending on the corrosion risk, various standards of high grade stainless steel are available.

The Grundfos SP pumps represent state-of-the-art hydraulic design. Built to deliver optimum efficiency during periods of high demand, the SP pumps provide low long-term costs and high operating reliability. In addition to a durable pump, you gain reliability and trouble-free, continuous operation, with very long service intervals when compared with other solutions.

TESTING TO THE HIGHEST EFFICIENCY STANDARDS

Delivering the performance we promise

Grundfos guarantees the efficiency we show in the performance curves for our products. Our tests are carried out on the most accurate testing equipment available, with the Grade 1* testing equipment and procedures controlled by third-party inspectors.

When you log in to Grundfos Web-CAPS, you get to see all performance data – for both pumps and motors. We hold nothing back, and all our test data is maintained for a minimum of five years. This means you can always get in touch and find out whether your pumps and motors are performing as they should. All you need to do is quote the unique series numbers for your pumps, and we can find the test data for precisely those pumps.

All Grundfos products are tested during the production process, regularly followed-up with reference tests. Any variance in the results means we rectify any issues in production straight away.

On request, our products can be issued with a certificate guaranteeing the performance tested for the product. If required, this certificate is issued on the basis of testing supervised by independent, third-party inspectors.

* Grade 1 testing is defined in the ISO 9906, Grade 1 standard.



The Grundfos SP range:

- Models with diameters of 4", 6", 8", 10" and 12"
- Flow rates up to 215 m³/h (material choice variants up to 475 m³/h) and head up to 810 m
- Advanced hydraulics for very high pump efficiency and reduced costs
- 100% corrosion resistant stainless steel with extra high-grade steel available for severe conditions
- Resistance to wear caused by sand and other abrasives
- Built-in motor burnout protection

WORKING WITH GRUNDFOS

Grundfos stays with you

From the first meeting at the waterworks to the implementation of a cost and energy saving optimisation of the pumps, Grundfos stays close honouring our commitment to co-operation and partnership.

Grundfos solutions are designed specifically for utility installations and all the components are fully integrated from the outset. Life Cycle Cost analyses have shown how this seemingly complex and costly process results in tangible benefits for owners.

The considered application of technology ensures the best possible fit to your pumping requirements. Grundfos submersible multistage pumps bring together external frequency converters (CUE) for variable speed drives and motor protection (MP204) to monitor motor conditions and adapt to changing conditions.

Together with skills in well field management, Grundfos can supply the specialist expertise to help meet your performance objectives, from the initial identification of needs, to the selection, installation, operation, and maintenance of the pumping solution.



PLUG-AND-PUMP CONVENIENCE



Monitoring and control specialists from Grundfos can contribute to finding the right solution based on your objectives for a given set-up.

Monitoring and control for optimum performance

The hydraulics, motors and electronics on Grundfos systems are specifically developed for pump operation. External frequency converters and motor protection are examples of how Grundfos ensures 24 hour monitoring and control of all vital parameters to ensure stable water abstraction.

In recent years, control and monitoring systems have increased the potential for improving both efficiency and reliability of pump systems. However,

integrating the many isolated components involved has at times proven complex and costly. Grundfos has addressed this problem by ensuring full compatibility between drives and monitoring and control units that are dedicated specifically to pumping systems.

The Grundfos CUE frequency converters represent one of the most comprehensive and versatile ranges of external variable speed drives for pump applications currently on the market. The easy to use MP 204 motor protection ensures 24-hour monitoring and protection of all vital parameters, such as dry-running or overload, to ensure operational stability.

For groundwater abstraction, Grundfos MP 204 motor protection can interpret irregularities and take the appropriate action to protect the motor and pump from damage. It can do this because it is specifically tuned in to the conditions that typically arise in a pump installation.

By integrating frequency converters and motor protection components, Grundfos can offer complete systems that are pre-engineered to work together. Interface issues that require expensive programming are replaced by simple commissioning procedures that offer step-by-step guidance that anyone can follow. Specialised functionalities have been developed and optimised for pump systems.

BIRKERØD — A CASE STUDY FROM DENMARK

The rewards of efficiency

If all of Denmark's waterworks were as energy effective as indications are for Birkerød Water Works, 11% of the total yearly energy consumption for the entire Danish water supply sector could be saved, the equivalent of 22 million kWh/year, which equals a reduction in CO₂ emissions of 11,000 tons/year.

Grundfos has been part of many energy optimisation projects for waterworks' groundwater abstraction. A project in Birkerød, Denmark, shows that Grundfos is not only able to identify and describe the problem, the company can also deliver potential energy-saving benefits with short pay-back times, pump-for-pump.

The project in Birkerød has an estimated total pay-back period of about three years, including the replacement of all pumps. The advantage of replacing pumps varies, and for some of the pumps in Birkerød, the estimated pay-back time is down to only 18 months.

Tailored pump sizes the answer

The project has only looked at the water intake aspect, where groundwater is pumped up from deep wells. This counts for almost half of the total energy consumption in the Danish waterworks. Even when equipped

with the latest technology, waterworks might show high saving potentials due to the fact that the groundwater pumps are wrongly sized. By changing to new and more effective pumps of the right capacity, the plant in Birkerød could achieve savings of 24% of energy consumption from water intake.

To ensure that everything works optimally, operation must also be optimised, meaning that the right pumps are used at the right time, to provide the best yield for the lowest possible energy consumption. For example, this could mean that it is better to use a small pump that runs for many hours, than one large pump that can do the same work in shorter time, yet uses more energy per cubic meter water pumped. In Birkerød, the result of the new pumps combined with an optimised operation indicates a savings potential of 28%.



BENEFIT FROM A LONG-TERM RELATIONSHIP

Commissioning, service and spare parts

Grundfos service starts with the initial planning of water intake projects and continues to the end of the product's lifetime. With our installation and commissioning service, Grundfos ensures your pump systems run smoothly and live up to expectations.

Incorrect installation will cause pump parts to wear out prematurely and energy consumption to soar. Under the terms of a Grundfos Commissioning Agreement, we offer to install our systems and offer an extended warranty. We ensure correct alignment and wiring, and as documentation,

we provide a full report, including operational data.

Customised service

Our service capability is based on a close-knit infrastructure of local service staff and more than 500 Authorised Service Partners worldwide. These are well-trained people with a thorough knowledge of our technology. As well as being able to commission Grundfos systems, we also offer service agreements, pump audits and an assurance of readily available spare parts.

A service agreement is customised to cover the individual service needs for each pump in each given application.

It would typically provide technical advice, training to operations staff and customised service solutions.

Our spare parts service is also customised to reflect each situation and is based on efficient global distribution. We have a variety of offerings such as online spare parts ordering and support, specially designed service kits, recommended spare parts list and so on. Authorised local service partners have their own stock of commonly needed Grundfos parts immediately on hand.

Energy efficiency pays:

- Birkerød Water Works can save up to 28% of the yearly energy consumption for intake of groundwater
- Nationally, the expected savings are of 11% of the total energy consumption for the entire water supply sector – equivalent to 22 million kWh/year
- CO₂ emissions will be reduced by 11,000 tons/year



A Grundfos service agreement means

- Efficient and uninterrupted operation of your pump systems
- 24-hour access to Grundfos Service Centres and Authorised Service Partners worldwide
- Service conducted by specially trained staff at all times
- Warranties on all maintenance and repair work
- Ensures stocks of spare parts and keeps your total cost of owning a pump to a minimum

Unmatched online service

All technical documentation and service information is available – always updated – via our online tool WebCAPS:

- Service instructions
- Step-by-step service videos
- Interactive exploded views
- Sectional drawings



SEE THE BIGGER PICTURE

Grundfos is a global leader within water-handling technology and is dedicated to developing pumping and treatment systems for water utility infrastructure. We offer expertise and industry insight that increase reliability, reduce lifecycle costs and handle water resources responsibly.

Our products are the result of decades of engineering expertise and are supported by a worldwide service network. Visit www.grundfos.com/water-utility for more.

Our expertise with pumping systems is supported by a full line of products and systems for:

- Water Intake
- Water Treatment
- Water Distribution
- Wastewater Transport
- Wastewater Treatment

Grundfos A/S
Poul Due Jensens Vej 7
DK-8850 Bjerringbro
Tel: +45 87 50 14 00

www.grundfos.com

The name Grundfos, the Grundfos logo, and the payoff Be—Think—Innovate are registered trademarks owned by Grundfos Management A/S or Grundfos A/S, Denmark. All rights reserved worldwide.