OPTIMISED WATER SOLUTIONS

Pumps and systems for today’s water supply and wastewater challenges
WE HAVE SAVED THE WORLD 1.5 BILLION KWH*

* Grundfos Sustainability Report 2011. This figure represents the global energy savings generated by all Grundfos A-labelled pumps sold between 2005 and 2011. The estimate is based on the actual sales figures for the year and assumptions about which previous models the sold pumps replace. The figure is calculated as energy savings in kWh a year.
Every year, new Grundfos products increase **energy savings by 0.3 billion kWh**. As we introduce high efficiency motors into more and more of our products and integrate these with a wider focus on electrical, mechanical and of course hydraulic efficiency, this figure will rise and the cumulative effect of **energy savings will increase**, year on year.

**Meeting challenges head-on**

Grundfos develops and implements technologies that meet the challenges facing the water supply and wastewater industry. Owners are experiencing rising energy costs and increasing green taxation, and CO₂ emissions need to be reduced. Pressure is on the industry to lower operating costs for Water Utility business and strengthen the search for optimised water solutions.

Pumps account for no less than 10% of the world’s electricity consumption, so it’s essential that pump systems are optimised to their full potential. The long-standing experience that Grundfos has with energy optimisation specifically for pumps is a unique asset.

**Optimised water solutions**

We design lifecycle costs into solutions to make life easier for everyone. Grundfos Water Utility is a full-range supplier and all elements of our pump systems embrace a high degree of modularity. If you are looking for energy-efficient, intelligent solutions and worry-free processes, we offer products and services that can be tailored and optimised for any given water utility application using tried and tested technology, without compromising their superior performance. We optimise pump systems to provide maximum reliability and resource efficiency – and our expertise is part of any delivery.

Meet the Energy Challenge

A Grundfos solution can make an immediate and substantial difference in the fight to reduce global electricity consumption. [Learn more at www.grundfos.com/energy](http://www.grundfos.com/energy)
At Grundfos, resource efficiency starts with the pump. We lower product lifecycle costs, ensure sustainable water management and build optimised equipment into the application. The measures we take for resource efficiency are from the outset designed for pumps and pump systems only, ensuring high reliability, continuous operation and superior performance.

We need to reduce costs without compromising the reliability demanded of critical water supply and wastewater operations. From new installations to refurbishment and replacement of vital components, optimising resource efficiency has a positive impact on the reliability, overall performance and lifecycle costs of water supply and wastewater operations.

**Service products that add value**

Grundfos is not only there for you in the unlikely event that something goes wrong. We can also offer you a long list of services that add a little bit extra to your business. We keep pace with your expectations and listen to what you have to say.

We deliver repair and maintenance solutions that simplify repair and rectify problems quickly and professionally. Remote monitoring solutions enable 24/7 management of pump installations, making preventative maintenance possible.

Our service solutions help reduce energy consumption and your carbon footprint, and we will even help you dispose of old pump equipment. Our focus is global, and so is our service organisation, ensuring a local partnership wherever your pump installation may be.

**Calculating lifecycle costs (LCC)**

We use LCC calculations to show the benefits of a fully optimised pump solution, from the design phase to disposal at the end of the product life.

When used as a comparison tool between possible design and refurbishment alternatives, the LCC process will show the most cost-effective solution and payback time based on the available data. LCC calculations are freely available as part of our online selection and design program, WebCAPS.

Visit www.grundfos.com for more information.
Grundfos Pump Audit

Measuring actual pump performance, the Pump Audit checks the overall efficiency of the pumps and proposes changes that could improve efficiency. Recommendations cover the size and number of pumps, the viability of frequency control, suitable motor protection, and so on.

Proposals are supported by calculations of the savings that can be made, the reduction in CO₂ emissions and the payback time on any investments.

Refurbishment optimises performance

Pumping station refurbishment is a source of cost reductions and energy savings. Failure to refurbish in time could result in excessive costs from using too much energy, the increasing risk of breakage in the system, and health and environmental hazards to the community, the environment, to workers and end-users. Grundfos minimises the impact on the safe and reliable operation throughout the refurbishment period.
Reducing your lead times and securing your project

Grundfos invests substantially more money in research and technology development than any other pump company and our innovative efforts result in optimised solutions for the customer.

Advanced solution tools for designing and validating system designs, worldwide test facilities geared to the precise applications for which our pump systems are manufactured, and a global focus on procurement, manufacturing, and distribution all contribute to delivery of your optimised water solution – on time and within budget.

Project management and supply chain

We are focused on where to produce and where to stock to ensure the highest flexibility, the best possible lead times and that your operations are constantly optimised. We manage the entire Supply Chain and ensure alignment to your needs, matching our sales and consultancy activities, including complex Project Sales and Engineer-to-Order (ETO) pumps, to fit with your business.

If a pump or any equipment requires replacement, then this must be done in the shortest possible time to reduce costly downtime. Our global logistics and distribution setup ensure rapid supply and installation of pumps and equipment, whether for a single pump replacement or a full system refurbishment.

New projects and major refurbishments often require products that require customisation at the factory or delivery outside the usual distribution channels. We are a trusted partner for consultants, contractors and water utilities who are looking for security, flexibility and reliability for their water utility solution from a full-line supplier.

Product quality from worldwide testing

We guarantee unsurpassed product quality using stress, vibration, product lifetime, witness and environmental impact testing to meet or even surpass international standards. We also conduct performance tests tailored to your requirements, with certified test equipment.

Project execution an area of expertise

Grundfos has established a global Water Utility competency network, to ensure that complex projects get the expertise they require. In direct cooperation with market clusters around the world, one of the key functions of our competency network is to provide an optimised project execution, ensuring deliveries at all stages of the project are timely, correct and within budget.
Spare parts availability worldwide

Our global supply chain network includes dedicated warehouses for spare parts and after market products to ensure fast and efficient supply.

WebCAPS – your online resource

WebCAPS is your free library for technical information, literature and tools, including manuals, CAD drawings, service instructions and videos, spare parts, and effective sizing tools.
OPTIMISED SOLUTIONS FOR THE ENTIRE WATER CYCLE

OPTIMISED SOLUTIONS AND SERVICES THAT ARE MADE FOR EACH OTHER COMPLEMENT AN UNRIVALLED FOCUS ON RESOURCE EFFICIENCY, DESIGN VERIFICATION, AND PROJECT CONSULTANCY AND EXECUTION. THAT IS WHAT YOU GET FROM GRUNDFOS, A FULL-LINE SUPPLIER OF PRODUCTS AND SOLUTIONS FOR ALL WATER UTILITY APPLICATIONS.

RAW WATER INTAKE

DRINKING WATER TREATMENT

Optimise, treat and pressure manage your water supply

From the raw water intake to the treatment regime and onwards through the distribution network to the end user, a water supply system must be fully integrated. Resource efficiency requires that the pumps, controls, dosing and disinfection solutions and pressure management regime are made for each other. Grundfos does precisely that.
Reliability and modularity for optimised wastewater handling

Collecting, transporting and treating wastewater is about keeping reliability high. Grundfos products and solutions for wastewater transport, flood control and the wastewater treatment plant build on operational reliability, energy efficiency through optimised pump systems and modular solutions.
Ensuring stable water supply

Sourcing raw water is the first step in any water supply system. Our cost effective, reliable and energy optimised raw water pumping solutions go further than most to bring water to life in a manner that is financially and environmentally sustainable.

In addition to pumps and pump systems optimised for performance and reliability, we supply the tools you need to guarantee the highest possible energy efficiency. We carry out energy audits at the water source, giving you the facts and figures you require to optimise your system for top efficiency and reliable operation.

As a full-line supplier with unsurpassed experience with groundwater, we have a proven track record of applying our extensive knowledge to all water sources and the entire water supply network.

Getting raw water moving

At Grundfos, we have decades of experience manufacturing pumps and motors and developing controller and monitoring systems for pumping solutions. This ensures a perfect match between hydraulics, motors, electrics, and all other mechanical components that make up a comprehensive pumping solution, ensuring the highest possible efficiency.

Grundfos pioneered the implementation of variable speed drives in pumping operations and has refined numerous functionalities that cater specifically to pumping conditions.

Experience from a huge installed base of stainless steel submersible pumps and motors is reflected in our surface water solutions. Grundfos can supply submersible, end-suction, split-case and propeller shaft pumps that effectively handle surface water, recycled water and seawater.

Optimisation at the well field

At the well field, the Grundfos Well Field Energy Audit (WFEA) is a practical tool for optimising groundwater intake, with a documented savings potential from reduced energy consumption. WFEA takes many operating issues into account, such as varying water quality from well to well, water drawdown, and requirements for peak demand situations.

Performance testing

All pumps leaving a Grundfos factory are performance tested in accordance with relevant international standards. Any pump can on customer demand also be tested to the strictest standards. All tests are carried out on test equipment that is certified by third-party inspectors. Tested performance data is stored by Grundfos for a minimum of 5 years.
Optimal groundwater intake

Our range of submersible multistage pumps (SP) along with variable frequency drives (VFD) is unmatched for well types. State-of-the-art hydraulic design delivers optimum efficiency during periods of high demand with high reliability, very long service intervals and low total cost of ownership. Using VFDs ensures more balanced water drawdown, protecting the water source.

Grundfos matches the stainless steel build quality of the SP pump to the groundwater conditions. Depending on the corrosion risk, high grade stainless steel variants are available.

Energy optimisation in practice

Grundfos in the Netherlands and Vitens, the largest drinking water supplier in the Netherlands, have a long-standing cooperation with energy optimisation and have worked extensively with Pump Audits and Well Field Energy Audits (WFEA). Vitens extracts and distributes 350 million m³ of water per year to 5.4 million customers along 47,500 km of distribution network.

Following a WFEA, Grundfos supplied SP pumps with MP 204 motor protection and Grundfos Remote Management at Vitens' Loosdrecht well field, one of a total of 110 well fields. This has resulted in 21% energy savings, or 55,000 kWh per year. Grundfos is helping Vitens achieve ambitious energy reduction targets and WFEA and Pump Audits are central to this strategy.
Drinking water treatment is technology-driven and heavily regulated. That is why you need a partner who, in addition to supplying pumping, dosing and disinfection solutions for each stage of the water treatment cycle, is able to offer packaged solutions for the entire water treatment process.

Grundfos supplies a wide range of disinfection methods suitable for different disinfection tasks and requirements. These include innovative UV treatment for pre-treatment and in-line final treatment, effective chlorine and sodium hypochlorite treatment with required residual effect, and chlorine dioxide treatment for effective legionella and biofilm control.

Prior to dosing and disinfection, we ensure a uniform bulk-flow and oxygenation in the reservoir. We use computer simulations in the design to assess the need for mixing. All necessary mixing and aeration equipment is supplied, in accordance with the design requirements.

International project expertise

Pure product knowledge is not enough. Grundfos offers our expertise for your water treatment project and can provide consultancy from planning through to design, cost evaluation, commissioning and maintenance. Our dedicated, global project management services help you with the choices to be made, ensuring your customised water treatment solutions are certified according to local rules and regulations – wherever in the world you may be.

Process knowledge, engineering capability, precision components, and dosing and disinfection accuracy are all part of our delivery to you. From the outset every aspect of the water treatment solution is integrated into your water supply system.
**Grundfos Water Treatment Solutions**

To meet the unique specifications of each water treatment project, we assemble a Project Management team from our experienced and highly qualified project engineers at our Water Treatment Competence centres around the world.

With the know-how and the resources to handle any application in the field of dosing and disinfection technology, no matter how complex, satisfactory project execution is assured.

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**Digital dosing pumps for desalination pre- and post-treatment in Minjur, Chennai Municipality**

The seawater desalination plant in Minjur will each day draw over 230 million litres of seawater to produce 100 million litres of potable water, the equivalent of 100,000 m³ per day. With plant life estimated at 25 years, the municipality required a turnkey solution with service and support from Grundfos India.

Grundfos supplied 28 DME dosing pumps running on customised skids with 3 or 4 dosing pumps, a pulsation dampener, a flow meter, and a counter pressure valve on each skid. For the customer, the technical characteristics and capabilities of the Grundfos DME dosing pumps have proven to be excellent.

This met the requirements for the reverse osmosis pre-treatment, where seawater is filtered and chemically adjusted, and post-treatment, where treated water is chemically adjusted to make it drinkable, with varying flow rates.

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**SMART digital dosing™ solutions that redefine dosing**

SMART Digital DDA, DDC and DDE diaphragm dosing pumps offer modularity, simplicity and flow intelligence and contribute to keeping lifecycle costs low. Processes where SMART Digital excels include disinfection, pH-adjustment, chemical dosing, cleaning-in-place, biocides, coagulation, precipitation/flocculation, filtration and reverse osmosis.
To reduce water loss (non-revenue water – NRW) and cut distribution costs, Grundfos offers pump optimisation and proportional pressure control solutions that increase pump and system efficiency, ensure correct water pressure at the consumer, and deliver peace of mind from high reliability and intelligent surveillance of the water distribution system.

Pressure management is now well recognised as being essential to effective leakage management. We package pumps, intelligent components and system surveillance to build unique pressure management solutions that minimise water losses (NRW), reduce energy consumption and minimise operational costs for leaks and pipe maintenance.

System design using proportional flow

The highly variable flow rates that characterise water distribution networks are an important factor affecting cost-efficiency and water loss. A tendency in system design has been to size pumps based on maximum demand, however far more time is spent pumping at low flows and the efficiency of such a single pump solution will fall quickly as flow decreases.

The optimal solution is to install more smaller pumps in parallel controlled by our multi-pump controller. Grundfos systems can be expected to deliver a hydraulic efficiency of more than 80%, and the multi-pump controller automatically maintains the best efficiency point by cascade operation and speed control.

To design systems based on this principle, Grundfos uses load profiles based on 24-hour consumption patterns. The load profile gives an overview of how much a pumping system operates at a specific flow rate on a daily basis, and the system can be designed or redesigned accordingly. Compared to traditional set-ups, the design principle we work by lowers the initial capital investment. When converting existing systems, payback time is typically within one to three years.

Grundfos Demand Driven Distribution

At the heart of the system is the Demand Driven Distribution controller, which automatically can adapt the setpoint of the pump to the actual flow required by the system and compensate for excessive system pressure.

Demand Driven Distribution minimises water losses, reduces energy consumption, and minimises operational expenditures for leaks and pipe maintenance. The system caters for all network sizes and ensures reliable, optimised and resource efficient distribution.
Non-revenue water (NRW)

The key issue of reducing and controlling non-revenue water (NRW) in distribution networks is to minimise losses through existing leaks and reduce the risk of new leaks. Pressure management is now well recognised as being essential to effective leakage management; reducing surplus pressure by 50% can reduce leakage loss by at least 30%. An important contributing factor behind pipe bursts that increases water losses due to leakage is water hammer, which is also reduced with a pressure management strategy.

In addition to pressure management, the International Water Association (IWA) also recommends active leak control, speed and quality of repairs, and infrastructure management.

Water conditioning

Grundfos supplies solutions for water conditioning in the water distribution network, including UV and Ozone, and we also provide repeater stations for the network, for example for renewing chlorine content.

Demand Driven Distribution in Ploiesti, Romania

The proportional pressure management of water supply was implemented at the Ploiesti Nord Gageni water supply zone, one of four such zones in this city of over 230,000 inhabitants.

Even though Ploiesti was already operating with a reduced night time pressure, the NRW (leakage) losses were reduced by a further 6.6% (approximately 146,000 M3/year) and specific energy (kWh/m³) was reduced by a further 7.4% (approximately 48,000 kWh/year). With these savings, costs were recovered within one year.
Keeping Reliability High and Downtime Low

Dependable, energy efficient solutions for your pumping stations and networks are essential for wastewater collection and transport. In an environment with continuous wastewater inflow, downtime is to be avoided at all costs. Your pumps need to work, and risk minimisation needs to be built into the system.

A pumping station is complex, and getting things right at the design stage is important to avoid issues such as blockages, odours, power outages and flooding. Grundfos takes the greatest risk factors out of the equation when designing or refurbishing a wastewater transport network, ensuring cost-effective and reliable operation.

We apply our technology and expertise to benefit the operation and reliability of your installation. Our technology-leading wastewater pumps offer the industry’s highest total, wire-to-water efficiency. VFDs, wastewater control, and remote monitoring from Grundfos keep you always in complete control of your system.

Our prefabricated pumping stations offer a unique, customised solution where space is critical. We carry out advanced computer modelling of pressurised sewer systems, and for large pumping stations we use Computational Fluid Dynamics (CFD) flow simulation and model testing to optimise the design.

Prefabricated pumping stations

Grundfos offers a full range of functional modular pumping stations – complete with all necessary pumps, piping, valves and level controls. The pump pit, pumps and controls can be combined to suit specific requirements for each individual application.

Highest efficiency wastewater pumps

To reduce lifecycle costs in the wastewater transport network, Grundfos supplies the SE/SL wastewater pumps with the highest total, wire-to-water efficiency yet seen in the industry. S-tube impeller technology ensures no compromise between large free passage and high efficiency, reducing the risk of blockages, maintenance costs and downtime.
Dedicated Controls & Grundfos Remote Management

Dedicated Controls is an intelligent, user-friendly monitoring and control solution. Designed to control up to six pumps in sewage pumping stations, Dedicated Controls can be combined with Grundfos Remote Management or to any scada system for monitoring and managing pump installations from a remote location.

Grundfos Remote Management reduces the need for onsite inspections and in the event of an alarm or warning, the relevant people are notified directly. Initial investment is minimal, and a fixed low fee covers data traffic, hosting costs and system support, including back-up of all data.

A solution for the old city, Chongqing, China

A prefabricated pumping station installed for a sewage system reconstruction project in Fengzhong Road in Chongqing, China was the perfect solution for difficult sewage system reconstruction in the old city.

The solution satisfied requirements for 4,320 m³/d inflow in a 2 m tank diameter with 8.3 m depth. The pumping station footprint is minimal, and similarly the work area above ground for installation was small, causing limited disruption.
FLOOD CONTROL

RESPONDING TO FLOOD AND STORMWATER RISK

Flood control pumping is characterised by a requirement for high flow and low head. As many flood scenarios are seasonal, flood control pumps may only run occasionally, placing heavy demands on the reliability of the pumping solution.

As part of our dependable, energy-efficient flood control solutions, we supply a complete range of products optimised for high total efficiency and low maintenance costs. Applying our design and flow simulation competencies means we can minimise the pumping station footprint, ensure safe pump operation and reduce the total cost of the pumping station.

Stormwater tanks are an effective way of reducing peak flow and equalising flow rates from stormwater runoffs in the sewer system. Computational Fluid Dynamics (CFD) flow simulation and model testing are used to optimise tank design and our pump and control solutions ensure reliable and automatic operation, regardless of the size. And once the hydraulic load is reduced and capacity is available, you can get stormwater moving again with perfect efficiency and reliability.
Reduce turbulence and increase efficiency

Our range of axial-flow propeller KPL pumps for flood control and other heavy-duty pumping applications offer the Turbulence Optimiser™, an innovative, patented solution for reducing turbulence in the gap between the pump volute and the column pipe, increasing efficiency by up to two percentage points.

Handbooks and guidelines available

Grundfos offers consultancy on every aspect of the flood control solution, and this is knowledge we are happy to share. Our handbooks for the design and optimisation of stormwater tanks and for flood control pumping stations are available for order or download from our website.

‘Pump gate’ – designed on site to solve local issues

To reduce the impact of flooding coinciding with high tides in Poglar, a suburb to Jakarta, Indonesia, we built an innovative solution where a floodgate was equipped with pumps. The ‘pump gate’ solution was developed in direct response to the challenges at the location.

Compared to a traditional pumping station, ‘pump gate’ required no additional land, no long and invasive construction period, costs were reduced, and there was an immediate benefit for the many residents in Poglar, living on the banks of the Angkwe River.
The efficient treatment of wastewater requires strong technical competencies. At the same time, wastewater treatment plants are required to meet increasingly stringent demands to reduce their impact on the environment and local communities. Wastewater goes through an increasing number of processes before being discharged into receiving waters, and each new process increases total energy costs.

From solution design and proposal to project execution and handover and run-in, Grundfos offers one point of contact for all phases of the project. We are a trusted partner for design, verification, installation, operation and maintenance. We save you time, energy and costs.

Throughout the design stage Grundfos works with you to ensure low lifecycle costs and hydraulic stability for mechanical, biological and chemical treatment.

Modular solutions optimised from the design phase

Our contribution starts with the initial identification of needs. Through our design expertise we provide guidance in optimal selection and positioning of equipment. For complex installations this can include CFD flow simulations in the design and specification phase. Our pumping, mixing, dosing and aeration systems are optimised for each other, and we offer pre-engineered and optimised modules for treatment processes.

Biological treatment is the largest and most expensive element at a wastewater treatment plant. With our aeration systems, we can help optimise tank performance and minimise operating costs. In response to flow variations in the tank, variable speed pumps equalise flow and load to the plant so the capacity of the biological process is not exceeded. With our aeration systems, we can further optimise tank performance and minimise operating costs. If the recommendations of a Grundfos system and energy audit are followed, savings of up to 50% of the yearly energy consumption are possible.

Optimise tank design for increased efficiency

Correct configuration of submersible wastewater pumps, mixers, flowmakers, ejectors and aerators is assured by using Computational Fluid Dynamics (CFD) simulations to depict accurately fluid flows at any location in the tank.

The result will reveal any bottlenecks, vortexes and areas with high or low velocity of the wastewater.
Integrated dosing and disinfection systems

We ensure that the PLC-controlled, fully automatic systems for dosing chemicals and poly-electrolytes we provide are seamlessly integrated with local regulations and requirements. We can advise on the use of chemicals (either as concentrates or ready-to-use solutions) and also on chemical storage with relevant safety procedures.

Refurbishment of Kubratovo WWTP, Bulgaria

The wastewater treatment plant at Kubratovo treats the domestic wastewater, process water and rain water from Sofia, the capital of Bulgaria. Serving a population of 1,313,000 (90% of Sofia), 480,000 cubic metres wastewater is tested daily.

Grundfos was involved very early in the refurbishment project and worked closely together with both the designer and the contractor to build the optimal design for the process tanks, focusing on processes, hydraulics and cost of installation and operation. Several CFD simulations were carried out by Grundfos in order to fully optimise the system.
Grundfos Water Utility
– optimised water solutions

Grundfos Water Utility is a full-range supplier of intelligent pumps and systems for all water supply and wastewater applications. We optimise pumping solutions to provide maximum reliability and resource efficiency for our customers. Our solutions are made with tried and tested technology and our expertise is part of any delivery.

We offer solutions and expertise within the following applications:

- RAW WATER INTAKE
- DRINKING WATER TREATMENT
- WATER DISTRIBUTION
- WASTEWATER TRANSPORT
- FLOOD CONTROL
- WASTEWATER TREATMENT