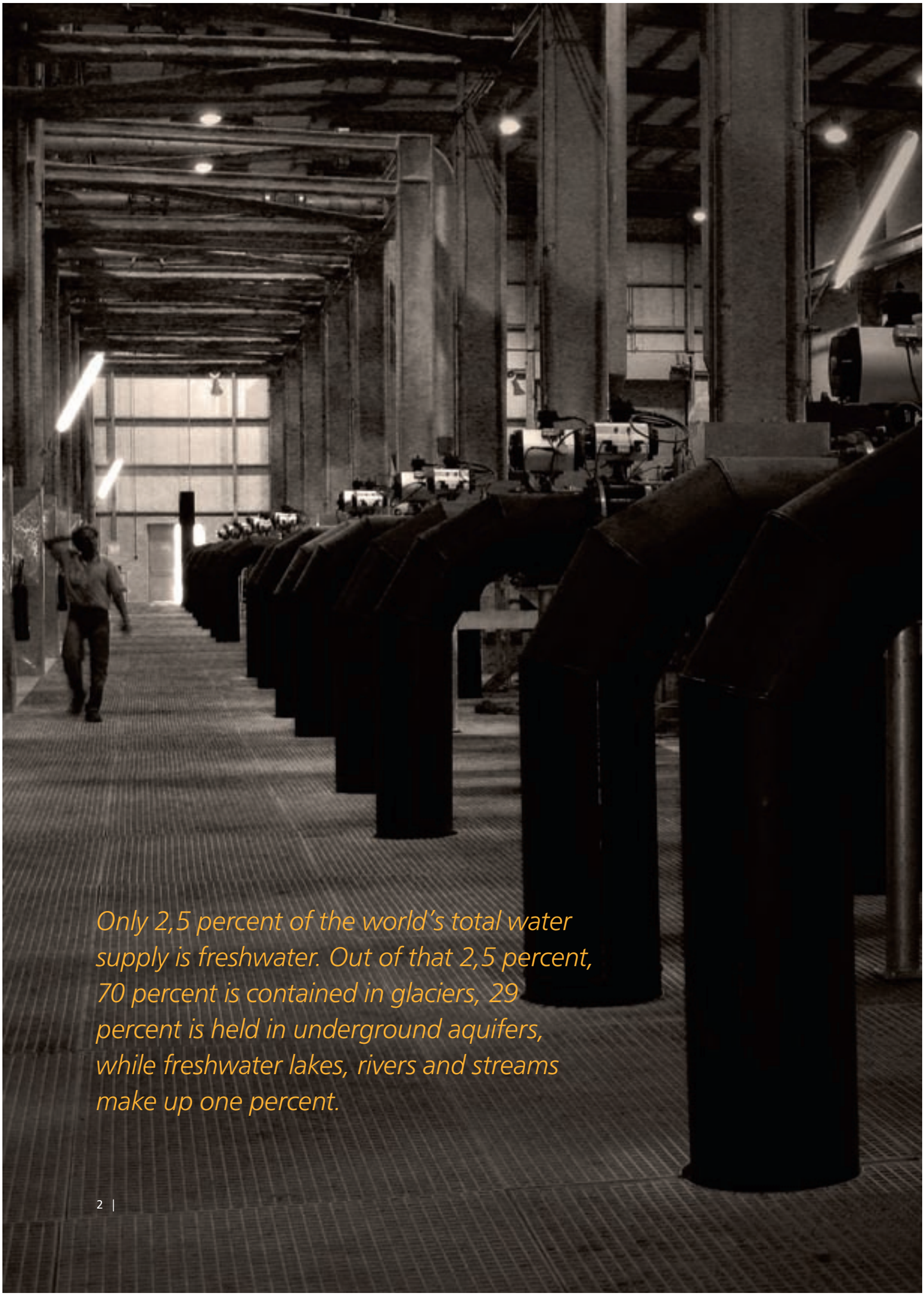
ITT

Water & Wastewater

The expertise behind the world's water and wastewater solutions

60 major cases from around the world

Engineered for life



Only 2,5 percent of the world's total water supply is freshwater. Out of that 2,5 percent, 70 percent is contained in glaciers, 29 percent is held in underground aquifers, while freshwater lakes, rivers and streams make up one percent.

Innovation throughout the cycle of water

Clean water for everyone – that's our goal. In a world of ever growing challenges, ITT delivers innovative solutions throughout the cycle of water. We are the world's largest provider of water and wastewater treatment solutions. And we are a leading provider of pumps and related technologies for a industrial, commercial and municipal customers.

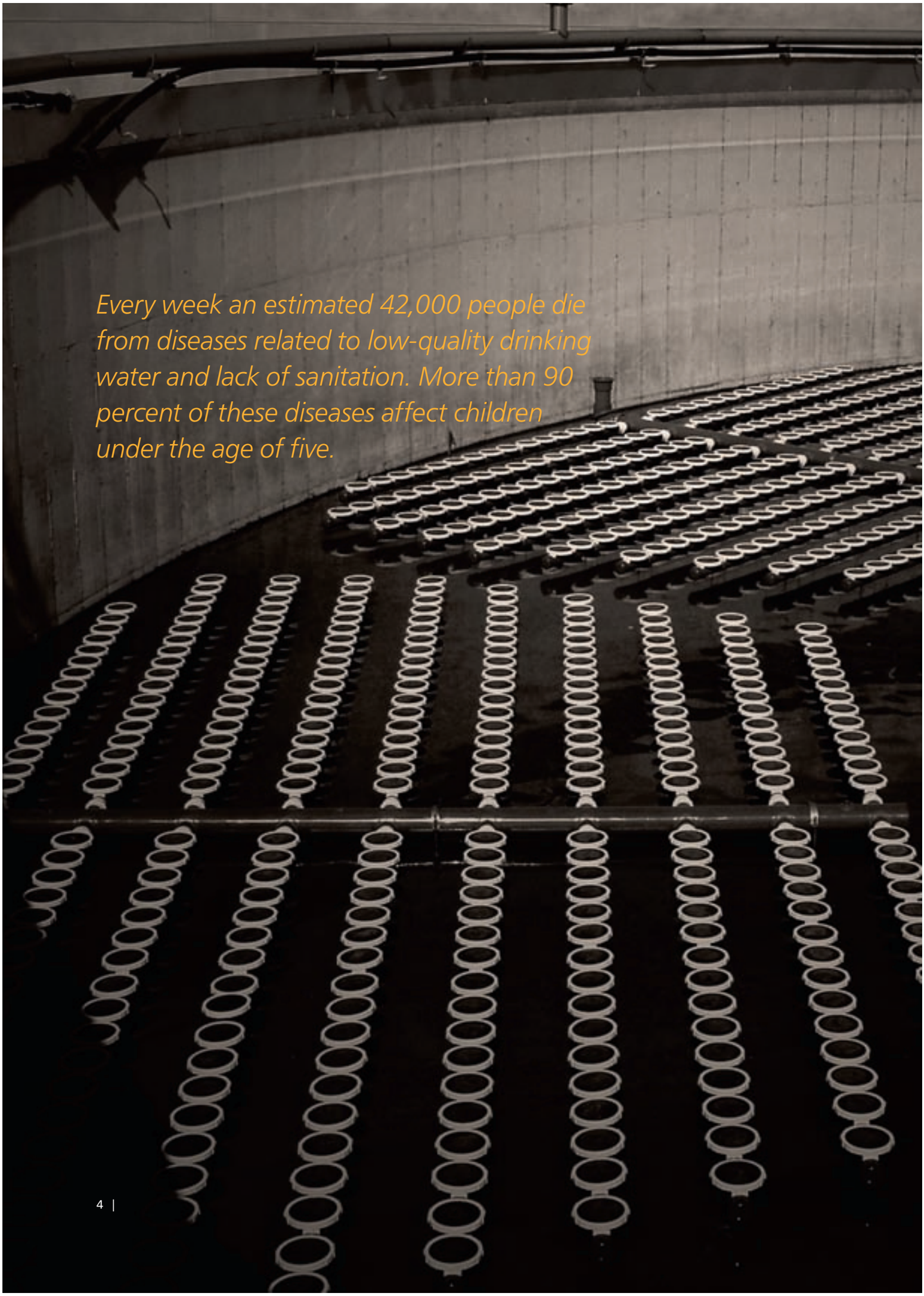
Organizations facing challenging water issues are increasingly turning to experts who have the breadth of capability to own and resolve such challenges. These experts employ holistic solutions that incorporate a range of skills encompassing both technical and commercial innovation.

A small number of companies are developing the necessary range of solutions and applications knowledge that cover the entire cycle of water use and reuse. ITT is at the forefront of this transition.

SETTING THE INDUSTRY STANDARD

Operating in some 140 countries, we manufacture and market a comprehensive range of water and drainage pumps, units for primary, secondary and tertiary treatment, and products for treating water through biological, filtering and disinfection processes. We also maintain the industry's most extensive sales and after-sales organization, with 70 sales companies operating both locally and globally.

CONTENT



Every week an estimated 42,000 people die from diseases related to low-quality drinking water and lack of sanitation. More than 90 percent of these diseases affect children under the age of five.

Doing essential things in extraordinary ways

We understand the importance of providing answers to water issues. Our solutions are setting the industry standards for innovation, performance and reliability. Empowered with breakthrough technologies and deep application expertise, ITT is deploying talented people and the broadest range of water and wastewater solutions to communities around the globe. We deliver substantial energy savings, reduced ownership costs, reliable operations and minimum maintenance. And, last but not least, clean water.

GLOBAL CAPACITY, LOCAL PRESENCE

With 6,000 experts working the world and production plants in Europe and Asia as well as North and South America, ITT is a truly global company. Yet our global presence is the sum total of our local achievements. The outstanding level of our solutions and services reflect our local expertise in every area, from consultation through to customized design to professional service and support. We are there for our clients, for the long term. Our integrated offerings deliver real operational, business and environmental results that stand the test of time.

LEADING PRODUCT BRANDS

Recognizing the need for holistic solutions through broad-based applications and new technology, we began to expand our core competencies years ago.

We focused on developing and integrating into our business innovative technologies in areas such as biological treatment, instrumentation, clarification, media filtration, membrane filtration, desalination, and UV and ozone disinfection.

This sustained effort to meet the demands of a changing market has paid off. Today, ITT Water & Wastewater is widely recognized as a leading company in the global water industry.

Our product brands are some of the most well known in the business:

Flygt

The Flygt product brand has been driving key innovations within wastewater pumping and mixing. We invented the first submersible sewage pump and the first submersible mixer. There has been no stopping the chain of groundbreaking innovations with Flygt ever since, amongst them the N-impeller. Today we offer both dry installed and submersible pumps and mixers.

Sanitaire

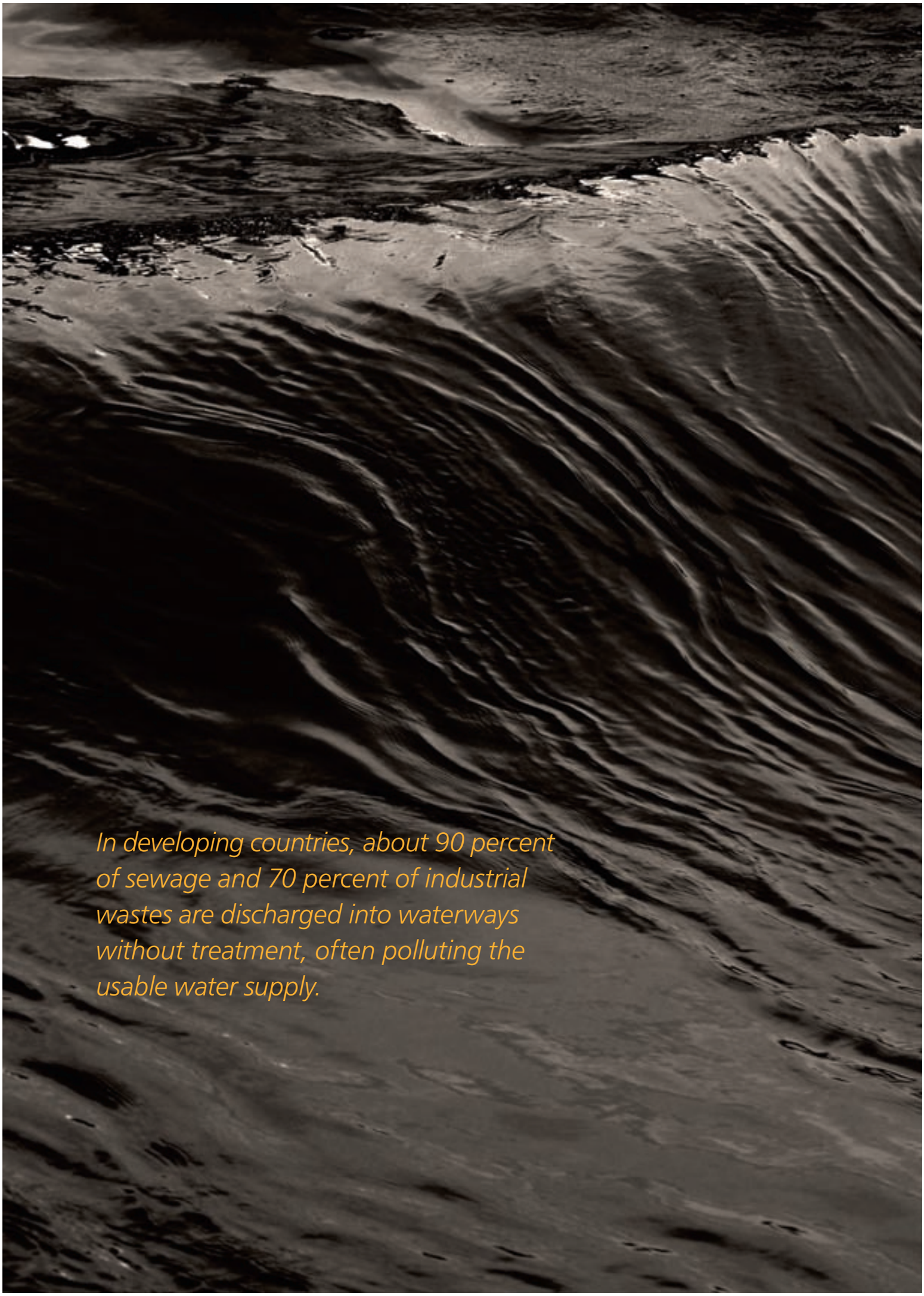
The Sanitaire product brand stands for the foremost resource in aeration design. Sanitaire keeps on breaking records around the world with innovative wastewater aeration technologies. Sanitaire's technology delivers the highest level of efficiency with minimal energy consumption for both membrane and ceramic disc diffusers.

Leopold

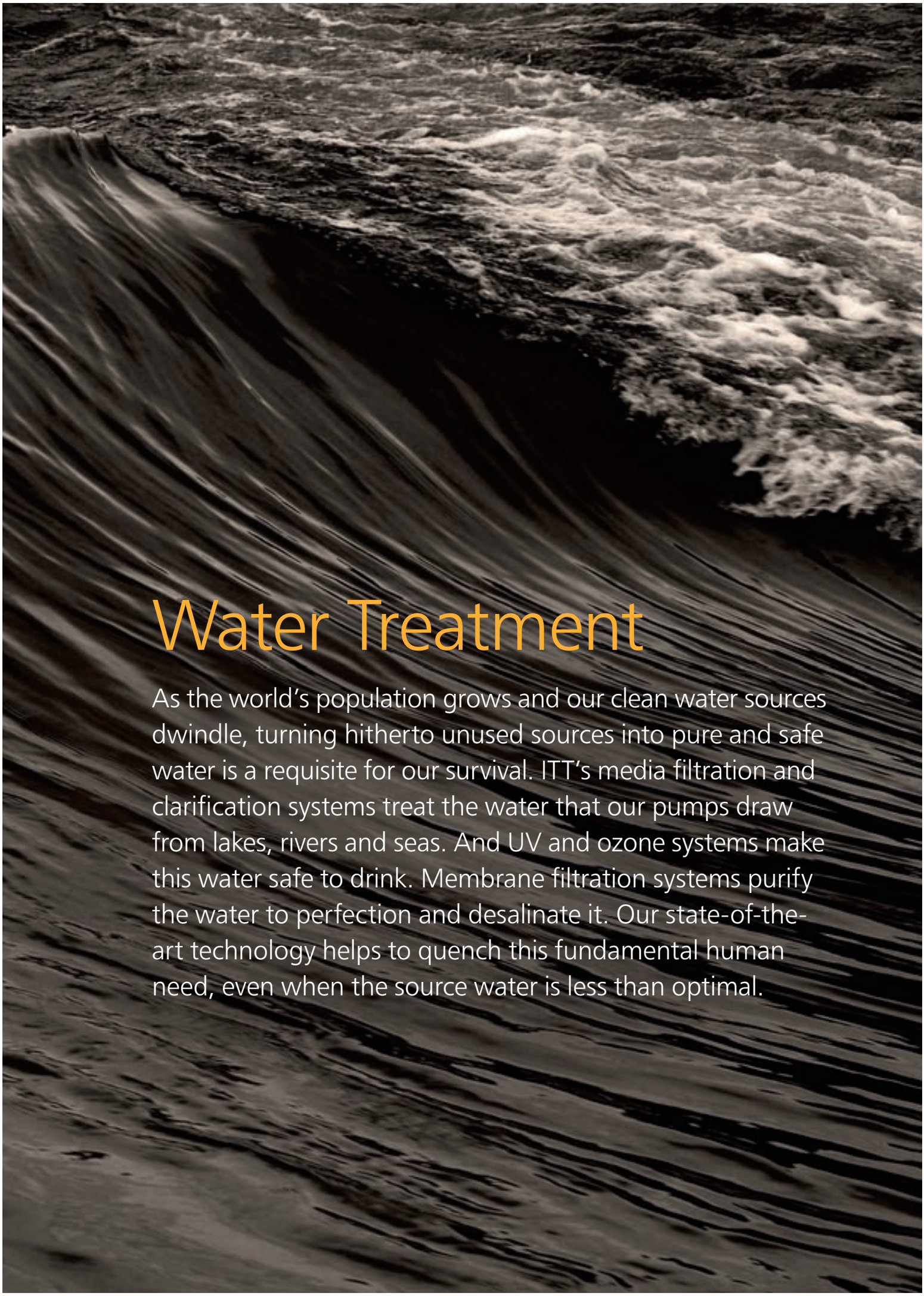
The Leopold product brand symbolizes extensive filtration experience that comes with over 8,000 installations worldwide. Leopold delivers outstanding filtration results and superior air/water backwash distribution. This results in longer filter runs, lower energy costs, less media breakdown and less water consumption.

Wedeco

The Wedeco product brand is the world leader in water disinfection with ultraviolet light and water oxidation using ozone. Wedeco has installed more than 200,000 systems worldwide and has more than 25 years of experience in the field of UV and ozone technology.



In developing countries, about 90 percent of sewage and 70 percent of industrial wastes are discharged into waterways without treatment, often polluting the usable water supply.



Water Treatment

As the world's population grows and our clean water sources dwindle, turning hitherto unused sources into pure and safe water is a requisite for our survival. ITT's media filtration and clarification systems treat the water that our pumps draw from lakes, rivers and seas. And UV and ozone systems make this water safe to drink. Membrane filtration systems purify the water to perfection and desalinate it. Our state-of-the-art technology helps to quench this fundamental human need, even when the source water is less than optimal.

Hampton Advanced Water Treatment Works

LONDON, UNITED KINGDOM

Hampton Advanced Water Treatment Works (AWTW) is one of the most technologically advanced of its kind. It is London's largest water treatment plant with a design capacity of 790,000 m^3/day. Owned by Thames Water, it has a key role as the control centre for the Thames Water Ring Main, the biggest single trunk water distribution system in the United Kingdom. The works was originally built in the 1850s and the site includes old Victorian buildings, filter beds and some larger water storage beds. Thames Water has made several large investments in the works, particularly with the introduction of Granular Activated Carbon within the Slow Sand Filters. The completion of a capital investment program in 1998 led to significant improvements. Hampton AWTW provides some of the highest quality drinking water in the world.

On arrival at Hampton, the stored water is fed into an on-site reservoir called the Grand Junction. This small reservoir is predominantly used to blend different source water and balance the flow into the works. There are 32 dual cell filters on site acting as roughing rapid gravity filters before the slow sand filtration process on site. ITT supplied Leopold filter underdrains, together with the main air scour delivery piping and supervision of installation and training services to the contractor Black & Veatch. The filters were redesigned in conjunction with ITT to maximize the available underdrain area.

The water is filtered through Primary Rapid Gravity Filters. These filters function in biological mode with no coagulant dose applied. The filters are designed purely to reduce the load from large reservoir algae and thus to lengthen Slow Sand Filter bed run duration. The water from the primaries gravitates under the Grand Junction Reservoir into the K-Shaft, where six pumps lift the water into the Ozone Plant. Most of the Slow Sand Filters contain a layer of granular activated carbon (GAC, for pesticide reduction) within the sand bed. The Slow Sand Filters are skimmed according to time or head-loss data. Filtrate water is then directed by low lift pumps from the Slow Sand Filters to the disinfection stage. The water is dosed with chlorine prior to the fine micro screens and then flows into the contact tank for disinfection. After disinfection, the water is sulphonated and then ammoniated, prior to being passed into supply with a combined monochloramine residual.

Next door to the works are two officially designated wildlife preserves, the Sunnyside Reservoir and the Stain Hill Reservoirs, which contain flower-rich grassland and habitats for water birds. The Hamptons AWTW well demonstrates the successful accommodation of nature conservation with operational considerations.

***Leopold** Universal Type S® underdrain provides superior distribution of water and air for effective media backwashing.*

***Leopold** IMS® (Integral Media Support) cap is the porous plate that eliminates the need for support gravel, resulting in more media depth and shallower filters.*

***Leopold** backwash troughs, filter media and control systems complete the gravity media filter systems provided by ITT.*

HENDERSON, NEVADA, USA

Henderson, Nevada, a suburb of Las Vegas, is located between Lake Mead and Las Vegas in Southwestern Nevada, USA. Henderson is the site of two of the largest water treatment facilities operated by the Southwestern Nevada Water Authority (SNWA). Both facilities, the Alfred Merritt Smith and the River Mountains Water Treatment Plants are direct filtration plants. The direct filtration process consists of adding a coagulant to the source water before deep bed dual media filtration and disinfection. The source water for both facilities is derived from Lake Mead, which is the impoundment behind Hoover Dam. Originally the Alfred Merritt Smith Water Treatment Plant was constructed in the 1970s on the shore of Lake Mead at a capacity of 650 MGD (2.46 million m^3/day). As the region continued to grow, the River Mountains Water Treatment Plant was constructed away from Lake Mead in the late 1990s. The final total capacity for both plants is 1.25 billion gallons per day (4.73 million m^3/day). ITT provided both plants with the Leopold filter underdrains, filter media and air header piping.

THU DUC, HO CHI MINH CITY, VIETNAM

Over the next five years, Ho Chi Minh City is making large investments in water and wastewater projects to develop the city's infrastructure. Thu Duc opened in 2008 and is the first of several new water treatment plants. Its conventional clarification and filtration design can treat 345,000 m^3 of Saigon River water per day. ITT supplied nine dual bay monomedia sand filters, each with an area of 81.5 m^2 for a total area of 1,467 m^2, complete with Leopold filter underdrains and IMS cap, backwash troughs, flume design, air/water backwash system, and control panels. ITT also supplied the mixers as well as the Tube Settlers for the settling basins. For optimum sludge collection and the ability to remove solids beneath the tube settlers, twelve submerged sludge collector units were installed. In addition, ITT provided the plant SCADA system including operator workstations, the operator main control panel, remote I/O panels, and field instrumentation.

BOGOTA, COLOMBIA

The Francisco Weisner Water Treatment Plant in Bogota, Colombia consists of 16 dual bays with 32 filters, a total of 45,066 square feet. For many years, the plant had been operating utilizing clay underdrains as its filter bottoms. ITT was selected to rehabilitate the plant with its Leopold filter underdrains and IMS cap. ITT also added air header piping to support the new air/water backwash system, which has increased the plant's efficiency. The air/water backwash employs an upflow water wash including air scour with full bed fluidization. Combined with a low rate backwash, air scour is the most effective way to remove solids from a filter by providing very effective cleaning action as the result of higher shear forces in the media bed and abrasion between grains. As a result of the new system, the Weisner plant is now experiencing a savings of 40 percent of its backwash water, as well as more than 25 percent increase in filtration without sacrificing water quality.

LAKE PLEASANT, PHOENIX, ARIZONA, USA

Phase one of the Lake Pleasant Water Treatment Plant uses water from the Central Arizona Projects' Waddell Canal and has a capacity of 302,800 m^3/day (80 MGD). At the time of its launch, the award-winning project was the largest potable water design-build-operate project in North America. The treatment plant has to deal with a wide variation in the feedwater quality and uses an array of advanced technologies to treat the water to meet or surpass regulatory requirements. The process consists of ballasted-floc clarification, ozone oxidation, deep-bed anthracite filtration, deep-bed granular activated carbon adsorption, and UV disinfection. ITT supplied the 16 Leopold deep-bed anthracite filters and the 16 Leopold deep-bed granular activated carbon contactors. Long-term climate change is threatening the viability of life in the dessert, making the Lake Pleasant Water Treatment Plant an additional resource for providing water to the people of Phoenix, AZ.

GOLD COAST, QUEENSLAND, AUSTRALIA

ITT was contracted to supply a Leopold Desalination Pretreatment System to Queensland Australia. As part of the Gold Coast Desalination Project, the first large scale desalination plant on Australia's eastern seaboard, ITT supplied 18 Leopold filters, totaling 2,147 m², to pretreat the seawater prior to membrane filtration. The FilterWorx System, which is a gravity media filtration system, protects the membrane system by removing contaminants that can foul the membrane system. The pretreatment system was custom designed to fit the needs of the Queensland project utilizing Leopold filter underdrains with IMS cap. At completion the Gold Coast Desalination Project will provide 125 million litres of drinking water per day to the residents of Southeast Queensland.

SONGJEON WATER TREATMENT PLANT, WONJU, KOREA

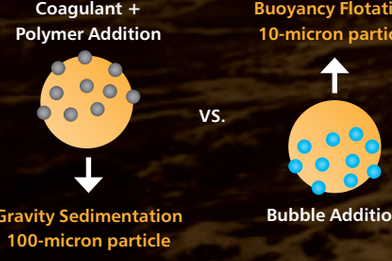
The Songjeon Water Treatment Plant, operated by the Korean Water Resources Corp, obtains raw water from the Hoeng-Seong Lake. The water contains seasonal algae blooms. And after rainfall the water's turbidity* and organic content increase significantly. Earlier, the algae were removed by using copper based products, which made the water taste and smell bad. Furthermore, the plant's disinfection practices led to carcinogenic chlorinated organic by-products. The new system is designed to handle 100,000 m³ of water per day in a variety of conditions. It includes a pre-sedimentation basin, a Leopold DAF system, as well as gravity filters with underdrain, IMS (Integral Media Support) cap, sand and anthracite media, and backwash troughs. The pre-sedimentation basin allows the turbidity to settle prior to treatment. The DAF removes the algae without the use of copper, which significantly improves smell and taste. It also eliminates more organic compounds than conventional clarification, and reduces the amount of chlorinated organic by-products to 65 percent below the criteria mandated in Korea and the United States.

* turbidity: the cloudiness or haziness of a fluid caused by particles that are invisible to the naked eye.

DISSOLVED AIR FLOTATION (DAF)

Operating Principle

Air under pressure is dissolved into water according to Henry's Law of Dissolution. Releasing the pressure back to STP via a special device creates millions of microbubbles approximately 30–100 microns in diameter. The microbubbles attach to floc in the water and float it to the surface for removal.



*The **Leopold** Clari-DAF® system is a proven, highly effective method of removing turbidity, insoluble metals, color, organics, algae and associated taste and odor. Its performance is superior to gravity sedimentation in providing quality effluent – producing consistently high sludge solids and operating at high loading rates, factors that can lower the total cost of operation.*

***Leopold** CT2® submerged sludge collector and Clari-VAC® floating sludge collector sub-systems along with their control panels complete the clarification product line.*

EVITTS CREEK, BEDFORD, PENNSYLVANIA, USA

The Evitts Creek Water Treatment Plant, located on the border of Pennsylvania and Maryland, provides drinking water to the City of Cumberland, Maryland and the surrounding area. Environmental factors were causing increased seasonal algae blooms, which created a severe taste and odor condition and shortened filter run times. To solve the problem, the City of Cumberland contacted ITT. The Leopold Clari-DAF system not only met the main treatment objectives, but also enabled a 36 percent increase in plant capacity. New filter and sludge removal systems further increased operational efficiency. Improvements include:

- 80% improvement in clarified water turbidity
- 400% improvement in filter runs
- 75% decrease in recycle water needed

The final design and installation was completed in June 2002, ahead of schedule and under budget. Commenting on the new systems, Plant Superintendent Rodney Marvin said, "I think I can speak for everyone when I say we are 100% satisfied."

TABLE ROCK & NORTH SALUDA WATER TREATMENT PLANT, CITY OF GREENVILLE, SOUTH CAROLINA, USA

For over 70 years, the Table Rock and Poinsett source waters from the Blue Ridge Mountains in North Carolina were so clear that the water was unfiltered and only treated with chlorine. When new regulations required all surface water systems to be filtered, the new Table Rock/North Saluda filter plant opened in July 2000. It is designed to handle 284,000 m^3/day and uses the Clari-DAF system for clarification and Leopold dual media filters for final filtration. The available land for constructing a treatment plant was limited, so a small footprint for the clarification step of the process was desirable. When evaluating the clarification settling system vs. the clarification flotation technology, the DAF process proved to reduce the land footprint by 82.7 percent. The DAF system also reduces the chemical usage as well as prolongs filter runs and decrease in-plant water usage by 59 percent. All of these savings make production costs 55 percent lower compared to a conventional clarification process plant.

FLORENCE, COLORADO, USA

Colorado South Water Treatment Plant located south of Denver handles water loads of around 6 MGD. The plant uses various surface water sources that blend into the resevoir, making the water difficult to treat. Algae growth is an additional problem, especially in summertime. To update the plant and improve performance, the City opted for a dissolved air flotation system. ITT was selected as the provider of the equipment for the Leopold Clari-DAF dissolved air flotation system, the gravity filters, and the plant controls. By December 2005, the project was completed – on budget and ahead of schedule. As a result of the new system, the use of chemicals has been dratically reduced, water quality has significanlty improved (99% of algea is removed), filter run times have increased ninefold and in-plant water use has been reduced by 150,000 gallons per day.

CAMBRIDGE, MASSACHUSETTS, USA

The Hobbs Brook Reservoir and Stoney Brook Reservoir flow into the Fresh Pond Reservoir via the Stoney Brook conduit and provide the raw water source for 24 MGD (91,000 m^3/day) water treatment plant for the city of Cambridge, Massachusetts. In 2001, the plant installed a Leopold Clari-DAF dissolved air flotation system with two 12 MGD trains with a total of 12 concrete flocculators. It includes six concrete DAF basins, two full recycle systems followed by intermediate ozone for primary disinfection, granular activated carbon gravity filters that are operated as biological filters, followed by disinfection with sodium hypochlorite (chlorine) and the conversion to chloramine as a secondary disinfectant. After installation, the plant's total organic carbon removal consistently exceeds regulatory guideline requirements. Trihalomethanes and haloacetic acids have also been reduced to well below the required limits.

Lovö Waterworks

STOCKHOLM, SWEDEN

Stockholm Vatten, a municipal utility company owned by the City of Stockholm, produces and supplies drinking water of the highest quality to more than one million people in Stockholm and neighboring municipalities. To reduce the use of chloramines, Stockholm Vatten chose ITT's Wedeco UV disinfection system for the Lovö Waterworks. The water source is surface water from lake Mälaren north-west of Stockholm.

ITT was chosen after an international tender evaluation of full life cycle costs for 20 years. This included costs for equipment, installation and running costs. In addition, technical criteria also weighed in, like experience with similar installations, service organization and design of the UV control system.

The Lovö waterworks has two production lines. Phase 1 is operating with two Wedeco systems, treating a flow of 144,000 m^3/day. These systems are certified according to the German Drinking Water Standard and were the first large scale installations of its kind in Europe in 2001.

Phase 2, six years later, saw two Wedeco reactors installed for treating 168,000 m^3/day. Both production lines have a total installed base of 360 UV lamps for treating 312,000m^3/day.

ITT's Wedeco disinfection system shows excellent results, with a 99.9 percent reduction of heterotrophic bacteria and zero coliform and E. Coli per 100 ml. The levels of chloramines have been reduced by 50 percent. Formation of trihalomethane is negligible and the levels of assimilable organic carbon have also been reduced significantly.

***Wedeco** UV systems have very high performance UV lamps as the core elements. Electronic control devices amplify their impact. Calibrated sensors monitor and log all material factors for the disinfection process. For optimum efficiency, specific computer based radiation geometries have been developed.*

***Wedeco** ozone systems are usually delivered as complete plants. They can be combined with other processes such as UV disinfection (e.g. multi-barrier disinfection plants), hydrogen peroxide, biological treatment, filtration and chemical flocculation to achieve optimum results.*

STYRUM-OST WATERWORKS, MÜLHEIM, GERMANY

The Styrum-Ost waterworks was constructed in 1912 in the city of Mülheim, close to the industrial centre of the Ruhr. To handle water shortages, the local groundwater was recharged by sand filtered Ruhr River water. In the 1960s and 70s, growing demand, drought and periodic contamination of the river made it necessary to find a better solution. In 1982, additional treatment stages were introduced, using the Mülheim Method, which produces high quality drinking water even when the raw water conditions are unfavorable. 2003 saw the introduction of ITT's Wedeco UV disinfection system, which replaced the use of health endangering chlorine in the final disinfection. This meant significant improvements in the taste and smell of the drinking water. The system is designed for a maximum water throughput of 192,000 m^3/day and was installed while the waterworks was in operation. The performance of the system can be automatically adjusted to the disinfection requirements when the flow rate is low. This saves energy as well as money.

VANCOUVER, CANADA

The Greater Vancouver Water District delivers water to approximately two million people. New regulations meant that the Seymour filtration plant had to be expanded and upgraded. After careful evalutation, ITT's Wedeco UV disinfection system was chosen for the new plant. UV is more effective, takes less time to inactivate harmful organisms and requires less space compared to other methods. ITT's UV disinfection system provides the lowest cost of ownership during the projected 20 years equipment lifetime. In addition, Wedeco disinfection units require 3–4 times less energy to deliver the same disinfection capacity into the same water flow as competing systems. The plant started operations in 2008 and is the largest UV disinfection plant in North America with a total capacity of 2.2 million m^3/day.

WEBER BASIN WATER CONSERVANCY DISTRICT, UTAH, USA

Weber Basin Water Conservancy District has provided drinking water to four counties in Utah for over 50 years. Its water quality goals are much more stringent than those of the US State and Federal government. ITT Water & Wastewater built North America's first large-scale disinfection system for "multi-barrier" disinfection of potable water at the Weber Basin Water District in Utah. The contract, using Wedeco UV products, was awarded as part of an upgrade to Weber Basin 3, a 46 MGD (174 000 m^3/day) drinking water treatment plant. The process upgrade includes an ozone oxidation treatment stage followed by disinfection with ultraviolet light. Weber Basin 3 is the first large-scale potable water system in North America to employ ITT's advanced low pressure-high intensity ultraviolet lamp technology, used extensively throughout Europe for the disinfection of drinking water.

LEPE DRINKING WATER TREATMENT PLANT, HUELVA, SPAIN

Gestión Integral Aguas de Huelva S.A. is one of the most important water suppliers in Andalucía. In order to comply with the European standards for water quality regarding trihalometanes and pesticides, the company decided to install pre-ozonization and intermediate ozonization, coupled with hydrogen peroxide and granular activated carbon filters in the drinking water treatment plants of Aljaraque, Tinto and Lepe. ITT Water & Wastewater designed a fully equipped and automated Wedeco ozone generation station to supply the ozone gas to the pre-ozonization and intermediate ozonization steps. The station contains two units with a maximum capacity of 9,300 g/h at a concentration of 10wt%, from LOX and a water cooling temperature of 20° C. The project was financed by The Public Administration of Andalucía and the units were commissioned and installed during 2007.

Dubai

UAE, MIDDLE EAST

This is one of the world's ten largest seawater reverse osmosis desalination plants. Each day it transforms salt water from the Arabian Sea into 30 million gallons (113,000 m^3/day) of drinking water. ITT was issued the contract in 2004 from PAL Technologies, the local engineer, procurer and contractor that supplied the turnkey package.

ITT designed, manufactured, supplied and installed all products for the plant, taking responsibility for the entire desalination process: from intake pump station, pre-filtration, through to the RO membranes and the distribution pump station, including instrumentation and controls. Other responsibilities included the facilities layout plan, civil contractor supervison, commissioning, training and performance guarantees.

"We are responsible for the entire desalination process, from seawater intake to fresh water distribution" explains Jorg Menningmann, director of business development for global projects at ITT. "The size of this project and our ability to provide a reliable and economical seawater reverse osmosis solution gives us a solid reference in this field. In combination with our pumping, pre-treatment and disinfection products and expertise, this capability enhances our technical and service offering to our customers regardless of the scope of the project."

Reverse osmosis technology has existed for decades, but the drawback has always been high energy requirements. The more salty the water, the more energy or pressure it takes to push the water through the membranes. To address this challenge, ITT's innovative solution includes energy recovery turbines that generate their own energy. This has cut external energy requirements by 45 percent compared to older desalination plants.

The project offered several unique challenges, all of which ITT successfully resolved, making reliable and affordable drinking water avalible to the rapidly expanding population of this region.

FIVE FORKS, VIRGINIA, USA

Facing water supply shortages due to population growth, a coastal Virginia community turned to ITT for a turnkey reverse osmosis membrane filtration system to treat a brackish well water source. Commissioned in 2007, the Five Forks Water Treatment Facility provides 5.0 MGD (18,900 m³/day) of potable water by blending a portion of the well water with RO permeate. Four 1.0 MGD membrane trains provide the level of treatment necessary to meet the high drinking water quality standard. The output from the plant is further blended with water from other sources to ensure that the facility will be able to satisfy the area's water needs until at least 2013. In addition to the RO units, ITT provided the variable frequency drives for the well pumps, as well as a pilot unit that is used for the testing of different membranes and of the pre-treatment and post-treatment chemicals. ITT also supplied the instrumentation, controls and computer-programming services for the plant-wide SCADA system.

NEWPORT NEWS WATER TREATMENT PLANT, VIRGINIA, USA

This brackish groundwater Reverse Osmosis system was the first major municipal RO water treatment plant in the commonwealth of Virginia. Evaluating various ways to meet increasing demand, brackish water desalting proved to be the most economic solution compared to other alternatives. The 5.7 MGD (21,500 m³/day) Newport News Waterworks RO Plant was primarily designed to provide safe drinking water, but it was soon realized that it provided enhanced water quality as well. By blending RO permeate with water from a conventional water treatment plant, organics were greatly reduced, thereby enhancing compliance with regulations regarding disinfecting by-products in drinking water distribution systems. ITT supplied the RO skids and technical support from installation through to start-up and operator training.

GIBRALTAR, EU

This 4400 cubic meter per day municipal reverse osmosis system supplies drinking water for the country of Gibraltar. The system includes all necessary pre-treatment and post-treatment to process Mediterranean seawater to EU drinking water standards. The first phase included two 1,000 m³/day trains. This initial installation performed so well that ITT was given the contract for the expansion to 4,400 m³/day that the system was designed for. The expansion is accomplished by the simple addition of two more packaged 1,200 m³/day trains. The system has met product quality and production capacity specifications since operations commenced. ITT, together with our representative, designed, supplied, installed and commissioned the system. ITT continues to provide technical support for operations to ensure 99+% plant availability.

ISLA DE TOAS, VENEZUELA

The residents of Toas Island, situated in the middle of Lake Maracaibo, Venezuela, needed a flexible water treatment system with operating parameters that could automatically adjust to drastic changes in salinity (8,000 to 32,000 mg/l) caused by seasonal variations. Lake Maracaibo had been opened up to the sea for oil tanker traffic, which meant that ocean tidal effects as well as influent rivers had an effect on the water conditions. ITT designed, supplied and installed a 400,000 GPD (1,515 m³/day) reverse osmosis system, specially designed with online monitoring and controls which made process adjustments simple while maintaining a steady output.

COOPER CITY, FLORIDA, USA

In response to the demand for more and better quality water, Cooper City, Florida upgraded its existing lime softening water treatment plant and installed an advanced water treatment process called Nanofiltration. The principal purpose of the plant was to make use of highly colored and hard ground water. ITT performed a pilot study to demonstrate the capability of an NF system on Cooper City's wells.The higly successful results of the study tipped the scales in favour of ITT's solution. A nanofiltration system operates at lower pressures than reverse osmosis providing lower operating cost. It only removes about 85% of TDS and hardness which is more desirable in many cases than, say, 98% reduction you get with RO technology. Yet nanofiltration achieves almost 100% color reduction, which is always an advantage. The system has been proven to be the lowest cost alternative to meet the City's requirements for drinking water from a previously unusable water well. This plant produces 3 MGD (11,400 m^3/day) of exceptionally high quality drinking water. When blended with their lime softened water, Cooper City enhances their overall plant output quality by reducing final color contents.

LOWER KUSKOKWIN SCHOOL DISTRICT, ALASKA, USA

Covering a geographic area equal to the state of Ohio, the Lower Kuskokwin School District is home to a large number of remote schools. The district uses eleven ITT water treatment plants to remove high levels of strongly colored organic content from the source water. Ranging in size from 0.6 gpm to 7.5 gpm (3.3 to 41 m^3/day), the water treatment plants are designed for reliability and for the harsh conditions of the arctic winter. The first three systems were installed in containers and fully tested prior to delivery, saving both time and work. Using tubular nanofiltration membranes, the water treatment plants operate without the need for chemicals other than post-treatment chlorination and membrane washing. In 2005, one of these systems won a competition for the best tasting rural water in the United States. Eight more systems were later installed on groundwaters containing very high levels of iron, manganese and organics. After pre-treatment oxidation, the nanofilters remove the organic content and clarify the water. All systems are connected to each other by a remote monitoring network.

SOUTH EAST WATER, UK

This ultrafiltration (UF) Drinking Water Treatment Plant provides a cryptosporidium* barrier on a groundwater spring water source. ITT offered the most suitable and cost effective method of achieving the required water quality. A turnkey contract was then awarded accordingly. The plant supplies over 265,000 GPD (1,000 m^3/day). ITT's system also provides the added benefit of reducing the turbidity** levels, making chlorination of the potable water more effective. South East Water has commissioned ITT to engineer two additional plants.

TIGHNABRUAICH & TAYNUILT, SCOTLAND, UK

Two nanofiltration (NF) plants, producing 158,500 GPD (600 m^3/day) and 200,000 GPD (758 m^3/day) respectively, were commissioned and built by ITT at the Tighnabruaich and Taynuilt water treatment sites. These plants are based on a new Package Membrane Plant (PMP) concept, which is specially designed to minimize cost and program duration. Constructed in a transportable building at ITT's production facility, PMP systems are commissioned prior to shipment. The first PMP contract returned a savings of 30 percent in cost and program duration.

* cryptosporidium: an organism that can cause diarrhea
** turbidity: the cloudiness or haziness of a fluid caused by particles that are invisible to the naked eye.

BAOSTEEL, CHINA

ITT supplied an ultra pure water system to this steel company in China which required different grades of water quality for cooling, quenching and boilers. Because steel production utilizes many different processes with high energy input and has many ancillary support functions, it is an industry that has high water usage with varied quality specifications. Baosteel required an industrial grade system that would provide flexibility and yet be economical to meet its multiple water requirements. ITT designed, supplied, installed and commissioned a system which produces 9.5 million gallons (36,000 m^3) of water per day by a process of pre-filtration, followed by two pass RO and partial electro-deionization. The system takes pre-treated surface water through a coagulation filtration process. The water is then processed by a two-pass RO system. Water from the first pass is used as general purpose plant water, including cooling, as well as feed water to the second pass RO system. The second pass RO permeate water is fed to an electro-deionization system for production of ultra-pure water for boilers. ITT was selected to supply the system because of our innovative approach and the resulting economic efficiency of the system. The plant has met all the water quantity and quality specifications and has been operating successfully for several years.

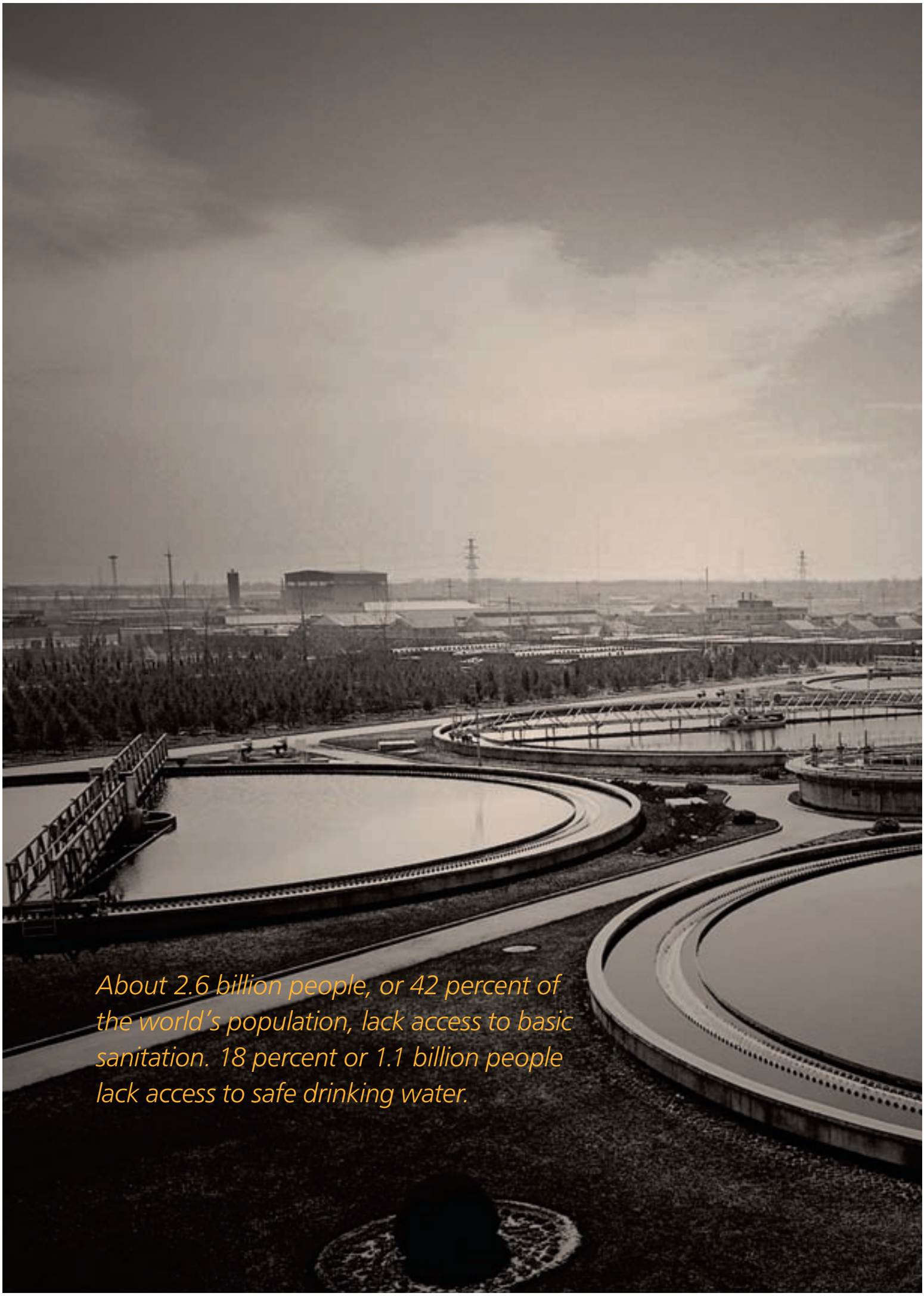
MAGGIE HAYS RO PLANT, AUSTRALIA

The plant provides potable and process water for a mining camp. The project progressed relatively easily despite the remote location of the site. ITT proposed a seawater reverse osmosis system capable of providing up to 240 m^3/day of permeate water with total dissolved solids (TDS) of less than 500 mg/l. The system was installed in 2006 and includes the RO membranes and pressure vessels, a multi-media pre-filtration system, high pressure pumps, piping, an automatic fresh water flush, PLC control and membrane cleaning system. A manual multimedia filter system significantly reduces the suspended solids and raw water turbidity*. These filters also provide better run time and operational cost savings for the five-micron cartridge filter. Three chemical injection systems are supplied with the RO unit for pre-treatment anti-scalant feed and product water treatment disinfection and stabilization.

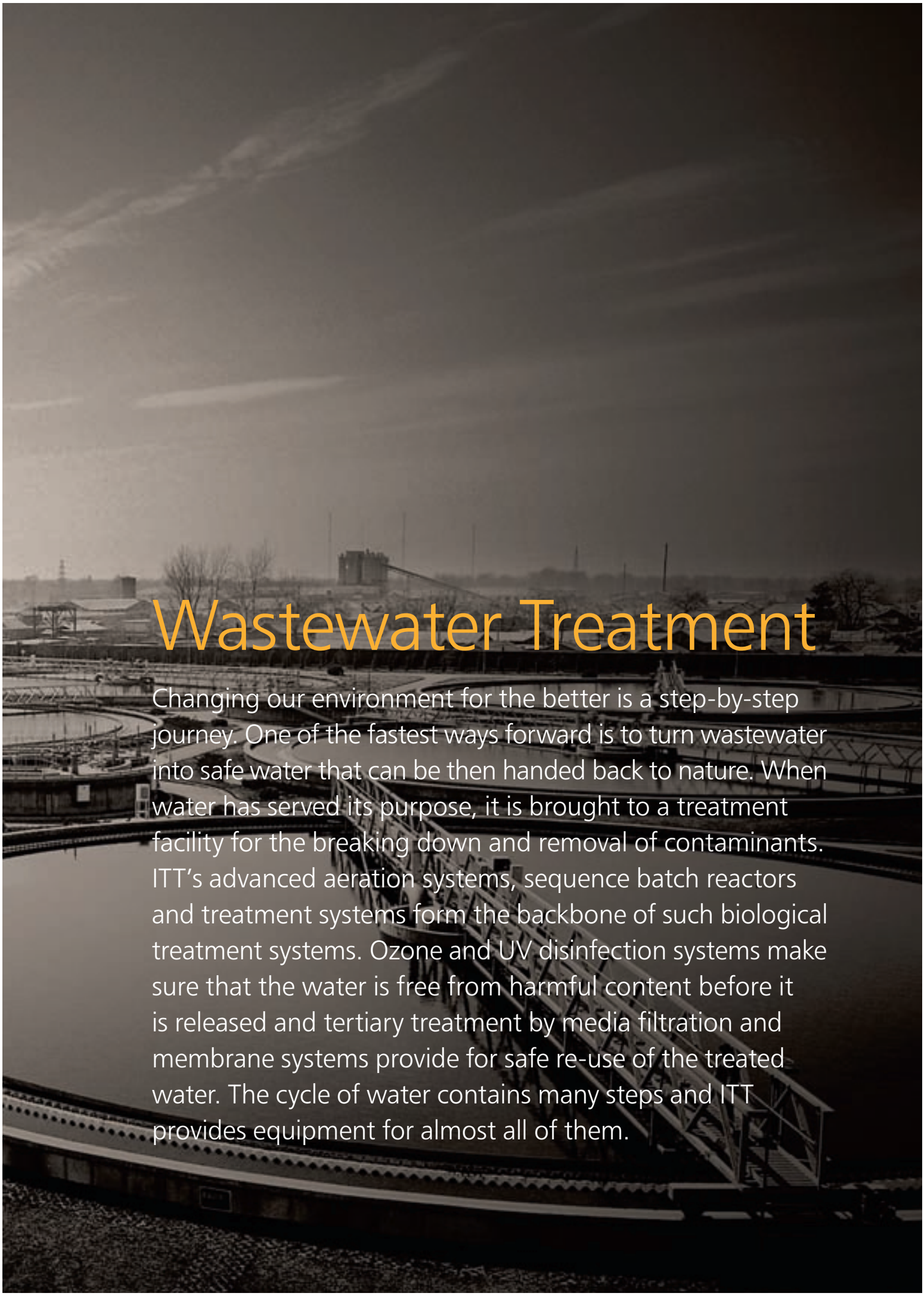
* turbidity: the cloudiness or haziness of a fluid caused by particles that are invisible to the naked eye.

MINING COMPANY, COLOMBIA

When a Colombian mining company decided to replace their outdated desalination systems, they contracted ITT for a reverse osmosis system that provided dramatic improvements in energy and maintenance savings. Carbones Del Cerrejon purchased three RO desalination systems from ITT. Each unit has the capacity of producing 145,200 GPD (550 m^3/day) of purified water. Production cost compared to the old outdated system has been drastically reduced. Operational cost has been cut by more than half.



About 2.6 billion people, or 42 percent of the world's population, lack access to basic sanitation. 18 percent or 1.1 billion people lack access to safe drinking water.



Wastewater Treatment

Changing our environment for the better is a step-by-step journey. One of the fastest ways forward is to turn wastewater into safe water that can be then handed back to nature. When water has served its purpose, it is brought to a treatment facility for the breaking down and removal of contaminants. ITT's advanced aeration systems, sequence batch reactors and treatment systems form the backbone of such biological treatment systems. Ozone and UV disinfection systems make sure that the water is free from harmful content before it is released and tertiary treatment by media filtration and membrane systems provide for safe re-use of the treated water. The cycle of water contains many steps and ITT provides equipment for almost all of them.

Cardiff Waste Water Treatment Works

WALES, UK

The plant is designed to treat the waste from a vast network of sewers serving the Eastern side of Cardiff and some of the South Wales valleys. This plant is located on reclaimed land close to Cardiff docks. To meet the requirements of the European Urban Waste Water Treatment Directive and coastal wastewater water quality legislation, the challenge was to start treating previously untreated sewage from four trunk sewers discharging directly into the Bristol Channel. The Cardiff project was part of a larger project to install biological treatment at several coastal locations to meet the requirements of the Urban Waste Water Treatment Directive.

This project is also one of the largest Sequencing Batch Reactors (SBR) in Europe. SBR technology has over the past few years become rapidly recognized as one of the most cost effective methods of designing large new sewage treatment works that are required to meet tight effluent consent standards.

The principle stages of the Cardiff works include offsite collection trunk mains with storm storage and pumping facilities, along with a large diameter eight kilometer collection tunnel transferring the flows to the main works. This comprises an inlet pumping station, inlet works, inter-stage pumping station, 16 SBR basins, outfall pumping station, and sludge treatment plant. The dried sludge from the works is sold locally as an agricultural fertilizer.

The Sanitaire ICEAS SBR system offered by ITT was particularly competitive as it is a flexible robust system requiring minimal land footprint. All flow to the works is biologically treated in the SBR basins and the final effluent is discharged through a four kilometer long sea outfall.

ITT were awarded the contract to design, supply, install and commission the core equipment within the SBR basins, including the fine bubble diffused aeration system, 64 stainless steel decanters and the process control software. Opposite basins are hydraulically linked to minimize influent pipe costs. There are four decanters per SBR basin, linked to a single drive via carbon fiber line shafts that act as a single decanter. The plant is designed to operate with a maximum of two basins out of service.

The plant has fully met the requirements of the wastewater treatment directive since being commissioned. ITT continue to work closely with the client to optimize the plant operation and minimize energy costs.

WHITEHAVEN WWTW, UK

In collaboration with Galliford Northern, ITT constructed a Sanitaire Intermittent Cycle Extended Aeration System (ICEAS) for North West Water's first four basins ICEAS Sequencing Batch Reactor (SBR) plant at Whitehaven. The ICEAS technology is one of the most cost effective wastewater treatment processes, designed to meet tight effluent consent standards. The plant was installed to meet the European Urban Wastewater Directive requirements and has consistently achieved higher levels of performance than required to meet the standards of the directive. Selecting the ICEAS process enabled the new works to fit within the existing site. The construction of the new works did not interrupt discharge flows from the existing works. The detailed design, construction and process commissioning was completed within 12 months. The reduced civil works required for an ICEAS SBR process and the effective management by ITT of the installation significantly contributed to this rapid delivery.

JINSHAN XINJIANG WWTP, CHINA

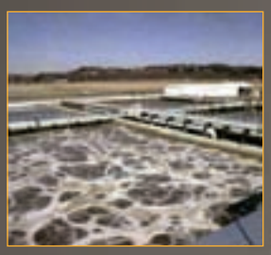
ITT provides the wastewater treatment solution to the Xinjiang plant in Jinshan, a suburb of Shanghai, using an advanced SBR system with effluent UV disinfection. Funded by The World Bank, the plant has a capacity of 50,000 m³/day (13.2 MGD), serving a population of 250,000. The plant opened in 2006 and is designed to double its capacity in the near future. ITT's Sanitaire SBR process is the heart of this plant, treating biological wastewater by enhancing the nutrient removal. This is the first facility in China employing the Sludge Inventory Management System (SIMS) that gives plant operators a completely automated sludge wasting routine that enables the plant to optimize nutrient removal as well as operational costs. This is also the first Chinese facility with a Wedeco UV disinfection system that destroys the pathogens in the water using ultraviolet light, making the final effluent harmless to the environment. Other ITT products included in this facility are Flygt Pumps and Mixers and Royce Instrumentation – a classic ITT product portfolio in the municipal wastewater treatment segment.

TULLAHOMA CITY, TENNESSEE, USA

One of ITT's first Sanitaire ICEAS plants was provided for Tullahoma's municipal wastewater treatment facility, which continues to produce high quality effluent and has never been out of compliance in over 20 years of service. In 1994, the City upgraded the plant to accommodate flows up to 30 MGD (113,600 m³/day) and installed ITT's fine bubble membrane disc diffusers to reduce energy costs and maintenance expenses. The City selected the ICEAS process, over an Oxidation Ditch and In-Channel Clarifiers, as the most economic option. The original estimate of the project was ten million dollars but the final cost only amounted to 5.1 million. The ICEAS facility has proven to be extremely cost-effective and consistently produces high quality effluent in spite of a highly variable organic load due to discharges from two local tanneries and an electroplating plant.

MARAGHEH, IRAN

ITT was selected to design and supply a complete Sanitaire Sequencing Batch Reactor (SBR) ICEAS plant at the Maragheh Sewage Treatment Works in East Azerbaijan, Iran. This system is the second stage of a three-phase development. The original plant used a conventional Activated Sludge Process whereas the new extension uses the ICEAS SBR process installed into only 2 basins. The incoming flow is directed to the SBR's flow via a common distribution chamber. The flow is routed from the distribution chamber to the pre-react chamber of each SBR. At the opposite end of each basin, the effluent is removed through decanters discharging via an internal collector pipe. Aeration is provided via fine bubble membrane diffusers on the floor of the SBR basins. Reliability and simplicity of operation are key attributes of this process. The plant is designed to operate both as a true SBR and in ICEAS mode.



JEFFERSON CITY, MISSOURI, USA

The City of Jefferson has maintained a sanitary sewage collection system since the early 1800's. The current Water Pollution Control Plant dates back to 1967. Over the years, additions and improvements have been made to the facility. In 2000, City officials decided to upgrade and construct a wastewater treatment facility that would meet current and future water requirements while serving a daytime population of over 50,000 people. After evaluating several treatment options, ITT's Sanitaire SBR solution was chosen as the most effective system for treating wastewater to meet the City's objectives. The new treatment plant has proved to be very successful, producing an effluent that well meets the health and safety requirements.

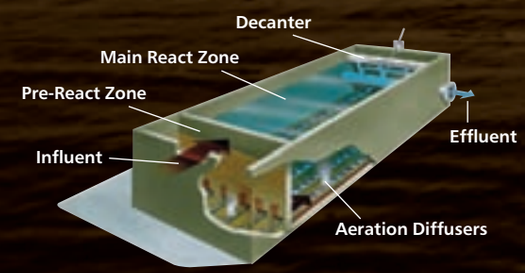
DOHA SOUTH, QATAR

ITT was selected to design, supply and supervise the development of a complete sewage system at the Doha South Sewage Treatment Works in Qatar. The selection criteria included the need for a cost-effective wastewater treatment process that would meet tight effluent consent standards. ITT proposed the installation of a Sanitaire SBR Intermittent Cycle Extended Aeration System (ICEAS) to manage the flow of wastewater for approximately 500,000 people. The project, completed in 2007, also includes the enhancement of the adjacent urban environment with access roads and street lighting. The final effluent from this plant is used for the irrigation of landscapes and agricultural areas, following additional tertiary filtration and disinfection stages.

SANITAIRE ICEAS SBR

Intermittent Cycle Extended Aeration System (ICEAS) Technology is one of the most cost effective wastewater treatment processes which can consistently meet tight effluent consent standards. ICEAS is a continuous flow SBR system which does not require primary or secondary settlement tanks or return activated sludge (RAS) pumps.

This means that the ICEAS process typically has a smaller footprint as well as lower construction and operating costs. The ICEAS system can provide high quality biological treatment within a compact plant.



Features

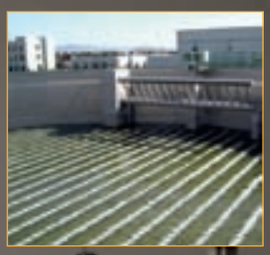
- Continuous Flow System, smaller tanks
- Reduces effects of shock loadings
- Time Based System, simpler to control
- Reduces blower requirements (1 per 2 basins)
- Significant capital and operational cost savings

Advantages

- Higher System Capacity
- Less Tankage Needed
- Offers Better Biological Nutrient Removal
- Provides a Pre-React Zone
- Needs Less Maintenance
- Costs Less to Operate
- Easy to Control
- Uses a Superior Decanter Design
- Expands Easily

STIRLING, UNITED KINGDOM

The existing wastewater treatment at Stirling comprised primary treatment followed by secondary treatment within two oxidation ditches, and then final settlement tanks. In order to double the capacity of the existing works to 100,000 people and provide the necessary treatment to meet the latest discharge standards, Scottish Water selected the Sanitaire ICEAS SBR process offered by ITT in preference to conventional biological treatment processes. The compact footprint of an ICEAS SBR enabled the new works to be constructed on a fraction of the ground area of the existing plant and within the existing site boundary, thereby offering significant savings on the project in both cost and time. The scope of ITT's supply included the design of the four-basin ICEAS SBR plant. It also comprises the supply, installation and commissioning of the SBR basins including the fine bubble diffused aeration system, the SBR decanters and the ICEAS control philosophy.



CHENGYANG, CHINA

In response to new regulations, the Qingdao government selected the Sanitaire SBR ICEAS system from ITT for the new wastewater treatment plant in the Chengyang District. The treatment capacity of the plant is 50,000 tons per day. ITT developed the technical system for the Chengyang Wastewater Treatment Plant, providing all the necessary equipment and services to the plant's bio-chemical section, including design, equipment supply and commission, guaranteeing that the plant's treated water would meet national discharge standards. An improved design has greatly reduced pumping system requirement, saving nearly 3 million yuan in equipment investment and about 1 million yuan in annual operating costs. Since the Chengyang Wastewater Treatment Plant was put into operation in October 2003, it has been using the ICEAS system. It has completely reached its designed treatment capacity, and reduced initial investment costs as well as operating and maintenance costs.

AMRIYA, EGYPT

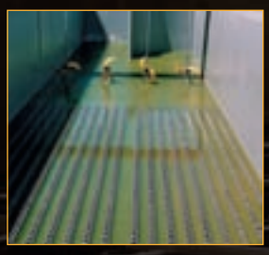
The Amriya works, located five kilometers southwest of Alexandria in Egypt, serves a population of approximately 35,000 people. It was constructed to provide full biological treatment of previously untreated sewage being discharged into Lake Maryut. It was also ITT's first Waste Water Treatment plant in Egypt. ITT manufactured, supplied and developed the process design for the new two-basin SBR plant operating the Sanitaire ICEAS system. In addition ITT supplied decanters, a stainless steel zero maintenance course bubble aeration system for the ICEAS basins, a waste sludge tank and the waste sludge pumps, as well as a PLC control system with full operator interface. ITT performed an inspection of the installed equipment and dry commissioning of the decanters, blower system, and control system on site. Following successful commissioning of the works in 1999 it has brought a significant improvement to the environmental conditions of the lake and its surrounding area.

HOLYHEAD, UNITED KINGDOM

The Holyhead Wastewater Treatment Works provides full treatment of previously untreated sewage from Holyhead Town, Trearddur Bay, Valley, Four Mile Bridge & Caergeilio, in order to meet the Urban Wastewater and Bathing Waters Directives. It also treats the flows from 5 sea outfalls and 10 combined sewer overflows. The treated effluent is discharged through a new marine outfall. The Sanitaire ICEAS SBR treatment process was selected to provide the maximum flexibility within a compact footprint. The SBR comprises four basins which receives screened and degritted sewage continuously using a simple time-based system to control the aeration, settlement and discharge stages of the process. ITT were awarded the contract to provide full design, procurement, installation and commissioning of all the equipment required for the works.

Sulaibiya Project

THE WORLD'S LARGEST WATER REUSE INSTALLATION, KUWAIT



The Arabian Gulf country of Kuwait is at the heart of the Middle East, a region that represents almost 5 percent of the world's population but less than 1 percent of its water resources. About 75% of Kuwait's potable water must be distilled or imported. Looking to conserve its limited water supply, the small country has built the world's largest water reclamation and reuse center.

Two major problems led to this decision. First, the existing wastewater treatment plant at nearby Ardiya had reached capacity. Secondly, the country's brackish water resources are now no longer sufficient to meet the growing demand for non-potable use. The Sulaibiya wastewater project is designed to resolve both of these issues. Prior to treatment at Sulaibiya, more than ten pipelines feed wastewater for pre-treatment to the Ardiya plant from Kuwait City and the surrounding area. A 25 kilometers long main pipeline conveys the pre-treated flow to the new Sulaibiya plant, where it is treated to potable water standards.

The plant comprises three elements – biological nutrient removal, RO / UF membranes and sludge treatment. A new 1 kilometer pipeline transports the finished effluent to the nearby brackish water gathering center prior to use, while the membrane system brine overflow is returned to the sea via another pipeline to the existing Ardiya outflow channel.

ITT was chosen to design, build and commission the aeration, mixing and pumping system at the Sulaibiya plant. ITT was also contracted for the design and supply of aeration equipment for oxidation ditches and digesters for the Sulaibiya project, leading to an ultimate capacity for the works of 158.4 MGD (600,000 m^3/day). All product installation has been designed with consideration to the intense demands from Kuwait's climate.

The water produced from this plant is used to irrigate landscape areas along highways, main roads and public gardens in large parts of Kuwait City. Vertical multistage pumps from ITT are driving the first phase of this irrigation scheme, and will also be used for the second phase.

Sanitaire *fine-bubble diffused aeration is the most efficient in wastewater applications, i.e. the amount of oxygen transferred to water per input energy is among the highest in the market. The* ***Sanitaire*** *membranes maintain a high efficiency for a large number of years.*

Flygt *low speed mixers effectively move and mix large volumes while incurring extremely low energy costs. They are the obvious choice in oxidation ditches and large tanks in biological treatment. Direct-drive stainless steel compact mixers are easy to install in both new and existing tanks.*

Flygt *pumps work efficiently in wastewater and sludge with up to 10% dry solid content. Progressive cavity pumps are available for use in dewatered sludge. Propeller pumps deliver high flow rates at low or ultra-low head with N-technology to ensure uninterrupted operation at sustained efficiency.*

BECKTON STW, UK

Located in Newnam on the north bank of the river Thames, the Beckton STW was first connected to the London Sewer network in 1850. Today, it serves a population of 3.5 million people and is one of the largest treatment works in the UK. The framework contract awarded to ITT has provided for the supply and installation of more than 195,000 Sanitaire fine bubble membrane disc diffusers and 1,000 km of associated PVC pipe-work over a five-year period and represents an investment in aeration equipment by Thames Water of more than £ five million. ITT acted as the Principle Contractor under CDM regulations during the installation of much of the work. The replacement of the aeration system has enabled the works to better meet the biological treatment requirements and reduce the energy costs for the plant.

WARREN CITY, MICHIGAN, USA

ITT installed over 8,000 ceramic Sanitaire disc diffusers with an in-situ gas cleaning system for the City of Warren's water treatment facility. ITT also provided a three-year diffuser cleaning contract through their local representative. The City's decision was based on the anticipated energy savings expected from ITT's Sanitaire high efficiency diffusers over their old system, which was both inefficient and trouble-prone.

VIENNA, AUSTRIA

Increasing environmental regulations and sewage volumes required the modernization of the main sewage plant in Vienna. The plant started operations in 1980 and purifies wastewater from a population of four million people. Along with water safety, energy efficiency was a high priority for the local authorities. After test evaluation, the ITT solution proved to be the most efficient. ITT delivered a total of 120 Flygt slow-rotating agitators and 48,435 Sanitaire disc fine bubble aerators for the new aeration tanks. In the 1980s, a degree of purification of 85 percent was sufficient. After completing the modernization in 2005, the plant has achieved a constant 95 percent thanks to the aeration system supplied by ITT that is used in the biological treatment process. The plant has proved to be stable, reliable and extremely energy efficient. So far there have been no malfunctions, failures or repairs that might have disturbed the internal biology of the plant or caused shutdowns. No wonder that the operators are completely satisfied with their choice of ITT.

Manukau

NEW ZEALAND

The upgrade of a 30-year old sewage treatment plant, involving the integration of the latest UV disinfection technology, was carried out as part of a 244 million modernization project, coordinated by Manukau Wastewater Services. When completed in 2001, it was the world's largest wastewater disinfection system.

The screening system was revamped, nine new combined reactor-clarifier tanks have been installed and a new tertiary wastewater treatment system is now in place, consisting of sand filtration reinforced by UV disinfection.

The Wedeco UV disinfection system consists of 12 open, 17m-long wastewater channels, which are integrated into a purpose-built structure. Each channel contains 3 banks of UV lamps with a total of nearly 8,000 high-performance UV lamps disinfecting 1.3 million m^3 of wastewater (or 365 million gallons) per day.

The purpose of this ambitious large-scale project is to protect the environment in the coastal waters of Manukau/Auckland and safeguard the health of bathers. According to the New Zealand authorities, the upgraded system is bringing about a considerable improvement in water quality. The local population will soon be able to swim and gather shellfish again in an area that has been closed to the public for 40 years due to the extreme pollution caused by the discharge of wastewater from the city of Auckland.

The decision to entrust this major order to ITT came after extensive testing of a number of competing systems by WaterCare Services Ltd. Chemical-free disinfection is gaining in importance not only in New Zealand but also in many other parts of the world, where this environmentally-friendly method is now regarded as state-of-the-art technology, and is increasingly referred to in legislation governing wastewater treatment.

***Wedeco** UV systems Type TAK provides a proven and environmentally friendly method of disinfecting wastewater. When exposed to UV-C light, microorganisms are inactivated within seconds through a physical reaction with the organism's DNA. In contrast to chemical disinfection, UV produces no harmful by-products. It also eliminates the risk to operators associated with handling dangerous chemicals. UV disinfection versus chemical methods gives increased disinfection effectiveness (especially against viruses) and is space-saving due to shorter reaction times.*

UMM AL-HYMAN SEWAGE TREATMENT PLANT, KUWAIT

This Wedeco UV system from ITT consists of 288 low-pressure high output lamps arranged in four banks in two concrete channels to purify 62,000 m³ of water per day. The water level in each of the two channels is maintained constantly with the help of a downward opening penstock. A purely mechanical wiping system prevents organic and inorganic deposits from accumulating on the lamp protective quartz tubes to ensure that the UV light actually reaches the water. The lamps are powered by electronic smart ballasts and monitored by a PLC, which enable adjustments to the UV lamp output for the water quality and flow rate. This reliable disinfection control uses UV intensity sensors that feature excellent UV selectivity, operational stability and a long operating life.

MUNICH, GERMANY

The bacteriological contamination of the river Isar had long prevented its use for safe bathing. To improve water quality, all sewage treatment plants discharging into the Isar south of Munich were equipped with a Wedeco UV disinfection step. The disinfection with UV light is a very efficient and environmentally friendly method for inactivation of human pathogens. Thanks to the positive results, the project was extended to the sewage treatment plants of the Middle Isar north of Munich. This included the sewage treatment plant II (Gut Marienhof) in the City of Munich. It is the largest plant in the area, disinfecting a maximum flow of 6 m³/s, including rain flow. The project has resulted in a drastically reduced bacterial load and remarkable improvement in the hygienic water quality of the Isar.

PRESTON WASTE WATER TREATMENT PLANT, UK

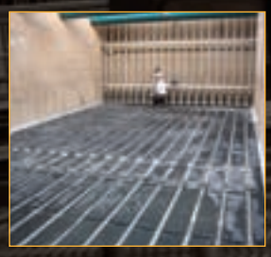
Preston was one of the very first variable power (VARIO) TAK Systems installed worldwide. The ability to offer significant savings in operation costs through the VARIO facility was a major reason why ITT secured the contract. The original installation, completed in 1999, had 1,188 lamps in two channels. Since then, two more channels have been added, making the total number of lamps 2,376 that treat a flow rate of up to 418,000 m³/day. The site is operated by United Utilities who are one of ITT's largest customers for Wedeco UV disinfection worldwide with 22 wastewater sites and 10 clean water systems consisting of over 8,500 lamps between them. ITT has been a framework supplier to United Utilities since 2001. ITT carried out health checks on all of the TAK sites in early 2008, identifying any maintenance and service requirements. We have also just completed a full service of the Preston system, which was a direct result of those health checks.

KALUNDBORG, DENMARK

The water treatment plant Kalundborg purifies and clarifies combined sewage consisting of 20 percent municipal and 80 percent industrial wastewater from a nearby pharmaceutical plant. When it scheduled an increase in production, the authorities of Kalundborg decided to completely redevelop the treatment facility to accommodate the resulting increase in wastewater. ITT supplied the plant with two Wedeco ozone systems with a total output of 180 kg/h ozone. The treated and biologically pre-clarified wastewater undergoes treatment with ozone within the recirculation system, in six reaction vessels with a total volume of 300 m³. Within only 15 minutes of total contact, a drastic reduction of the stubborn organic impurities occurs. Ozone treatment also degrades harmful endocrine disruptors such as drugs and hormonally-active residues in the wastewater.

Blue Plains Advanced Wastewater Treatment Plant

WASHINGTON DC, USA



The Blue Plains Advanced Wastewater Treatment Plant is the largest advanced wastewater treatment facility of its kind in the United States with a rated annual average capacity of 370 million gallons per day (1,400,500 m^3/day) and a peak wet weather capacity of 1.076 billion gallons per day (4,072,700 m^3/day). While other metropolitan areas have facilities with larger capacities, none of these provide the high level of treatment like Blue Plains. The plant covers an area of 150 acres (607 km^2).

Wastewater is collected by the District of Columbia sewer system and from the Maryland and Virginia suburbs and is delivered to the Blue Plains Advanced Wastewater Treatment Plant. The existing wastewater treatment processes consists of preliminary and primary treatment, secondary treatment, nitrification/ denitrification, effluent filtration, chlorination/ dechlorination and post aeration.

The ITT project for the Blue Plains Advanced Wastewater Treatment Plant included furnishing, installing and placing into successful operation the complete filtration system for the plant's filter upgrade. ITT rehabilitated 40 dual bay filters, totaling 80 filter cells with a total filter area of 83,200 square feet (7,729 m^2).

After demolition of the existing filter equipment and concrete repair, ITT installed Leopold filter underdrain with IMS cap, an air header piping system, 560 fiberglass reinforced plastic troughs in addition to 4,333 tons of anthracite from the company's Anthracite Processing Facility in Watsontown, Pennsylvania and 4,550 tons of silica sand. The state-of-the-art filtration system incorporating air-water backwash was completed at Blue Plains in February of 2007.

***Leopold** Universal Type S® underdrain provide superior distribution of water and air for effective media backwashing. **Leopold** backwash troughs, filter media and control systems complete the tertiary filter systems as provided by ITT.*

GALESBURG, ILLINOIS, USA

The wastewater treatment plant in Galesburg chose the ITT treatment system as an economical way to reduce Total Suspended Solids concentrations, especially during high flow conditions when solids could wash out from the processes. Installation was completed in September, 2007. The plant has an average design flow of 11 MGD (41,600 m^3/day) and a peak design flow of 28 MGD (106,000 m^3/day). The ITT package includes eight energy efficient Sanitaire DrumFilters and Control System, one ITT high pressure booster pump system with three pumps, a control panel and three Flygt submersible lift station pumps. The tertiary treatment package from ITT is reporting effluent concentrations of less than 5 mg/l.

JOHNSTOWN, COLORADO, USA

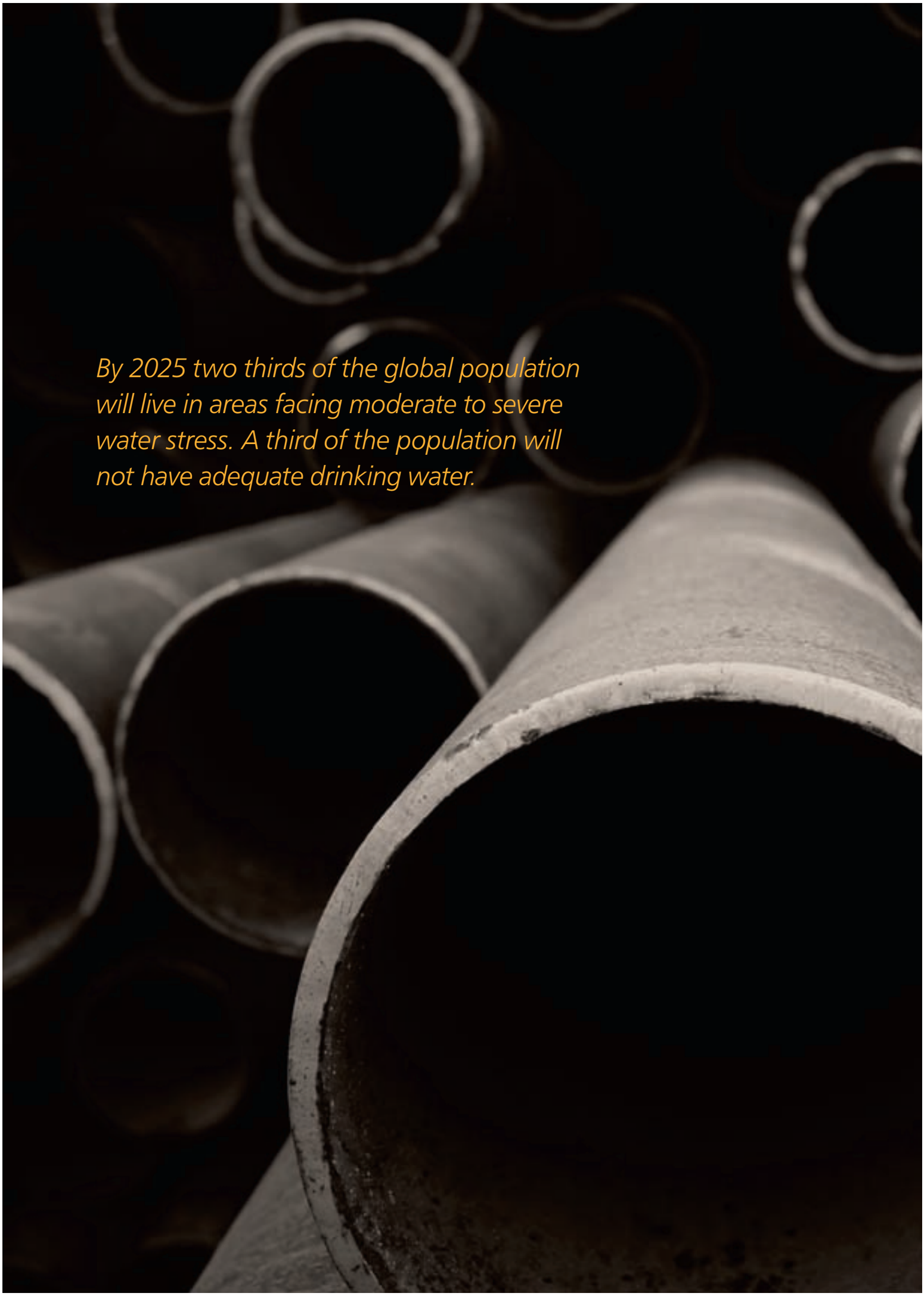
The wastewater treatment system in this rapidly growing community had reached its maximum capacity due to new regulations and a growing population. After a successful pilot study, the Town purchased a Leopold Clari-DAF system from ITT designed to handle 750,000 gallons of water per day (2,800 m^3/day). The plant layout allows for a duplicate to be installed, which would double the capacity. The treatment scheme contains aerated lagoons followed by a settling lagoon prior to discharge. The use of chemicals has been significantly reduced, sludge handling is more efficient and the summer algae blooms have had no effect on plant discharge.

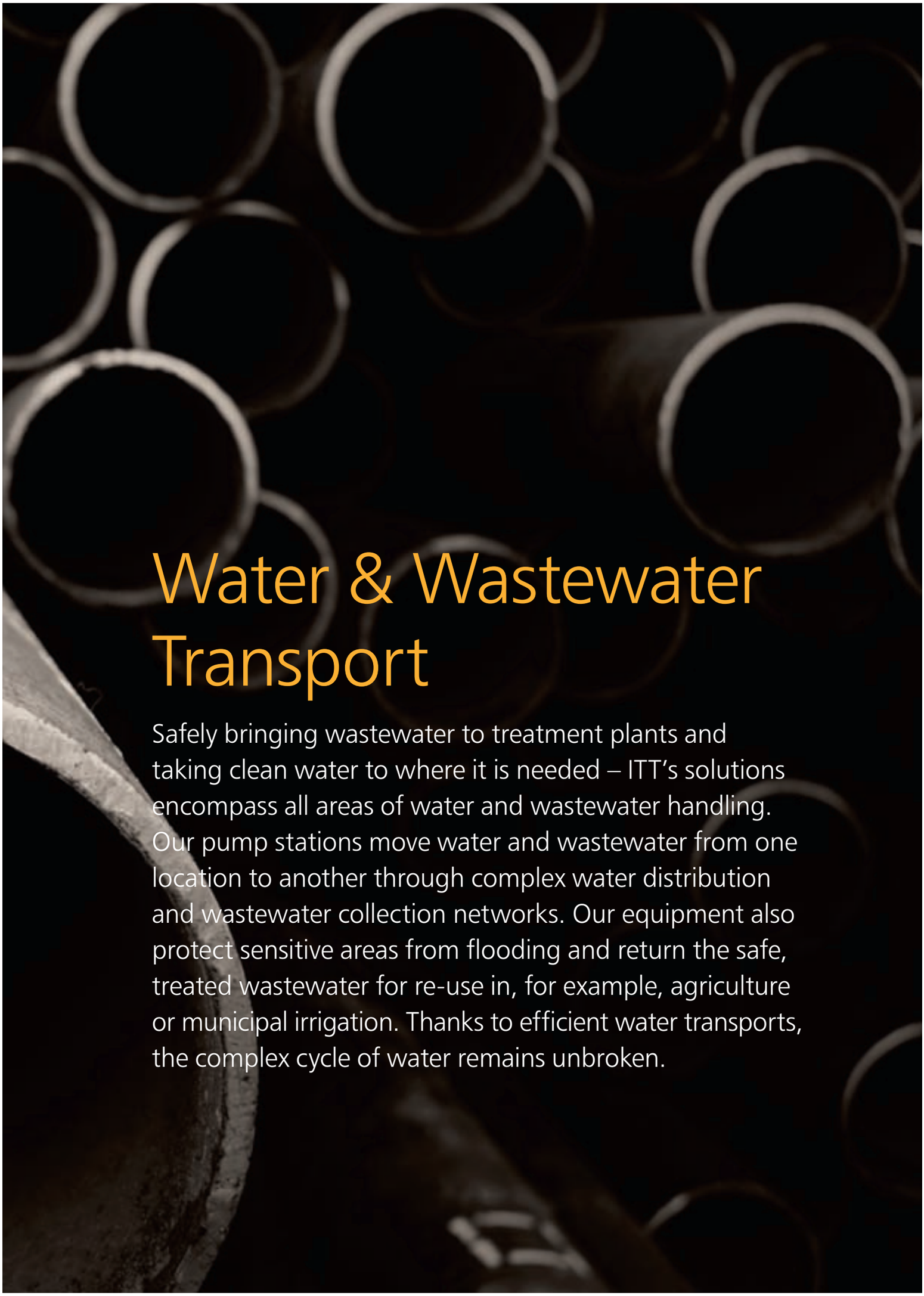
SMITHFIELD, NORTH CAROLINA, USA

Population growth and increasingly severe limits on nitrogen discharges meant that the plant in Central Johnston County had to turn to filtration in order to comply with regulations. ITT's Leopold filtration system was selected after careful evaluation. After completing the full expansion, the plant will handle 9.5 MGD (34,100 m^3/day). In 2006 the total nitrogen discharge was 10 tons, only a third of the allowed 30 ton maximum limit. Close client collaboration has resulted in several custom made solutions to solve specific problems and improve the plant's performance.

CHANDLER, ARIZONA, USA

The Chandler Airport Water Reclamation Facility consists of four Leopold tertiary filters, totaling 1,560 square feet (145 m^2). In 2003 the plant expanded to double its size utilizing the same filter design and raising the flow rate to 10 MGD (37,850 m^3/day) with a TSS removal rate of 46.2 percent. The facility boasts a zero percent discharge rate with its effluent going to golf courses, decorative fountains, etc.


By 2025 two thirds of the global population will live in areas facing moderate to severe water stress. A third of the population will not have adequate drinking water.



Water & Wastewater Transport

Safely bringing wastewater to treatment plants and taking clean water to where it is needed – ITT's solutions encompass all areas of water and wastewater handling. Our pump stations move water and wastewater from one location to another through complex water distribution and wastewater collection networks. Our equipment also protect sensitive areas from flooding and return the safe, treated wastewater for re-use in, for example, agriculture or municipal irrigation. Thanks to efficient water transports, the complex cycle of water remains unbroken.

Karl XII pump station

STOCKHOLM, SWEDEN

Stockholm is sometimes described as the Venice of the North – a fitting title for Sweden's beautiful capital city. But unlike Venice, Stockholm's reputation for clean water is world-renowned. Water that is both clean enough to swim in and to fish in. By 1994 the Karl XII station's pipes and three De Laval cast iron pumps were nearly 60 years old. A breakdown at the station would constitute a very serious environmental hazard. The prospect of untreated sewage flowing out into the waters of central Stockholm would be disastrous for a city that had staked its reputation on the purity of its water.

Having considered a number of alternatives for the renovation of the station the Stockholm Water Company decided to replace the old pumps with four new Flygt CZ 3501 pumps, thus creating two stations in one. Originally fitted with one pressure pipe, a new pipe was connected at the station to increase safety and the old pipe was relined.

The four Flygt pumps, designed for optimum functionality, were grouped in such a way that each pair had its own pressure pipe connection. This, in effect, created two separate systems capable of operating independently or in several combinations. The most unusual aspect about this solution also happens to be the feature the client found most attractive. This is that, unlike most dry installed submersible pumps of this size, the Flygt pumps could be installed horizontally instead of vertically – a crucial point in view of the fact that the station has a very low ceiling. The pumps are assembled in a "gun cradle" and can simply be dismantled and "rolled out" for service and inspection.

***Flygt** is the world's leading manufacturer of submersible water and wastewater pumps, but also:*

- *Wet-pit column pumps up to 25,000 l/s and up to 60 m (400,000 GPM & 200 ft)*
- *Dry-pit wastewater pumps up to 8,800 l/s and up to 60 m (140,000 GPM & 200 ft)*
- *Split-case pumps up to 14,200 l/s and up to 190 m (225,000 GPM & 620 ft).*

ORLY AIRPORT, PARIS, FRANCE

This is a storm/rain water treatment plant, treating the inflow from a large gravity sewer collected from all over the Orly Airport tarmac. The pumped effluent is discharged to a grit chamber and then to a dual lagoon collecting system before it is treated through large sand filters, and transferred to the river. The pumping station is set in a circular caisson and includes both the dry weather inflow and storm water sumps. The storm sump includes a circular inlet baffle chamber for the stabilization and de-aeration of incoming storm flows and is equipped with 12 large Flygt submersible pumps that are capable of discharging a total of 16 m^3/s. Flows in excess of the installed pumping capacity are discharged via an emergency overflow weir installed upstream within the diversion chamber constructed in line with the gravity interceptor sewer. The pumped effluent is discharged to a grit chamber and then to a dual lagoon collecting system before it is treated through large sand filters, and transferred to the river.

GRAN CANAL, RIO HONDO, MEXICO

Mexico City takes most of its drinking water from underground sources, which causes the city to sink. In order to keep the sewage effluent flowing away from the city, one of the main arteries, Gran Canal, had to have a large pump station installed. ITT's Flygt product brand was the only that lived up to the City's requirements. ITT delivered a total of 20 low lift submersible propeller pumps and handled the installation and testing of the pumping facility on site. Advanced computer simulations and model tests prior to the design and installation helped to ascertain excellent hydraulic function and client satisfaction.

WASTEWATER PUMP STATION

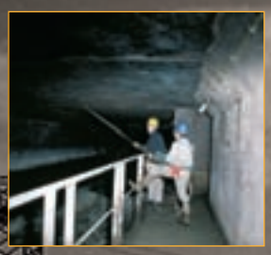
Flygt dry pit pumps have been designed with large, unobstructed flow passages through the impeller and volute, which makes them ideally suited for pumping sewage, wastewater and storm water. Numerous impellers are available with varying performance characteristics, solids handling capabilities, number of vanes and impeller rotations so that the pumps may be custom sized to fit any given application. The heavy-duty, rugged construction and conservative mechanical design minimize pump vibration and maximize pump life. The cast version of the dry pit pumps are available in sizes up to 54" (1,372 mm) diameters. Fabricated volute designs are available with virtually unlimited capacities.

CLEAN WATER PUMP STATION

ITT offers a series of vertical column and axial flow pumps for sewage, water supply, wastewater, storm water and flood control where pumping requirements can exceed a half million gallons per minute. Flygt vertical wet pit column pumps are efficient and reliable and are designed to maximize pumping efficiency over a wide range of capacities and heads. The optional "pull out" design reduces maintenance costs and downtime as the discharge piping remains undisturbed when removing the pump. They are available in sizes up to 120" (3,050 mm) diameters. Custom engineered sizes and multiple stage impeller arrangements can be built to even exceed these gargantuan capabilities.

NEW ORLEANS, LOUISIANA, USA

ITT's Flygt pumps and systems helped keep the New Orleans area free of floodwater during the onslaught of Hurricane Gustav in the fall of 2008. Positioned at 25 different pumping stations in Jefferson, St. Charles, St. Bernard and New Orleans parishes, Flygt pumps have a total pumping capacity of 20 million gallons of water per minute. The pumps serve as additional capacity to the city's existing flood water infrastructure to manage water levels in the event of natural disasters such as Gustav. "We expected our pumps to keep New Orleans dry as powerful Gustav bore down," said Jim Peterson, managing director of ITT's large pumps division in its Water & Wastewater business. "ITT marshaled its resources in the region to ensure we had the right people in place to provide emergency service as the storm approached. In the end, the pumps and people performed exactly as expected." ITT's Flygt pumps are part of a sophisticated system that serves the east bank of New Orleans by draining storm run-out to prevent flooding. When the city lost electricity during the storm, diesel fuel and standby generators powered the pumps to keep pace as the storm surge moved through the canals.

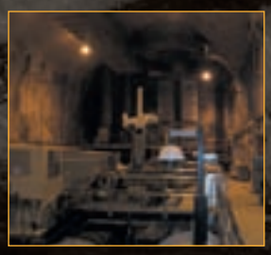


BRUSSELS, BELGIUM

The sewers of the Belgian capital, Brussels are still cleaned by hand-moved carts from 1870. However, to solve the city's severe flooding problems, new solutions were necessary. In order to stop wastewater from flowing back from the collectors and flooding cellars, ITT installed a pump station with Flygt pumps that automatically pump excess water back into the river till water levels start to fall. A new monitoring and control system was also installed by ITT, linking the new pump station to other existing pump stations and retention basins. The computerized network keeps track of the volume of water pumped and checks the need for maintenance around the clock. The system generates daily reports based on data collected, and alerts the operators via their mobile phones when there seems to be a problem. Recent high tides and heavy rainfalls have not caused any of the problems Brussels used to suffer.

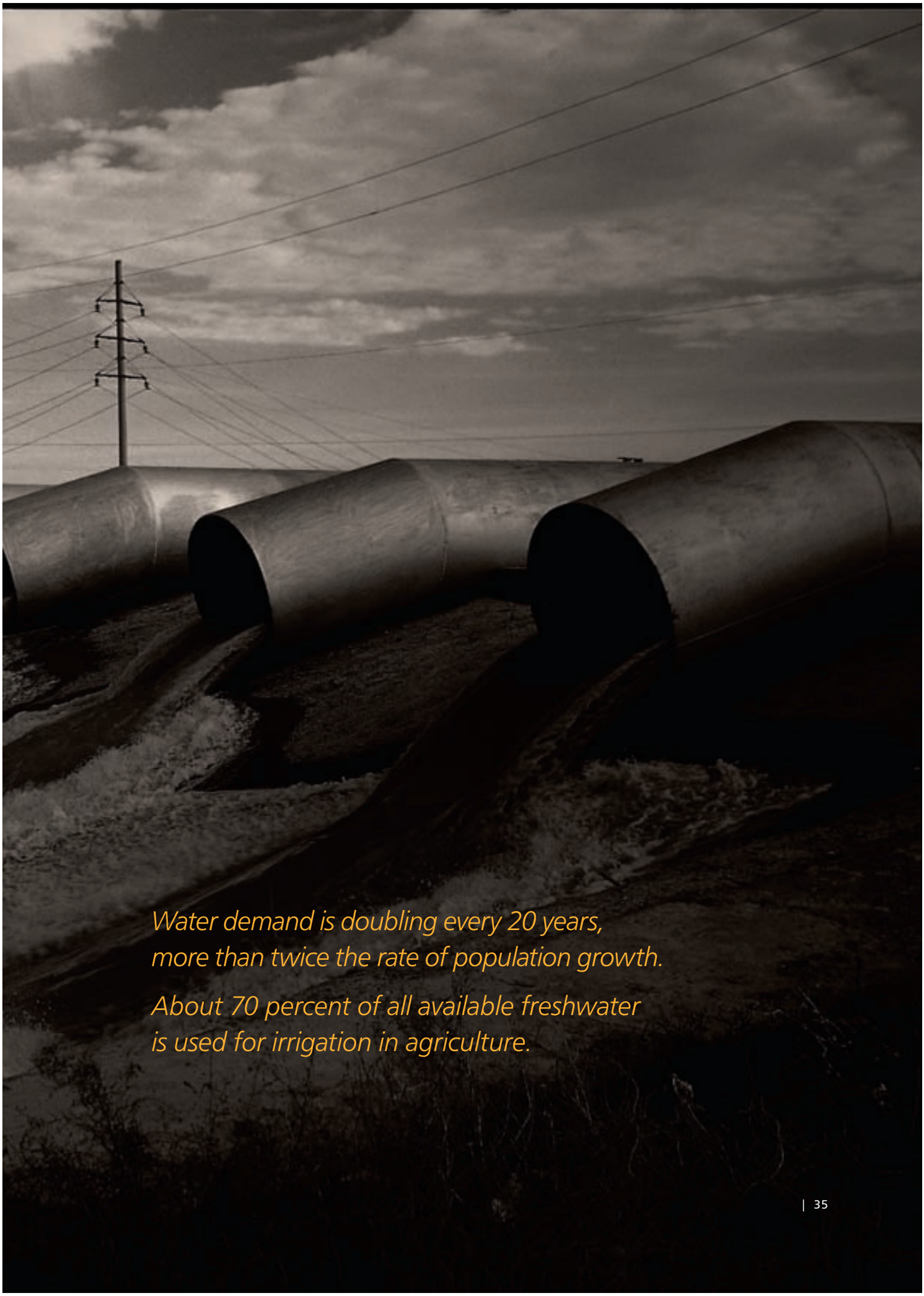
YULANGYZ CANAL, TURKMENISTAN

In 1996, due to a lack of maintenance after the fall of the Soviet Union, the system of irrigation channels in Eastern Turkmenistan had been deteriorating. Over a four-year long period, ITT reconstructed the mechanical as well as the electrical supply systems in order to restore and improve irrigation in the area. The project included 61 large low lift submersible Flygt pumps in six pumping stations with all electronic control equipment plus a system for automating the operation of the pumps. The project was successfully completed in spite of the scarcity of local supplies and inadequate infrastructure.



CALUMET TARP, CHICAGO, USA

This project included replacing some split case pumps that were old and falling apart. ITT provided four new Flygt pumps and connected them to the existing 6,000 hp electric motors. Each of the pumps is rated at 50,000 GPM at 375 ft (3.15 m^3/s at 114 m). Efficiency was very important and ITT guaranteed 89 percent rates. The pumps are located approximately 250–300 feet (75–90 m) below ground level and had to be lowered in three pieces through a hole in the roof of the tunnel before installation. They are used to pump sewage from the deep tunnel and up into the plant for processing. Greater Chicago has installed several ITT pumps. Most of them are split case pumps and are used in connection with sewage treatment. It is a fairly unusual service for a split case pump in US.



Water demand is doubling every 20 years, more than twice the rate of population growth.

About 70 percent of all available freshwater is used for irrigation in agriculture.

ITT

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Integrated solutions for fluid handling are offered by ITT Water & Wastewater as a world leader in transport and treatment of water and wastewater. We provide a complete range of water, wastewater and drainage pumps, equipment for monitoring and control, units for primary and secondary biological treatment, products for filtration and disinfection, and related services. ITT Water & Wastewater, headquartered in Sweden, operates in some 140 countries across the world, with own plants in Europe, China and North and South America. The company is wholly owned by the ITT Corporation of White Plains, New York, supplier of advanced technology products and services.

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