TOP DUTCH
A good place to be great

THE NEXT WATERTECH INDUSTRY

What will be the future of the WaterTech industry?

The WaterTech industry keeps on innovating. Thanks to collaborations in the TopDutch region, new technologies are being developed that contribute to sustainable solutions. Solutions that lead to more clean water, the recycling of raw materials and energy from wastewater, and more efficient processes.

WHAT WILL BE THE FUTURE OF THE WATERTECH INDUSTRY?

1.

SUSTAINABLE INNOVATIONS IN WATERTECH

The world is changing at an undeniable pace. There is more pollution, more people and a depleting proportion of available, safe drinking water. Therefore, we need to develop more sustainable solutions to ensure everyone across the globe will have access to safe water. One way of doing this is through re-using wastewater.

'There are all kinds of developments when it comes to sustainability in water technology', says Hein Molenkamp, Managing Director at the Water Alliance. He represents the water technology sector in the Netherlands on international trade missions, which means he encounters water problems from all over the world.

'All around the world, there is a need for innovations in water technology,' he says. 'For example, regarding wastewater treatment and re-use. Strict rules still often prevent the re-use of wastewater. Though it's sometimes often applied in countries that suffer from droughts, for example, for irrigation in farming. Consider a city like Dubai, where people practically live in the desert. The city keeps expanding while the amount of available water is rapidly diminishing, and it's expensive to produce drinking water out of seawater. So, re-using wastewater is a necessity there. 'Wastewater is actually an incorrect term; this makes it sound like garbage, a surplus. In the future, there should not actually be any more wastewater because all the water and the substances it contains should be re-used. We have to stop seeing water as garbage and, instead, learn how to recover raw materials from it, so we can re-use both.' Industries are talking more and more about the development of 'zero-liquid-discharge'. We could also try and re-use as much water as possible in homes.

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Hein Molenkamp, Managing Director at the Water Alliance

Waterschoon:
small-scale, local, innovative wastewater treatment

The TopDutch project, 'Waterschoon', is an example of water technology, innovation and sustainability coming together. 'For this project, we connected 200 households in a neighborhood in Sneek, in Friesland, to a local, innovative wastewater treatment system,' explains Brendo Meulman. Meulman is the Technical Director at DeSaH BV, one of the partners in this project. The houses in that neighborhood don't have a sewage system to drain the wastewater. Instead, we differentiate between gray water - water from the shower, washing machine and kitchen faucet - and black water from the toilet. The water is transported to the water treatment system in the neighborhood in two streams and the gray water is purified. Heat from the water is used to provide hot water for the shower and heating systems in the neighborhood.

The black water is mixed with the compost that is mulched in the houses. Microorganisms ferment the waste from the toilet together with the compost. This creates biogas that provides energy to the neighborhood. Raw materials, such as phosphate and nitrogen, are also released and can be used to make fertilizer.

'So, the wastewater from the houses is no longer waste, Meulman concludes, 'but a source of raw materials and energy. What you end up with is clean water that meets the criteria to be disposed of as wastewater.' Thanks to the innovative developments and a collaboration between WaterTech company DeSaH, housing organization Elkien, water authorities Wetterskip Fryslân, the municipality of Sûdwest-Fryslân and Stowa, a water knowledge center, this neighborhood uses less water, saves on energy costs and even generates raw materials. 'Generating raw materials can be very useful for a lot of countries,' Meulman says. 'For example, the whole world currently depends on just a few countries with phosphate mines. When you have the technology to recover those raw materials from water, you become less dependent on those countries. When it comes to sustainability, we often only think about energy, but recovering raw materials and saving water are also important parts of sustainability.' The WaterSchoon project is not limited to the Northern Netherlands. Neighborhoods with a similar wastewater treatment system are currently under construction in Amsterdam and some cities in Canada and Sweden.

Bacteria turn garbage into an asset

Using bacteria to purify water is nothing new, it has been done for years. Paques, a company focused on industrial wastewater treatment using bacteria, has been doing this since the 1960s. Director for Global Business Development & Strategy, Joost Paques, gives us some insight into the developments in his field of work. 'We keep on discovering new bacteria that have different qualities. In the 1980s, for example, we found out that there are bacteria that transform organic materials into biogas. This occurs in our intestine. But that alone is not enough for an industrial purification that can produce biogas. It took years to fully understand that process and to be able to use it on an industrial scale. The same happened

with bacteria that transform sulfur oxide into sulfur or ammonium into nitrogen. They are now used on a large scale in wastewater treatment.' And the developments just keep on coming. 'We've now discovered bacteria that transform organic materials from wastewater into biopolymers - in other words: degradable plastic. If we can apply this on a large scale, we can use wastewater to make sandwich bags that you can just throw onto the compost heap, where they will be broken down into fertilizer.'

To achieve these innovations, Paques is looking for collaboration opportunities. 'We were one of the driving forces behind Wetsus because we need thorough research for our innovations.' And, maybe because Paques has experienced how important networks are for innovation, he is working on a new concept: the BioBizzhub. 'We want to help start-ups to scale up and find potential customers. Here in the Northern Netherlands, we can also help them find facilities, such as office space, workspace to build prototypes and testing facilities.' This way BioBizzhub - with financial help from the European Union, local governments and Paques - stimulates more innovations in the field of biological purification in the Northern Netherlands.

2.

INFLUENCE OF DIGITALIZATION

Digitalization is rapidly taking over the world and it is also providing new possibilities for water technology. For example, sensors help monitor water quality and collect data, while robots make the work easier. Digitalization is playing a growing role in various companies.

Sensors generate knowledge

Molenkamp sees how digitalization is playing a role in various companies. 'Drinking water companies and water authorities are doing it, but many businesses in the water technology sector are more and more often using digitalization in their innovations too.'

Water authorities in the Northern Netherlands are always looking for ways to purify water even better. Research and Project Manager, Yede van der Kooij, from Wetterskip Fryslân, one of the TopDutch water authorities, explains why. 'We want to keep the water in the Netherlands clean, even the surface water. Therefore, we're constantly measuring the water quality and looking for new knowledge to further improve water purification.'

As an example, he mentions measuring nitrous oxide (commonly known as laughing gas). 'We have known for a long time that nitrous oxide is released during our water purification process. And we also know that it's bad for the environment; nitrous oxide contributes 200 times more to the greenhouse effect than carbon dioxide. About 30% of the ecological footprint of wastewater treatment in the Netherlands is caused by nitrous oxide. But otherwise we know very little about how the nitrous oxide originates.

'If we want to do something about those emissions, we first have to learn more about this.' That is why several water authorities in the Netherlands have installed sensors that measure nitrous oxide emissions. 'This way we hope to gain insight into the conditions that create the gas. That knowledge will allow companies and research institutes to look for ways to reduce nitrous oxide emissions.'

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It is not only water treatment companies that use sensors to collect data; more and more other places where process water is processed are using sensors to monitor this process. And this is only going to increase in the coming years, according to experts like Molenkamp and Van der Kooij. Companies are currently still a bit hesitant; they first want to be sure that the sensors are always 100% dependable. This is quite a challenge for wastewater treatment plants, says Van der Kooij. 'Wastewater can also contain hair and other things that stick to sensors, causing them to not function properly.' Internet stability used to transfer the data is also not always as reliable as it should be.

Increasing digitalization

Mateo Mayer, CEO at Aqua Collor Sensors, a company that develops sensors, thinks digitalization will increase exponentially in the decades to come. 'Electronics keep getting better and cheaper, so digitalization is also getting cheaper. Data traffic is also becoming more reliable, faster and cheaper, certainly once 5G is implemented.' So there is a lot of innovation going on in the field of digitalization. Molenkamp mentions a few other examples from the Water Alliance. 'The Acquaint company has developed a robot system for inspecting pipes. Pipes are a huge cost for a water authority. The robot makes it possible to inspect the pipes without having to dig up the ground. The robot itself can move through the pipes and check their quality. This means huge savings for the pipe owners because they, based on the measurements, will not only have to replace the pipes less frequently but also only have to replace those pipes that really need replacing.'

Another example is a company that uses sand filters to purify water. They are used all over the world to produce drinking water, as well as for communal and industrial wastewater treatment. 'The filters operate with a dynamic sand bed that is checked by the operator periodically. So, the company has now developed SandCylce sensors that move with the sand and send data to a computer. This allows the operator to monitor the status of the filter from a distance and optimize the process.'

Monitor and intervene remotely

All developments in the field of digitalization make it possible to do more things remotely. This creates new possibilities in, among others, the field of water purification. ‘People still do some of the inspections: for example, checking if the pumps are still working and taking samples to analyze in the lab.’ says Molenkamp. ‘Many of those activities can be done digitally. This is not always done because we have to know for sure that the equipment really works and doesn't just go offline all of a sudden.
But if it works well, it should be possible to analyze the data from various wastewater treatment installations at one location. This, of course, must be monitored by people who can intervene if the data shows that something is wrong, but this means not every treatment plant has to have someone on site with knowledge of the process. This makes more small water treatment installations, like the Waterschoon project, possible. These are then monitored at a central location. In case of any issues, someone at the local level can be called in to fix the - often technical - problem.’
This can make processes at a local level more effective since they would require less manpower.

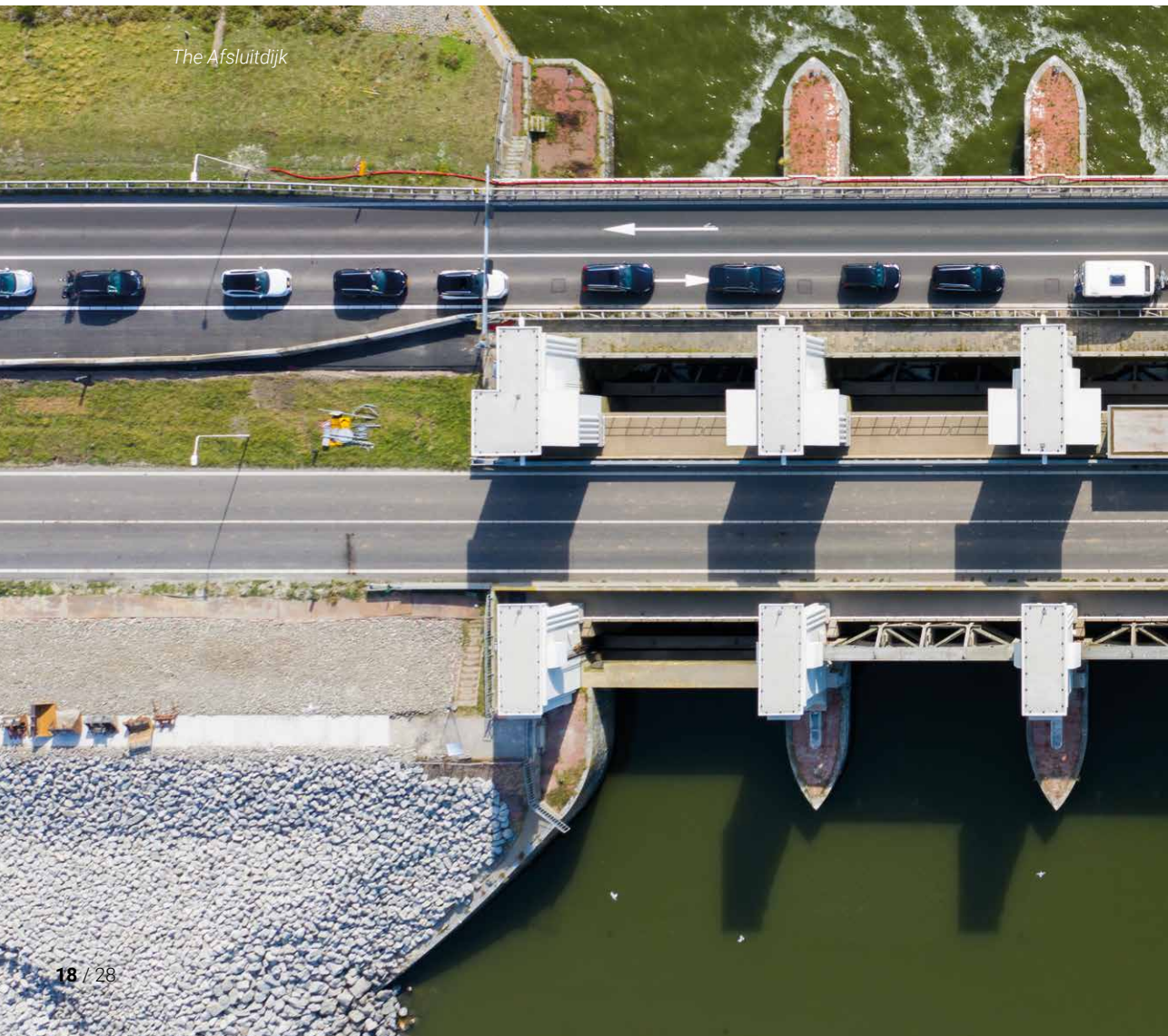
3.

THE IMPORTANCE OF INNOVATION IN INDUSTRY

Sustainability and digitalization of water technology is not only important for improving water treatment processes and creating clean drinking water. The WaterTech industry cross-links with many others which can lead to new solutions for a sustainable and healthy economy across many different industries.

Energy production

'Water technology is an enabling technology,' says Molenkamp. 'Water technology often plays an important role in many processes, not just in the water sector, but also, for example, in the agricultural sector, the food industry and various other processing industries. But water quality is also a crucial factor in the energy sector and the health sector.'



The Afsluitdijk

The energy sector is an example of an industry where water technology plays an even bigger role. Companies are looking for new ways to produce energy. Some of the more sustainable energy sources are directly connected to water. REDstack, a company near the Afsluitdijk in the Northern Netherlands, generates energy from the difference between salt and fresh water, the so-called Blue Energy, which can also be a good alternative for fossil fuels in other parts of the world. Another example of potential energy sources comes from the new trend of generating biogas from wastewater through fermentation.

Producing beer and soft drinks

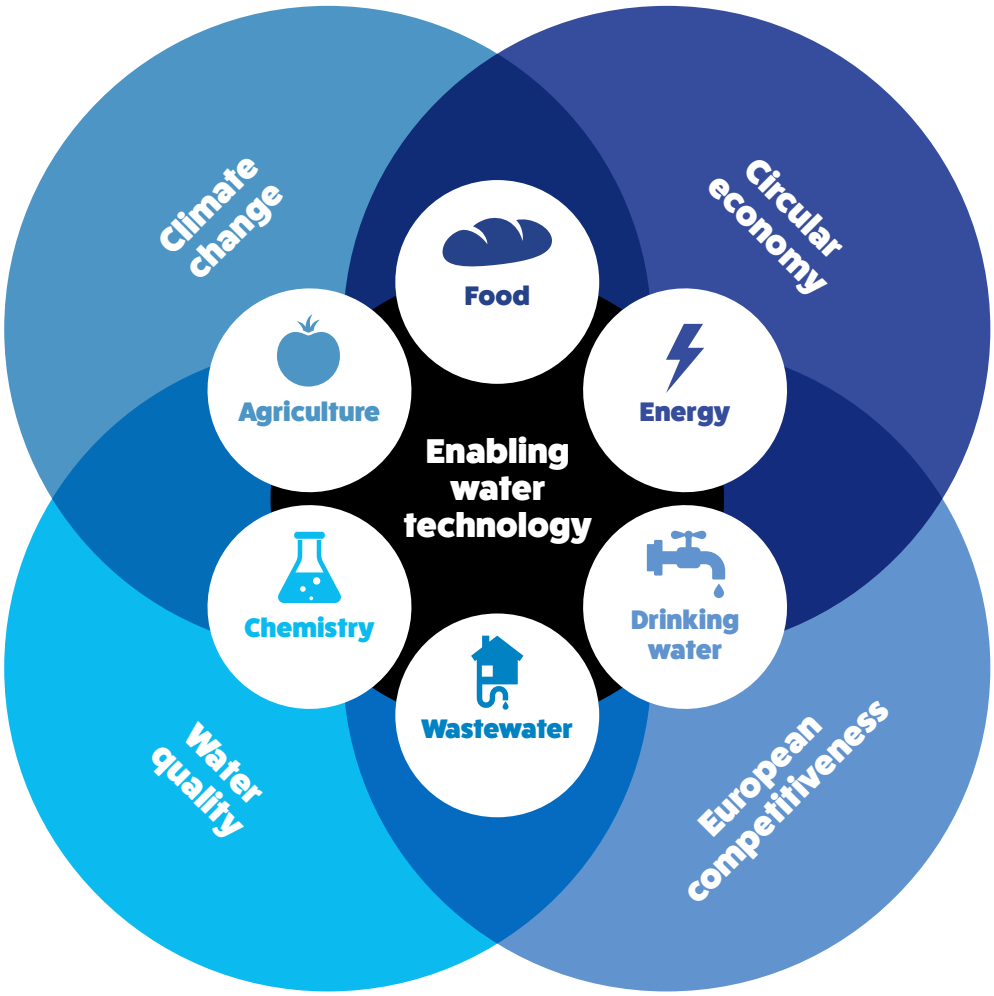
Another industry where water technology plays an important role is the drinks industry. 'A lot of water is used to produce beer and soft drinks. These companies will run into trouble if drinking water becomes scarce and, thus, more expensive. So, they benefit from efficient water purification, leaving enough process water for their production processes.' Molenkamp explains. 'These companies also produce lots of process water that is currently disposed of as wastewater. Solutions like the purification with bacteria from Paques can be really useful for them. If they can purify their process water to such an extent that part of it can be re-used, those companies will save both a lot of water and expenses.'

Markets are everywhere

The market for water technology innovations is very big. In addition to the examples mentioned earlier, Molenkamp from the Water Alliance and Van der Kooij from Wetterskip Fryslân can list many more industries that will benefit from this. One example is the Nereda process that is used in the Netherlands to extract alginic acid from the purification sediment of wastewater treatments. 'Bacteria are clustered together to form granules that are put in the purification sediment. These bacteria break down matter from the sediment, which creates alginic acid. That alginic acid sticks to the granules. After a period of time, the granules are filtered from the sediment and the alginic acid can be extracted and re-used as an adhesive in the paper and cardboard industry or as a thickener in paints for the textile industry.'

Molenkamp also mentions another example: 'In a collaboration between Wafilin Systems, a TopDutch company, and Avebe, a potato starch producing company, a process was developed to extract proteins released from potato water during starch production that can be used as animal feed or as a supplement in the food industry.'

So, the innovation in water technology is not only beneficial to the water sector but to all sectors dealing with water, from the food industry to the manufacturing industry and from science & health to the cleaning and chemicals industry. Whether it is slowing down climate change, improving water quality or circular technology, water technology plays an important role.



The potential benefits of enabling WaterTech

4.

THE DUTCH INFLUENCE: HOW A SMALL COUNTRY BECAME BIG IN WATERTECH

The Netherlands is a small, densely populated country that is predominately below sea level. This location has necessitated innovation in the field of delta technology for decades, so the Dutch can continue to live safely behind the dikes. But the Netherlands is not only at the top of the class when it comes to delta works.

It is also one of the frontrunners in water technology worldwide. Abroad, the Netherlands is well known as a country where everyone can drink water from the faucet safely. This is quite unique when you consider that the Netherlands is situated in a delta where several European rivers culminate; yet we are still able to produce clean, safe drinking water. Everyone who has traveled knows that you cannot automatically assume that it is safe to drink from the faucet everywhere in the world; but it is in the Netherlands. That is a good example of the knowledge and aptitude of the Netherlands as water technology experts, according to Molenkamp.

Wastewater treatment - a necessity

The Netherlands is so good at water technology because of its dense population and the presence of water, thinks Yede Van der Kooij, Research and Project Manager at Wetterskip Fryslân, one of the authorities responsible for sufficient, safe and clean water in the TopDutch region. 'Because we are densely populated and have quite a lot of agricultural land, the effects of, for example, artificial fertilizer were seen quite quickly in the drainage water. The nitrogen and phosphate levels are very high in the Dutch surface water. And we are surrounded by all this water: if we discharge filthy water into canals, it's we who suffer the consequences.' That is why wastewater treatment in the Netherlands goes further than in other countries. 'Once I was invited to talk about our wastewater treatment in America. They were amazed that we even recycle toilet paper and re-use it in paper production.' Because technology is needed for all that purification, the water authorities invest in research and innovation, to keep improving it.

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Yede Van der Kooij, Research and Project Manager at Wetterskip Fryslân

Demo site facilitates innovative developments

Another stimulation for WaterTech in the Northern Netherlands was the establishment of Wetsus, a large water technology research institute. Wetsus is located in Leeuwarden and forms the basis of the current WaterCampus, where various organizations, including Water Alliance, the CEW, Centre of Expertise for Water Technology, the Water Application Center, etc. are collaborating. This led to the idea of making Leeuwarden the WaterTech Capital of Europe. So, Wetterskip and Wetsus created a demo site at the RWZI (sewage treatment plant) in Leeuwarden where, since 2011, companies can test their new systems. Yede van der Kooij explains 'Companies can test equipment at this demo site without directly affecting the entire wastewater treatment. They build their installation and we supply the wastewater. We can also help them find interns or help with analyses. Companies pay rent, of course, but not much, because we think knowledge development is also really important. Sometimes we even work on a 'quid pro quo' basis, if we are allowed to use their knowledge in exchange for the use of the demo site.'

The power of networking

The establishment of Wetsus, the development of several demo sites, the many SMEs and start-ups in Leeuwarden at the Watercampus and the Water Alliance activities have all contributed to the growth of water technology in the Northern Netherlands in the last decade. Water Alliance Managing Director, Molenkamp, regularly experiences the power of this network. 'There are no large water multinationals in the Northern Netherlands, mainly SMEs that are looking for innovation and want to collaborate with knowledge institutes. The region is also home to many manufacturing industries that are important suppliers to water technology companies, so they too benefit from the growth. The Netherlands is a country of knowledge and one of its strong points is the collaboration between research and the business community. A facilitating government that is willing to create, for example, testing grounds and finance pilot projects is, of course, also very important. This makes the TopDutch region a testing ground for innovative water technology that can be marketed worldwide.'

Paques also experiences the power of collaboration. ‘When it comes to innovation, I think that a small company especially can really stand out. Smaller companies are more flexible and, therefore, able to respond to new questions and knowledge. And when you connect small companies to each other, as we often do here in the Northern Netherlands, you have a powerful network that really creates opportunities for innovation. This also creates competition, of course, but that can also help you to stay focused. If you keep on developing good products, you will also keep your customers.

Knowledge, the drive to innovate, testing opportunities and the will to work together all converge in the Northern Netherlands. A driving force behind sustainable innovation that will ensure the TopDutch region remaining an important player in the expanding WaterTech Industry for years to come.’

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Are you interested in exploring what your business possibilities could be? Connect with Reinder de Jong, our WaterTech expert.

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