In sewage treatment plants, municipal wastewater is purified via mechanical, biological and chemical purification processes. In this context, pipes play an essential role in transporting the water./ Source: Pixabay

Pipes to combat water stress

Floods and droughts are growing threats to the existence of people and the environment. Climate change means that devastating extreme weather events will continue to intensify. To help cope with them better, wastewater and larger volumes of rainwater in sewers and sewage treatment plants must be managed as effectively as possible. In addition, the efficiency of transporting drinking water to consumers should be increased even further. These objectives can only be achieved with the right pipes, ideally as part of digitalised and therefore intelligent pipeline networks, with these “smart” pipes contributing to relieving water stress.

Messe Düsseldorf

Messe Düsseldorf GmbH
Postfach 10 10 06
40001 Düsseldorf
Messeplatz
40474 Düsseldorf
Deutschland

Telefon +49 211 4560 01
Telefax +49 211 4560 668
www.messe-duesseldorf.de
info@messe-duesseldorf.de

Geschäftsführung:
Wolfram N. Diener (Vorsitzender)
Marius Berlemann
Bernhard J. Stempfle
Vorsitzender des Aufsichtsrats:
Dr. Stephan Keller

Amtsgericht Düsseldorf HRB 63
USt-IdNr. DE 119 360 948
St.Nr. 105/5830/0663

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Pipes in a water supply network are lifelines for households and the economy. To avoid disruptions and increase efficiency, water and wastewater management is becoming increasingly digitalised. “Digital solutions can pave the way for savings and optimisation,” explains the German Water Partnership (GWP), a network of the German water industry. By linking process and planning data, the entire technical and organisational process/value chain of the water infrastructure can be represented in digital models of buildings and plants.

Detecting burst pipes before they happen

The result of this combination, as the GWP explains, is the digital twin. This is a data-based model of a plant “that bundles all planning and operating data about a plant over the entire life cycle of the plant, actively supports the maintenance of this information and enables continuous optimisation of planning, operation and maintenance”. The digital twin at the plant level provides the best starting point for modelling and simulating processes. “This can be, for example, the intelligent linking of data from the sewer network and meteorological stations to ensure an improved basis for decision-making in the event of heavy rainfall events.”

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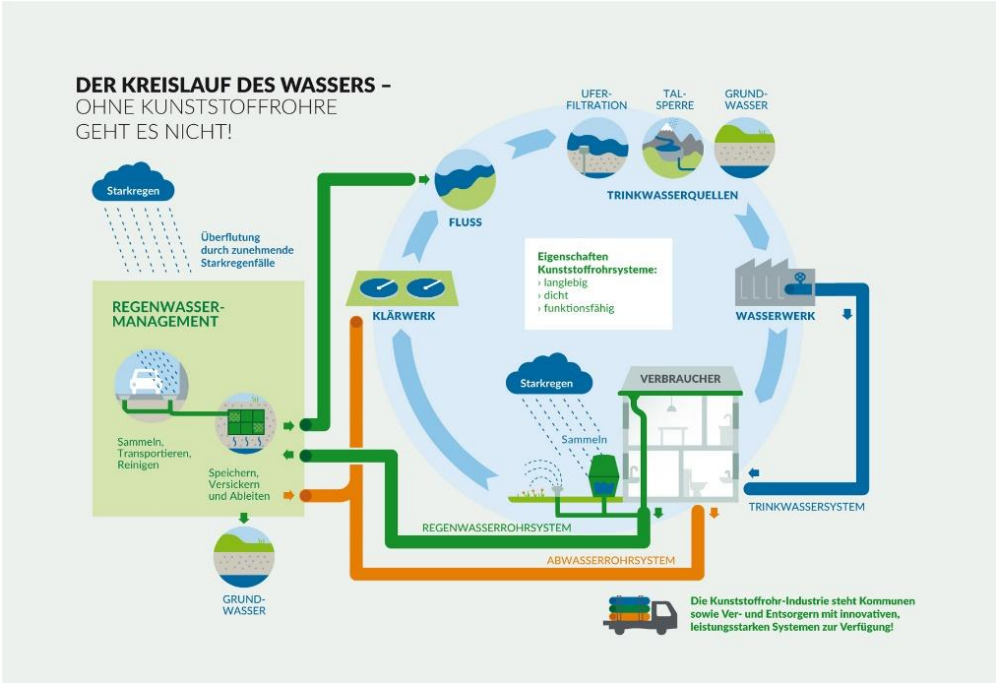

The water cycle, where plastic pipes perform an important function. / Image source: ©KRV (Kunststoffrohrverband e.V.)

To optimise energy costs, plant operators can use digital tools to optimise pump schedules, detect leaks or burst pipes before they happen, and take preventative action promptly. GWP: “The dynamic and up-to-the-minute information on the condition of the plant obtained in this way helps to increase efficiency in plant operation.” In addition to improving the efficiency of wastewater treatment, this will also increase municipal safety. All thanks to Water 4.0.

Data from pipe-mounted sensors for Water 4.0

Water 4.0, of course, requires sources from which the data gushes. Therefore, for example, pipes in the supply network and reservoirs are equipped with sensors, and the data from these sensors is recorded and analysed in its entirety. “This enables a variety of data-driven applications that aim to improve our understanding of the system, as well as our monitoring and control of it,” Gelsenwasser AG explains in a technical article published by the German Gas and Water Association

(*Deutscher Verein des Gas- und Wasserfaches, DVGW*). One essential aspect of this is that everything happens “on-line”, i.e. in real time.

New sewage treatment plants are being built worldwide – because the global demand for wastewater treatment is high. / Source: Pixabay

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There is a great demand for strategies for digitalising pipeline systems for the transport of water and wastewater. However, such strategies can only be relied upon if the pipes used are also reliable. For example, pipes for drinking water should be made of suitable, durable materials. Copper, stainless steel and certain plastics are used to ensure corrosion resistance and prevent any risk to health. The pipes must be able to withstand high pressures and a range of temperatures, and have low porosity.

Damaged sewers can cause pollution

Action is needed because some wastewater networks are outdated or insufficiently dimensioned. Damage can lead to wastewater leaking out of the sewers “and seeping into the soil and groundwater, resulting in

contamination. In other cases, leaking sewers can lead to surrounding groundwater entering the sewer system (infiltration water), putting an unnecessary burden on the entire drainage system," notes the Ministry of the Environment of North Rhine-Westphalia (NRW). This could even mean that it would not be possible to guarantee that sewage treatment plants can be operated as would be expected for the state-of-the-art, and that more polluted wastewater would have to be discharged into bodies of water.

In some countries, sewage is a huge problem. In Saudi Arabia, for example, a large proportion of wastewater remains untreated, and only a small fraction of the treated wastewater is reused. It is estimated that in 2021, only 60 percent of wastewater was treated in sewage treatment plants, according to Germany Trade and Invest (GTAI). It is hoped that this proportion will rise to between 95 and 100 percent by 2030. This represents a high investment potential for the tube industry.

Drinking water is the most important nutrient – there is no substitute. / Source: Pixabay

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Billions for the American water network

Greece suffers from poor efficiency in its sewers and sewage treatment plants. According to GTAI, in order to better purify the wastewater, sewage treatment plants and sewage systems are to be built and modernized nationwide In Greece, almost 1 billion euros will be available for the construction and modernisation of wastewater treatment plants over the next few years. By 2025, almost 300 million euros will have been spent on nationwide wastewater projects.

According to GTAI, the water supply network in the US is in desperate need of action. “Government programs are pumping billions into the ailing American water network. Most importantly, pipelines made of lead must be replaced.” A situation that offers great opportunities for the tube industry, among other things. As part of the “Infrastructure Development and Jobs Act”, the US government will provide around $ 50 billion for the modernisation and expansion of the water sector. Most of that funding (35 billion US dollars) will flow into the fresh water supply, while wastewater treatment will receive 12 billion US dollars.

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However, the need is even greater: In its report last year, the US Environmental Protection Agency (EPA) concluded that “around 625 billion US dollars will be needed between 2021 and 2040 to guarantee the supply of drinking water alone,” reports GTAI. If other aspects such as wastewater management and flood protection are included, this would probably result in a sum of about 1 trillion US dollars.

The global water situation is becoming critical

On a global scale, water supply problems are many times more severe. According to the UN World Water Development Report 2024, 2.2 billion people do not have access to clean drinking water. The situation is

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even more precarious when it comes to sanitation: 3.5 billion people have to manage without access to basic services. The situation is deteriorating, especially in cities. And this against the backdrop that “population growth, socio-economic developments and changing consumption habits are causing water consumption to rise by one percent annually,” emphasises UNESCO. The situation is becoming increasingly critical, but investments in pipes as part of smart pipeline networks could – and will – help to alleviate this dramatic situation.

Trends and highlights from the industrial sectors of wire, cables and tubes will be presented at the world's leading trade fairs wire & Tube from 13 to 17 April 2026 in Düsseldorf. Current industry and product information can be found on the Internet portal at www.wire-tradefair.com and www.tube-tradefair.com and on LinkedIn: https://www.linkedin.com/showcase/wire-and-tube-leading-international-trade-fairs/.

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Press Contact wire und Tube 2026:
Petra Hartmann-Bresgen M.A.
Ulrike Osahon
Tel. +49(0)211/4560 -541/-992
Fax +49(0)211/4560 87-541/-992
HartmannP@messe-duesseldorf.de
OsahonU@messe-duesseldorf.de