WHITEPAPER

DIGITAL SERVICES IN WASTEWATER TECHNOLOGY

The transformation to Water 4.0

AERZEN

DIGITAL SERVICES IN WASTEWATER TECHNOLOGY

Digital applications have the potential to sustainably optimise processes in wastewater technology through the data-supported networking and control of systems. Operators benefit from lower energy and life cycle costs, greater process reliability and greater transparency.

> In order to meet the requirements of the Paris Climate Convention on the reduction of climate-damaging greenhouse gases, considerable energy savings are required in wastewater treatment.

The water industry is facing a profound change: In line with developments in industry, Water 4.0 is becoming increasingly important. Digitalisation, automation and resource efficiency are keywords that will shape the future operation of blower stations.

The transformation to digital wastewater technology is taking place in a political context that places ever increasing demands on the efficiency of energy-intensive machines and systems. In order to meet the requirements of the Paris Climate Convention on the reduction of climate-damaging greenhouse gases, considerable energy savings are required in wastewater treatment. However, the motivation for digitisation is not only driven by politics: rather, the players in wastewater technology want to use digital applications to reduce the life cycle costs of their plants, achieve greater process reliability and increase their own understanding of processes and systems.

Water 4.0–the future of wastewater technology

Operators of water treatment plants face a great challenge: rising electricity prices and legal requirements for energy efficiency are forcing them to significantly reduce the energy requirements of their plants.

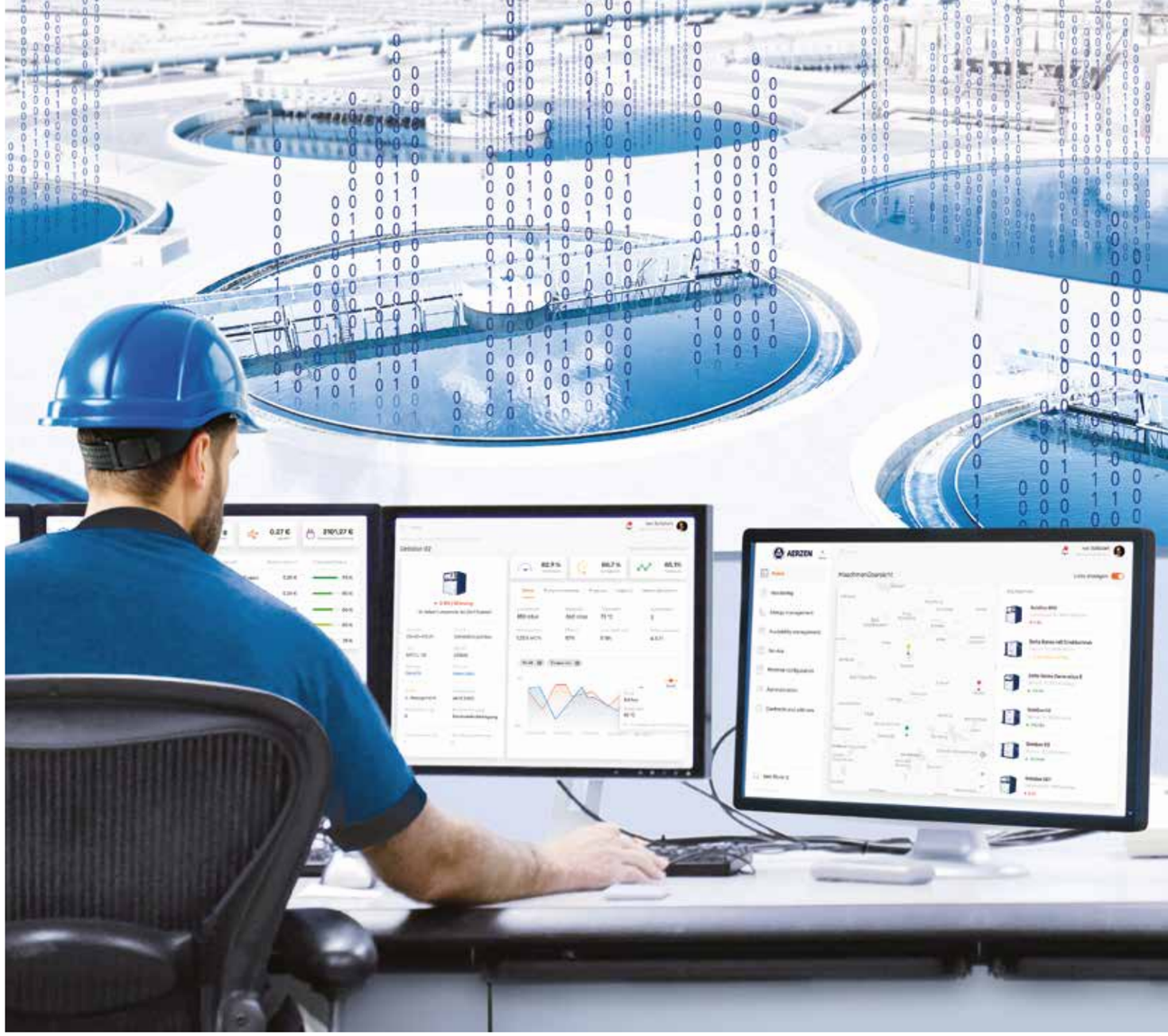
This challenge must be seen in the context of a fundamental industrial change towards digitisation. As with Industry 4.0, the water industry is also on the way to exploiting the possibilities of digital applications. Water 4.0 refers to the transformation from technically efficient, mostly decentrally controlled plants to a networked, data-supported, digitalised and centralised control system. In the digital future, isolated individual systems will be replaced by holistic strategies for higher-level process optimisation.

With its energy-intensive water treatment processes, waste water technology offers considerable potential for the use of digital applications. The example of municipal wastewater treatment plants underlines the importance of wastewater technology for political targets in terms of energy consumption: The electricity demand of municipal wastewater treatment plants in Germany amounts to more than 4 billion kilowatt hours.[1] Here, the focus is on the aeration tank–here, bacteria are used to decompose carbon and ammonium compounds with a high energy input.

However, the consideration of energy efficiency in wastewater technology is by no means limited to the energy-intensive processes of the wastewater treatment plant. In a digital, networked system, all upstream and downstream processes of the entire value chain are also relevant.

Water 4.0:
The term Water 4.0 stands for resource-efficient, networked water management. The cornerstones of this water management system are digital and automated processes that make use of current data from machines and plants. Water 4.0 describes a sustainable water infrastructure that is characterised by transparency, operational reliability and efficiency.

1 Source: IWR: https://www.iwr.de/news.php?id=34433 (refers to Germany)



> The electricity demand of municipal wastewater treatment plants in Germany (2017) amounts to more than **4 billion** kilowatt hours.

IoT solutions in waste water technology–opportunities for operators

The players in the wastewater industry agree: the networking of plants and digital system components on the basis of relevant data recorded in real time offers great potential for process optimisation. In this context, from the operator's point of view, a high degree of continuity of planning and operating processes through modern hardware and software should be aimed for.

The Internet of Things (IoT) is increasingly coming into focus through this approach. By implementing modern sensor technology, it is possible to network all processes relevant to wastewater and to optimise them holistically. By integrating additional data such as weather forecasts, external influences on operating processes can also be identified, evaluated and used to increase efficiency.

The most important advantages of networked plant technology in the wastewater industry →

THE MOST IMPORTANT ADVANTAGES OF NETWORKED PLANT TECHNOLOGY IN THE WASTEWATER INDUSTRY ARE:

Monitoring and control
The continuous monitoring and control of the relevant processes offers the possibility of a significant increase in process safety in wastewater technology. Modern sensor technology makes it possible to view the status of each system at any time.

For example, compressor and blower packages in wastewater treatment plants can be integrated into a central plant management system. This enables the user to find out about the status of the systems at any time, to detect faults at an early stage and to compare energy performance using KPIs.

Remote service
In terms of maintenance and repair processes, digital services offer great potential for cost savings. Thanks to worldwide access to the operating parameters of the assemblies, the operator can plan service and maintenance operations at an early stage without having to inspect the plant himself on site. This approach makes it possible to reduce time- and cost-intensive assessments to the necessary minimum.

The remote service approach enables the user to consolidate wastewater treatment plants and monitor them centrally from any location. Centralised planning and control of maintenance and repair processes can eliminate superfluous, decentralised structures and reduce costs. This advantage has proven its worth especially in crisis situations: through the digital networking of plants, "home office" is now also possible for wastewater plant operators.

Planning
Digital transformation offers far-reaching possibilities already in the planning phase of water treatment plants. On the one hand, the consistent integration of digital services makes it possible to meet the requirements of local authorities and authorities in terms of energy efficiency and process reliability. On the other hand, digital applications can noticeably reduce the life cycle costs of plants and CO_2 emissions. This makes it possible to meet the requirements of the Paris Convention with regard to the environmental compatibility of industrial plants.

Resource optimisation
The optimisation of existing resources is one of the central arguments for the use of digital, networked technologies in wastewater technology. Resource optimisation refers not only to energy resources, but also to time and personnel resources. Centralised plant management with a holistic, networked approach makes it possible to reduce time-consuming and costly on-site appointments. This can also relieve the burden on the personnel responsible for operation and maintenance, which is a further advantage of the digital transformation against the background of the lack of skilled workers.

Increase of process and system understanding
The continuous collection of all process-relevant data leads to a significant increase in the process and system understanding of wastewater treatment plants. Particularly when operating energy-intensive, expensive systems such as blower and compressor packages, operators benefit from data-supported services.

Due to the large amount of available data, the user also has a sound basis for foresighted planning of service calls. Thus, strategies such as predictive maintenance can be used to detect imminent failures of plant components at an early stage on the basis of their condition and prevent them by replacing them. In addition, components that are only operated at partial load can even be operated beyond their intended lifetime.

IoT
The term Internet of Things (IoT) describes the increasing digital networking of physical objects. The basic idea of IoT is the largely independent, automated communication of machines and devices among themselves and with the outside world. Through the Internet of Things, real objects become objects of the virtual world and can make their state information available on an ongoing basis. The "Internet of Things" is closely linked to the trend towards digitisation and Industry 4.0.

> There will be 500 billion IoT objects in 2030. In 2015, there were about 25 billion.
> Robbins, 2015

> IoT increases employee productivity and plant operation.
> Robbins, 2015

Cyber Security and Data Ownership
Data protection is an important issue in the digital transformation in wastewater technology. Some of the data required for digital applications contains sensitive or security-relevant information that must not fall into the hands of third parties. For this reason, it is important that the data is protected from the moment it is collected, through transmission via 4G/LTE mobile radio, to the moment it is evaluated. In doing so, it makes sense to rely on cloud solutions, whose servers are located in the European Union. In this context, the international IEC 62443 series of standards on cybersecurity in industrial automation is of particular importance. Another important point from the user's point of view: Data ownership (ownership rights to the data) should remain with the customer at all times, even when working with external providers.

AERprogress–digital transformation with AERZEN
The compressor and blower manufacturer AERZEN has more than 150 years of experience in mechanical engineering – as a technology pioneer the company decisively shapes innovative trends such as digitalisation. The specialist for blowers and screw compressors recognised the possibilities of digitalisation in waste water technology early on and consistently expanded its portfolio to include digital services. AERZEN develops thereby more and more from a machine builder to a system integrator.

The result is the new company unit Aerzen Digital Systems, which offers with the modular product portfolio AERprogress customer-specific services all around digitalisation. The special feature: AERZEN as an experienced manufacturer of compressed air packages combines its broad machine and process know-how with tailor-made, innovative solutions for the networking of plants. This holistic approach makes it possible to optimise the system as a whole.

DEFINITIOS

Textbox Cyber Security (IEC 62443) The international IEC 62443 series of standards deals with the cyber security of automated, industrial production plants including all components. The aim of the series of standards is to create a uniform standard for the safe implementation of "Industrial Automation and Control Systems" (IACS). IEC 62443 is closely related to the Cyber Security Act of the European Union. This aims to replace national and non-uniform regulations on cyber security with a holistic, EU-wide approach with uniform data protection requirements.

Data Ownership (Ownership of the data) means in information technology, the ownership structure when handling company data. Data Ownership refers to the rights to and control about data, which for example in companies processes are recorded by sensors. The The data owner is the only actor who has the right to use, analysis and distribution of his data.

The user can see at a glance which systems are in operation, whether there is a fault or whether maintenance is due.

Machine Park Management as the basis for the digital future
As a basic package, the machine manufacturer offers Machine Park Management with integrated Remote Service. The module gives the customer a transparent insight into the operating status of his entire machine park. The user can see at a glance which systems are in operation, whether there is a fault or whether maintenance is due. If action is required, he can take measures quickly and can also instruct them remotely and have them implemented. All relevant maintenance data are automatically documented in a complete history. In addition, the monitoring menu offers further detailed information on all relevant plant and process parameters of the plants under consideration.

With the basic machine park management package, the user benefits from maximum transparency and cost-efficient, central monitoring of his plants. By displaying the system status, the number of on-site appointments can be reduced considerably. In addition, the performance data of the machines can be compared across locations using KPIs.

Only sustainable and intelligent energy management systems can ensure efficient wastewater treatment in the future.

Energy Management–reducing energy costs and saving resources
Compressor and blower packages already meet high efficiency standards. However, considerable further savings potential can be realised through networking and higher-level, demand-oriented control of systems. For this reason AERZEN offers with the energy management module a tool which makes the energy consumption of all plants transparent at any time.

The Energy Management module consists of the two add-ons Improvement System and Consumption Certification. The add-on Improvement System aims to reduce energy consumption. It shows the user KPIs, CO_2 emissions and efficiency values. On this basis, it is possible to identify and realise savings potentials.

With the Consumption Certification add-on, users have the option of creating standard-compliant reports from the recorded data on energy consumption with just one click. The reports meet the requirements of the international energy management standard ISO 50001:2018 and make it easier to meet the obligation to provide proof to shareholders and stakeholders.

The digital transformation as a future opportunity for wastewater technology
The wastewater industry is undergoing a profound change towards networked, data-based and holistically oriented control systems. Companies have long since recognised digitisation as an opportunity to operate their systems in a resource-saving, energy-efficient and life cycle-optimised manner.

Investments in modern, data-supported automation technology quickly pay off through lower energy, maintenance and personnel costs. In addition, plant operators benefit from higher process reliability thanks to centralised plant management. AERZEN offers with AERprogress a portfolio which is ideally adapted to the needs of the wastewater technology.

MORE INFORMATION ON THESE AND OTHER TOPICS AROUND AERZEN DIGITAL SERVICES CAN BE FOUND AT:
www.aerzendigital.com

AERZEN. Compression - the key to our success.

AERZEN was founded in 1864 as Aerzener Maschinenfabrik. In 1868, we built Europe's first positive displacement blower. The first turbo blowers followed in 1911, the first screw compressors in 1943, and in 2010 the world's first rotary lobe compressor package. Innovations "made by AERZEN" keep driving forward the development of compressor technology. Today, AERZEN is among the world's longest established and most significant manufacturers of positive displacement blowers, rotary lobe compressors, screw compressors and turbo blowers. AERZEN is among the undisputed market leaders in many areas of application.

At our 50 subsidiaries around the world, over 2,500 experienced employees are working hard to shape the future of compression technology. Their technological expertise, our international network of experts, and the constant feedback we get from our customers provide the basis for our success. AERZEN products and services set the standard in terms of reliability, stability of value and efficiency. Go ahead - challenge us!

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