Global Water Trends 2021

Shaping the future of the water industry

IDRICA

Foreword

2020 was, without a shadow of doubt, the year of the pandemic, on every level. The gravity of the situation forced us to adapt quickly to the new environment and put us through a tough test of stamina and resilience. Unfortunately, not all companies have weathered the storm, especially in the hardest-hit sectors, such as tourism and leisure.

Some sectors, such as the water industry, had no choice but to adapt. Water supply and wastewater treatment are essential services that must be guaranteed, whatever the circumstances. However, the speed and efficiency of the response to the new scenario created by COVID-19 has varied greatly depending on each utility's degree of technological maturity prior to the crisis. Yet drinking water has not been the only branch affected. Water is needed for industry; it is needed to produce energy and water is obviously needed for agriculture.

2020 is now history, yet its legacy has taught us the importance of good water management in our lives, whether directly or indirectly. Now, with the whole of 2021 ahead of us, what we need to do is set the goal of optimum management and anticipate the hurdles in front of us. The technological revolution in which we are immersed will be a powerful lever for change that will provide utilities with the digital tools they need to successfully and rapidly adapt their processes.

Based on the advantages that digital transformation will bring to water supply and wastewater treatment operators, at Idrica we want to go one step further and predict what the industry trends will be in 2021.

We are convinced that data-based management, fast data collection and smart data transformation will certainly be the driving forces behind more independent, sustainable processes in a sector that is key to human activity. In 2021, we will be witness to the implementation of smart, autonomous processes in drinking water and wastewater treatment plants, based on the variables in each type of facility. In turn, sensors will play a key role in improving performance in the quest to minimize the effort, time and money currently spent looking for leaks. Globally, remote control of all processes will continue to be a priority, from infrastructure operation to the management of work orders for field operators. And finally, in the field of communications, 5G will be decisive in 2021.

At Idrica we aim to boost efficiency in water utilities, guiding them through their digital transformation by facilitating communication between people and processes. We would not be able to do this successfully without knowing where the industry and technologies are heading. We hope you enjoy our review of the trends on the table for 2021.

Francisco Salguero

COO, Idrica

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Remote, digital water management, supported by specialized teams

As a provider of an essential service, the water industry has worked non-stop throughout the coronavirus crisis. A lot of the maintenance and operations work has had to be done in the field, but many other tasks have been performed remotely. Thus, managers have had first-hand experience of the benefits of digital transformation.

Over the next year, utilities will continue to invest in digitally transforming all their processes. The aim is to continue optimizing a new remote, collaborative style of management among all the relevant stakeholders. The efficient use of water, and returning it appropriately to the environment, are two issues that are central to any future changes.

1

Digital transformation of processes and infrastructure

2020 will be remembered as the year that triggered the digital transformation of the entire water industry and, by extension, their management and distribution areas. The roadmap drawn up by utilities already has digital transformation on its list of priorities. One of the major challenges along this road, although not the only one, is to ensure sufficient investment is made. Solid awareness of the range of options available on the market, their advantages and their compatibility with current utility infrastructures and systems is essential when choosing the right technology.

The drivers of digital transformation in water utilities must not only be successful in the process of change, but also be able to convey the benefits to the entire team, convincing those who are most reluctant to innovate. The advantages go beyond management efficiency, as they foster the streamlined, environmentally sustainable use of water.

The future lies in centralizing and interconnecting all data, making it a tool for decision-making

2

Greater control over quality data

The first step to successful digital transformation is having accessible, secure and high-quality data. It is not only a matter of fitting equipment with sensors; the data needs to be processed correctly, so that the information can be converted into knowledge.

Information must be collected about how facilities operate, and about the results of any work done on the infrastructure. In our industry, the fact that water networks are located underground adds complexity to the task, especially where there is no comprehensive inventory available.

However, even taking into account the scale of the challenge, no one doubts that the future lies in centralizing and interconnecting all data, making it a tool for decision-making. This will be the primary objective of many water utilities around the world in 2021.

3 Remote management

During the coronavirus crisis, water utilities have had to switch to remote management as a way of protecting their employees and customers. Resilience has largely hinged on the degree of digital maturity reached before this unprecedented scenario.

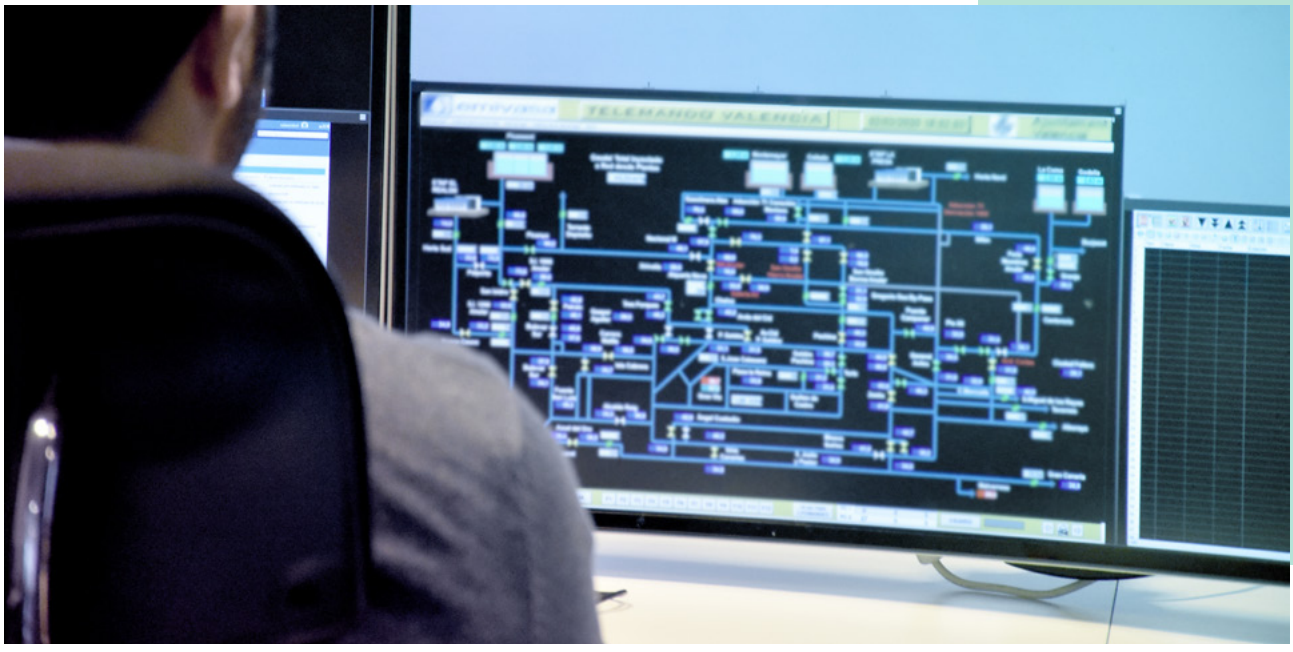
Although it is obvious that there will be an increase in remote management in the future, the challenges related to team motivation and team spirit are sometimes overlooked. In 2021, managers will have to develop different strategies to ensure that employees working in the field and those telecommuting preserve their team identity.

4 Infrastructure-related working teams with occasional external support

The need for greater flexibility and immediacy, which is the consequence of current uncertainty, will lead to work on infrastructure being based on small, stable, specialized teams. We must not forget that water is a scarce, essential resource. As such, society expects companies to resolve incidents as fast as possible. These teams ensure faster access to the source of the problem, such as a major leak in the street, and to solving it.

The main disadvantage of this type of organization is the need for external support when the work required transcends the knowledge of the team members. In this scenario, specialists are called upon to provide their expertise. However, this is a small price to pay considering the greater resilience provided by stable, specialized teams, and this is why we will continue to rely on these teams in the future.

Teresa Martín
Water Operations Specialist, Idrica



Variable monitoring will help to avoid crises not only based on viruses and bacteria, but on any event or factor that may affect water safety.

Centralized, autonomous control of DWTPs

A common problem in drinking water treatment plants (DWTPs) is process fragmentation, stemming from the use of different technologies and operating modes. The updating and interconnection of the different SCADAs, which usually emerge ad hoc with each revamping, expansion or new process, is a challenge for the team and makes it difficult to optimize the DWTP.

As a result, and given the importance of these facilities for the supply of drinking water in terms of quantity and quality, these plants tend to rely on significant human resources for their operations.

This is mainly due to the lack of tools and equipment to collect sufficient information and perform the tasks at hand. However, automation is increasingly gaining ground in daily operations, overcoming the initial reluctance and investment constraints

The trend is a move towards centralized, totally autonomous control over plants, transcending silo-based process management.

1 Advanced predictive control of DWTPs

There are several steps on the way to full plant automation. Basic automation, which is already common in several countries, collects information through instrumentation for subsequent manual control. In this sense, PID control is a clear improvement over previous methods, as it enables a proportional, integral, derivative reaction to errors. For example, the required amount of chlorine can be adjusted according to the data collected by the analyzer.

The next step, advanced predictive control, is the latest trend. This system automatically adjusts the predictive model parameters to the cause-effect relationship of the process and its variations over time. The algorithm learns and calculates the ideal level of each parameter, so that their adjustments no longer rely on human decision-making. At present, this type of control is being implemented on a pilot basis for some cases of use, but the trend is for it to be mainstreamed into overall plant management.

The cases of use in which advanced predictive control is applied, for example, involve predicting the quality of the water collected, automating dosing for coagulation, simulating the properties of the chemicals stored, monitoring decanters, optimizing filtration and pumping, monitoring water as a product and calculating microbiological risks.

For this transformation to work, people need to trust in automation as the best way to eliminate unintentional human error, and as a more reliable option than manual measuring.

2 Integration and analysis of all relevant data

To achieve stand-alone control of an entire plant, all the data that may have an impact on its operation must be integrated. This includes, for example, external data such as weather forecasts. Sometimes, this process will temporarily involve entering manually collected data into the system, until the appropriate tools can be implemented.

The integration of all the information in a single platform ensures that everything is in place to make decisions and predict processes automatically, with recommendations for action being issued where appropriate. For example, if a storm is expected in the next 24 hours, operators are alerted so they can adjust the coagulant dosage before the turbidity changes.

It will then be up to the operator to decide what to do with these operating strategies, running them manually or automating their solution. Advances in mechanical, hybrid and AI methods are behind this new approach to plant management, which is essential for the smooth running of processes.

The water industry expects the technological solutions that group information together and issue subsequent recommendations to be modular, agnostic, interconnected and scalable so they can be customized to cater for the reality of each individual plant - and sometimes to the reality of more than one.

3 Asset life optimization

In line with a move towards greater sustainability, the trend is for predictions - rather than manufacturer recommendations - to outline the best time to replace an asset or update its maintenance schedule. In addition, new technological solutions will enable corrective actions to be taken when necessary, performing predictive, proactive maintenance, since the system will detect trends and make specific recommendations to operators, in order to extend asset life.

4 Detection of possible threats

In the future, we will see how systems increasingly take into account the detection of possible threats to the population through drinking water. The monitoring of variables will serve to avoid crises based on viruses and bacteria (SARS-CoV-2, Legionnaire's disease, etc.), as well as any other event that could affect water security.

Miren Aldecoa

Water Treatment & Desalination Consultant, Idrica

Data analysis, sensors and communications in leak detection

The United Nations' Sustainable Development Goal (SDG) No. 6 aims to provide access to clean water and sanitation for the entire population within the next ten years, according to its 2030 Agenda, yet the arrival of SARS-CoV-2 in our lives has jeopardized this objective and has heightened the need to invest heavily in the relationship between the "ecological transition and digital transformation".

The loss of drinking water from hydraulic networks is not only a poisoned arrow for the ecosystem, but also constitutes an economic loss for the water utility, since each liter of water fed into the network for consumption must be collected, made drinkable, and pumped through thousands of meters of water networks.

Likewise, not detecting and repairing a leak in a hydraulic infrastructure as soon as possible can lead to a critical situation if it becomes becomes a burst water pipe that causes damage to civil infrastructure or a disruption in the public water supply. This phenomenon is especially critical during crisis episodes triggered by natural disasters (earthquakes, hurricanes, droughts, etc.), or during a lockdown such as the one experienced in recent months around large parts of the world.

Therefore, in 2021, new leak detection methods that go beyond sectorization should be consolidated as a first step towards reducing the size of inspection areas and enhancing water loss reduction processes. The technological advances in sensors and communications are bringing us closer to our ultimate goal; to use water as efficiently as possible.

The technological advances in sensors and communications are bringing us closer to our ultimate goal; to use water as efficiently as possible

1 Locating leaks using mathematical models and algorithms

A new alternative to sectorization is locating leaks through the analysis of big data, applying mathematical modelling and algorithms to data processing. It should be remembered that sectorization of the drinking water supply network involves high economic costs that include not only the investment in metering and shut-off elements, but also the necessary work required to install them. In addition, sectorization can affect water quality by breaking its mesh network.

This new approach to managing hydraulic efficiency in drinking water supply networks is also more accurate, as it reduces the size of the inspection area the leak is located in. For this process to be successful, data is required to develop the mathematical model (GIS, demand distribution and operational control) to assess the feasibility of installing flow meters at strategic points and to monitor night-time consumers. The value of this system is enormous, but in order to obtain results, utility managers will have to implement advanced software so that the section of the network where the possible leak(s) is/are located can be pinpointed.

The first trials in Spain and the positive results obtained have attracted international interest, and although other companies can be expected to replicate them in the future, few will be successful, as it is essential to have a multitask team on hand that can steer implementation and subsequent operations, as mathematical models, algorithms and hydraulics are three vectors that must go hand in hand.

2 Acoustic leak detection

Another trend that we expect to see gaining ground in the coming year is the permanent installation of hydrophones and integrating the data obtained from them into platforms used to manage water efficiency as a further step towards pinpointing the location of leaks. These electronic devices, installed at predefined points in the network depending on the material , record the night-time noise produced by water. The aim is to send this data to water efficiency management platforms which can integrate data from different utility indicators and thus be able to identify the specific point in which a leak is located.

Another trend that is already on the table is the transformation of household water meters into sensors that help to monitor any anomalies that may occur in the network in real time. Thus, by taking advantage of existing infrastructure and using data processing and algorithms, each customer would be helping to detect possible water losses.

In the case of water pipelines or large diameter pipes, there are already viable solutions on the market. Leading this race is a network inspection system with wireless, in-line, neutral buoyancy technology for the detection of water leaks. This equipment detects leaks by pinpointing their exact location, and evaluates the network, generating valuable information for the asset management decision-making process.

3 Data centralization on a single platform

Advances in telecommunication infrastructures, with the advent of 5G, are leading us to a scenario of digital connectivity that breaks down barriers in terms of the number of linked sensors and the communication between them in real time.

Progress in sensor technology to reduce water losses only makes sense if the data acquired can then be processed to make better decisions. It is increasingly necessary for any type of service indicator such as smart metering, work orders, GIS, smart SCADA and billing to be housed on the same platform.

In 2021, water utilities will be focusing on centralized, agnostic management of all their data, extracting as much value as possible from it in order to reduce costs and use water more responsibly and sustainably. To quote Idrica CEO Jaime Barba, "digital transformation is a reality. Those who have not jumped onboard it are already too late".

Josep Reguart

Leaks Specialist, Idrica

Smart irrigation and smart meters set to transform the farming industry

One of the biggest challenges for irrigation associations is monitoring and automating network assets, over and above their basic functions, such as the filling of irrigation basins and scheduling watering times. The boost provided by sensor technology, although still incipient, will mean improvements in infrastructure operations and control.

New investments in smart meters and smart irrigation are planned for 2021 but, at the same time, technologies that have already been implemented and are not being used due to a lack of experience on the part of the infrastructure operators will need to be brought back into service.

Environmental sustainability and improved water efficiency will drive the transformation of the farming industry, which is clearly moving towards centralized, automated management.

1 Remote metering and leak detection

The implementation of smart meters is still an unresolved issue for most irrigation associations. Although this technology is one of the keys to boosting irrigation efficiency, the initial investment required is often only feasible through public subsidies. This is why, in the 21st century, the general trend is still for teams to take visual readings over several weeks, increasing costs, delaying data collection and opening the door to human error.

In the quest for greater water and operational efficiency, the future of irrigation lies in smart metering. As in the area of drinking water, this development will improve the management of the billing cycle, including meter reading, billing and payment collection; and, through real-time reading of subscriber meters and the application of advanced algorithms, we will able to monitor and detect leaks and fraud and forecast demand.

In the absence of smart meters, the first step toward monitoring leaks in the network is to carry out a preliminary study to decide where to install sector meters, so that water balances can be carried out by individual sectors, and where to install pressure transducers to detect sudden drops in pressure. Real-time analysis of the water consumed and its comparison with historical data, as well as real-time information about the pressure in the network, will enable the sector where the leak is located to be pinpointed.

2 Smart irrigation

In the coming year, more and more irrigation associations will choose to water their land according to the real needs of their crops and the moisture content of the soil. This is what we call smart irrigation. Based on remote sensing and sensors installed in the fields to calculate the water balance, technological solutions will indicate when and how much water should be used to optimize water resources and thus promote environmental sustainability.

Remote sensing in itself is a breakthrough, as it provides information on the state of the crops without the need to deploy any assets. Satellite imagery can map vegetation and soil health by monitoring specific parameters such as moisture, its photosynthetically active biomass index and nitrification. In 2021, remote sensing is expected to provide increasingly complex information.

A further step forward in this trend is the automatic adjustment of irrigation schedules through the application of algorithms, taking into account the water needs of the crop, the moisture content of the soil and the weather forecast.

Improved environmental sustainability is the main advantage of smart irrigation. By optimizing water consumption, the energy used for pumping the water is also reduced.

3 Data integration

Both smart meters and smart irrigation imply that more data have to be available and ready to be analyzed. Therefore, data integration will undoubtedly be one of the main trends this year.

The ability to view all relevant system information on a single platform in real time is key to improving decision-making. To this end, in the coming years, asset monitoring and consumption control will become commonplace.

In order to extract value from the data, irrigation associations will also need to have specialists on hand to operate this specific software.

Begoña Tarrazona

Irrigations Consultant, Idrica

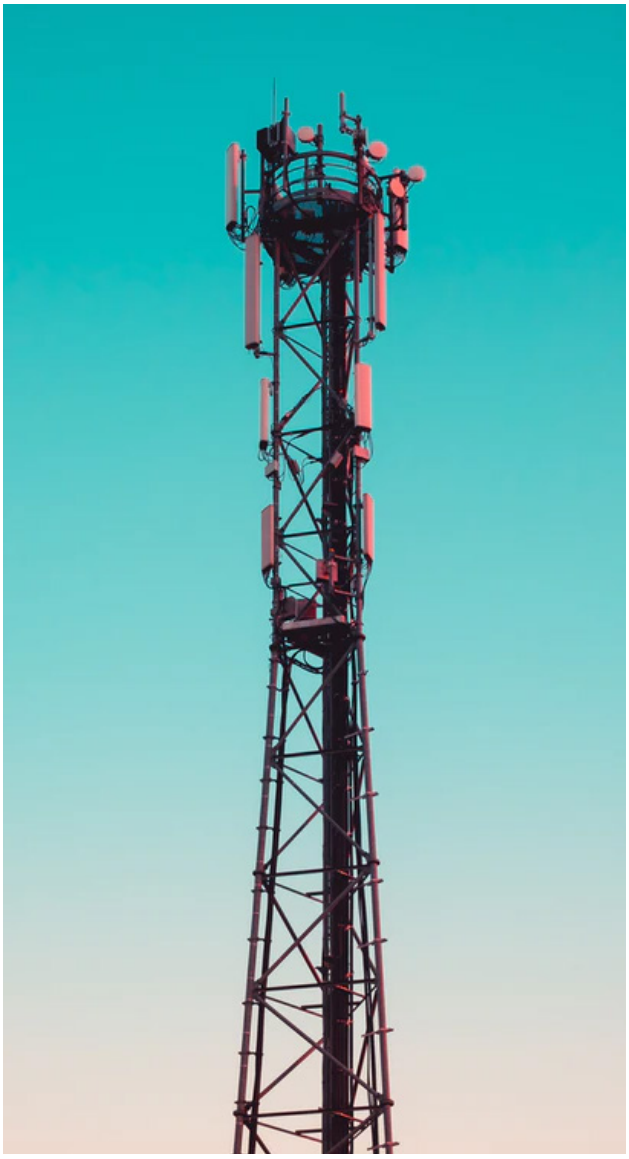
How 5G can help to manage water service infrastructure

4G enhanced the functionalities we already had. However, the arrival of 5G brings new business opportunities and added-value services, thanks to its low latency and its ability to connect millions of devices in a small area. In the water industry, autonomous infrastructure operation, remote driving and the use of data in real time will make a difference in the coming year.

The first 5G pilots are already underway in different parts of the world. We know that in the future there will be an explosion in the number of sensors used in homes and cities. According to the consultancy firm Gartner, around 26 billion devices are expected to be connected by 2022. For this to be feasible, 5G is a must.

The main obstacles to overcome this year will be coverage levels and the ongoing reluctance to adopt this technology which, in any case, will not replace previous technologies, but rather complement them. 5G will be making a strong landing in 2021 on the inevitable path towards digital transformation.

Decision-making will be improved by using business process data in real time



1 NB-IoT applied to smart metering

The application of NB-IoT technology is starting to produce excellent results in the water industry, mainly in the area of smart metering. Compared to more traditional solutions with proprietary protocols or LPWAN technologies, such as SigFox and Lora, NB-IoT uses the telephone operator's network coverage and requires SIM cards to operate.

Data transmission via NB-IoT is a very interesting option when there are not many SIM cards to be deployed, as their upkeep also has to be taken into account. Both the GSMA and the 3GPP standards association have adopted NB-IoT as part of the 5G family, thus ensuring it will have a relatively long future.Its main advantages for smart metering are its extended range, penetration and coverage, as well as more efficient battery management.

2 MIoT (Massive IoT) and Critical IoT

The deployment of 5G opens up new horizons in all areas. In water utilities, Critical IoT or Industrial IoT will drive the efficient management of infrastructures thanks to the implementation of real-time decision-making algorithms. Autonomous plant operation and irrigation and driving robots via 5G will be commonplace in industry 4.0. and smart factories.

The disruption brought about by 5G will create new business opportunities and totally new professions. In comparison with the transition from 3G to 4G, 5G will not only improve current infrastructure management, but will also provide new functionalities. Business process data can be used in real time to improve decision-making.

By participating in the definition of the 5G ecosystem required by companies, the network will be able to adjust to each operator, enabling the creation of private networks. In addition, when dealing with critical infrastructure, this technology will guarantee the ubiquity of the network, i.e. uninterrupted coverage. In the past, companies had to adapt to the network. Now, it is the network that will adapt to the user's needs.

In relation to remote control, real-time drone surveillance is a very interesting application for the water industry, for example, for inspecting sewers and irrigation operations.

With increasingly sophisticated sensor technology, MIoT will ensure the coexistence of smart metering with the digital transformation of other meters and smart devices in homes and on the streets. One of the most important benefits offered by 5G is the ability to connect millions of devices in a small area.

3 Edge computing

One of the advantages of 5G is its ability to merge with new technologies. Edge computing or cloud computing processes the data generated by devices closer to the source where it was originally processed. This seemingly minor issue reduces latency, lightens the load of traffic in the cloud and speeds up data analysis in real time. Compared to the long distances that our data currently has to travel, this new method of transmitting information opens up new perspectives across all sectors.

4 Network slicing

Network customization, i.e. the creation of private networks tailored to the needs of each company, is now a reality. Network slicing guarantees a better quality, more reliable service. In the future, every facility will be able to have its own 5G node, which will provide a unique slice of the network, suited to its specific needs.

Carlos Tejedor
Instrumentation & Smart Metering Specialist, Idrica

Automatic, preemptive and sustainable decisions in WWTPs

The discovery of activated sludge by the engineers E. Arden and W. Lockett at the beginning of the 20th century meant a change in the established paradigm in the field of wastewater treatment, paving the way for a technological breakthrough that definitively changed our relationship with the environment. Cities were no longer a hive of insalubrious conditions and the watercourses that had degraded constantly since the First Industrial Revolution began to recover their biodiversity. However, nowadays, in an increasingly changing environment, wastewater treatment plants are facing new challenges that are putting their resilience and ability to adapt to the test, requiring progress in sensor implementation, digital transformation, the breaking down of information silos and automated decision-making.

Public and private utilities are increasingly confronted with ever tighter financial resources to manage facilities. Stricter plant effluent and sludge quality requirements demand greater precision in process operations. Pressing environmental concerns are leading to a need to minimize plant impact measured in terms of greenhouse gas emissions, odors and noise. Finally, there is a growing interest in managing assets throughout their life cycle.

It is even more important to implement a decision-making process in wastewater treatment plants that harmonizes the four aspects mentioned above. The new connectivity and data management opportunities offered by Industry 4.0 are opening up new horizons in the management of wastewater treatment plants.

Up until now, different platforms have controlled these areas separately, causing management inefficiencies. The future lies in centralized management, through platforms that are capable of monitoring and connecting all variables in real time and assisting in decision-making in each of the four main areas.

Managers will be able to receive alerts and ascertain the degradation of assets before they fail

1

Data integration in Smart SCADAs

Today, the industrial automation systems used in wastewater treatment plants are key to their everyday operations. However, these systems need to move towards a solution that harnesses the full potential of the incipient Industry 4.0.

Adding sensors to all devices is the first step towards the centralization of relevant data for WWTP managers. Sound management of these increasingly complex infrastructures requires aggregating data from internal sources (LIMS, CMMS, SCADAs, field devices) and external sources (meteorological data and social networks, mainly) in a single point.

Breaking down information silos by interconnecting all data sources provides a more holistic view of operations and helps to extract value from data to improve decision-making.

The new ways of integrating sensor-based data are geared towards achieving scalability and connectivity, aiming to be flexible and user-friendly, adapting to the particularities of each WWTP.

2

Automatic, preemptive decisions

Algorithms and mathematical models applied to centralized data provide managers with recommendations on what actions to take next. This criterion, based on experience and plant operation optimization, preempts problems by taking different factors into account, such as the weather and expected pollutant levels.

This functionality is relevant to virtually all aspects of wastewater treatment plant operations, from odor generation to asset management, which can be predicted through continuous monitoring of Life Cycle Assessment (LCA) parameters. Managers can receive alerts and ascertain the degradation of assets before they fail. This means that equipment can be replaced without interrupting the service.

Another step forward in this area is automatic decision-making: the system takes into account all the variables to autonomously activate the necessary plant operations. Self-calibration of the mathematical models, taking into account the constantly changing conditions, is a milestone that can only be achieved by including algorithms in the system.

3

The circular economy and greater commitment to sustainability

Population demands for sustainability are increasing, and this trend includes WWTPs. More and more measures are being taken to reduce greenhouse gases and the carbon footprint of these facilities.

Quality objectives have broadened, and it is no longer enough to produce good quality water and sludge at the lowest possible cost; plant managers must also take other aspects into account, such as minimizing noise and odor emissions.

WWTPs have an important role to play in meeting the UN's Sustainable Development Goals. Technology can help reduce water pollution by eliminating discharges and minimizing the emission of chemicals and hazardous materials.

Jacobo Illueca
Wastewater Consultant, Idrica

Conclusions

If the pace of change in a company is slower than that of its environment, its end is nigh. Comprehensive water industry management is a must, and if utilities cannot adapt, the service offered to the public will be compromised. Throughout this report on the trends for 2021, we have reflected on how the market will move during the year and on the opportunities that technology will bring to our industry.

In 2020, as a consequence of COVID-19, utilities have proved that remote management is feasible and also more efficient than traditional management models linked to a physical workstation. The answer is to relentlessly continue digitally transforming all existing processes in order to achieve optimal remote, collaborative management of all the stakeholders involved.

In drinking water treatment plants, there will be a move towards centralized, totally autonomous control over the facilities, transcending silo-based process management. Managers will have to tackle the common problem of process fragmentation stemming from the use of different technologies and operating modes. Thus, the future of wastewater plants lies in centralized management, through platforms capable of monitoring and connecting all variables in real time and assisting in decision-making in each of the four key areas.

2021, in order to achieve the best possible management of water as a resource, new leak detection methods that go beyond sectorization should be consolidated as a first step towards reducing the size of inspection areas and enhancing water loss reduction processes. Technological advances in sensors and communications are bringing us closer to our ultimate goal; to use water as efficiently as possible.

One of the key developments in the farming industry will come from improvements in the hydraulic and operational efficiency of the network thanks to the installation of sensors and of remote meters for farmers. Furthermore, smart irrigation, based on the real needs of crops, the moisture content of the soil and weather forecasts, will become more widespread thanks to advances in remote sensing and sensor technology. In this area, technological solutions and automatic irrigation rescheduling will optimize water consumption and enhance environmental sustainability by reducing the farming industry's water and carbon footprints.

Finally, and above all, 2021 will be the year in which 5G will make its mark in terms of communications in all fields and applications. Thanks to its low latency and its ability to connect millions of devices in a small area, managers will experience increased capacity in autonomous infrastructure operation, remote driving and the use of real-time data.

About Idrica

Idrica is a leading company specializing in water cycle management.Its unique value proposition is based on the efficiency andquality of its services and on the GoAigua technological solutionused for the digital transformation of the industry.

Contact us for an analysis of the challenges facing your organizationand learn how the GoAigua technology is helping itscustomers in the water industry.

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