AVK SMART WATER DIGITAL MONITORING

SMART WATER
DIGITAL MONITORING

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CONTENT:

WHY DO WE NEED A DIGITISED WATER DISTRIBUTION?

Digital solutions can help fight some of the environmental and urbanising challenges that water utilities face daily. The technological development has made it economically feasible to digitise large parts of society and new technology such as Internet of Things (IoT) provides the water sector with new opportunities.

Challenges within water supply management
Every day, water companies face challenges related to water supply management. The potential impact of water scarcity; increased water consumption; high energy costs; urbanisation and Non-Revenue Water (NRW) are just a few of the challenges forcing water companies to think of innovative solutions.

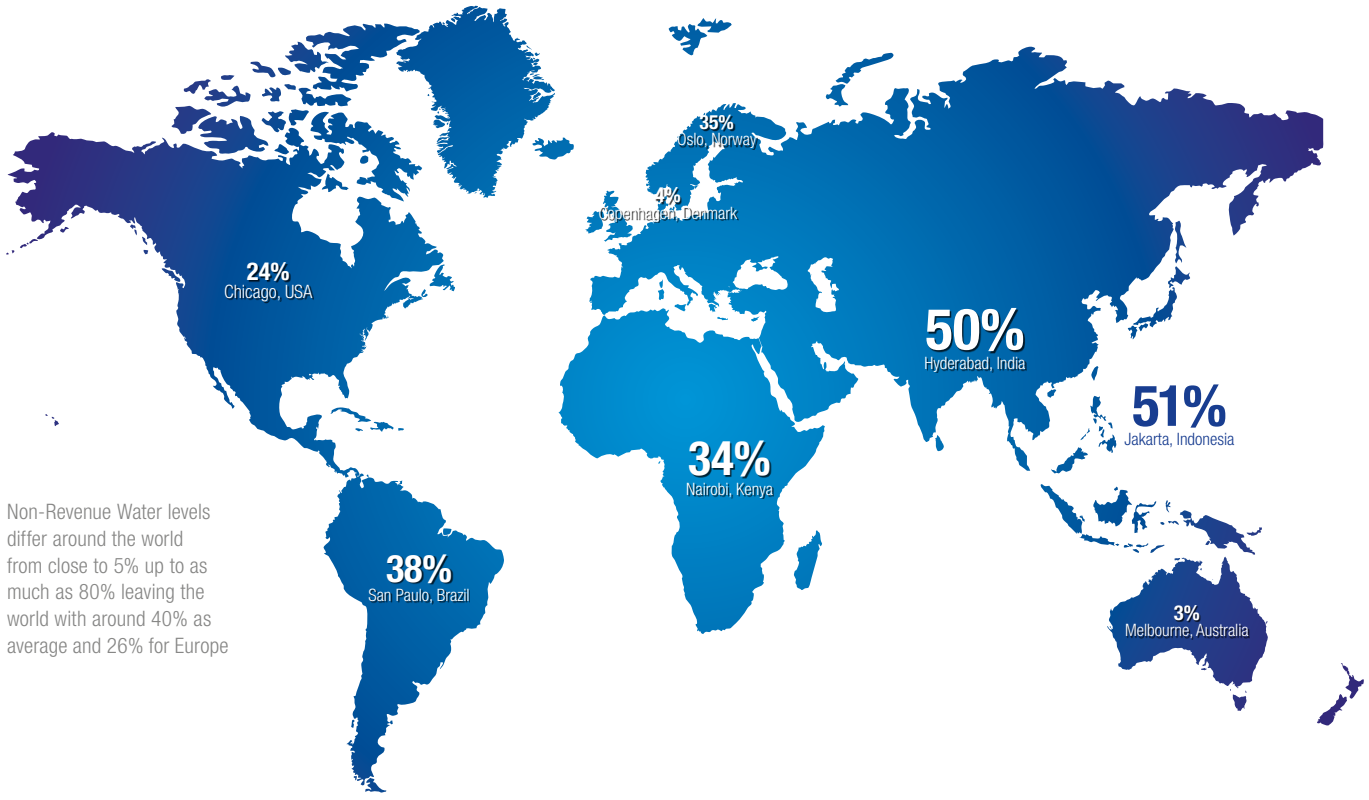
Non-Revenue Water is basically produced and cleaned water lost somewhere in the water distribution system, never reaching the consumers. This means water not used or paid for affects local economies as well as local resources available. The problem is universal, ranging from NRW levels of about 5% to as much as 80% in certain areas. Clearly, there is a need for a more sustainable way of delivering water.

The challenge is to streamline the operation, maintenance, and increase safety of the supply network and water quality, and at the same time protect environment and water resources. An important part of the solution is to be able to monitor pressure, valve open/close position, and pollution in the distribution network.

Overview of the entire water network
With thousands of valves, fittings and hydrants installed across the distribution network, valuable information about its condition is right at hand. What if some of your most critical valves sent messages to you every time it was operated?

Not just your valves, but also fire hydrants and from section inlets. Based on data directly from critical points in your distribution network, you can make fact-based decisions that will help you manage your water distribution in a more sustainable and efficient way.

Advantages for local utilities and for the environment
Digitalisation and transparency contribute to better structured and automatic operations. Digital solutions actively contribute to reducing water loss, energy consumption and operational costs as well as ensuring the water quality. It leads to huge advantages locally, and it contributes to overcoming global, environmental challenges. Furthermore, optimising the system to only distribute the needed amount of water will allow for energy savings.



Non-Revenue Water levels differ around the world from close to 5% up to as much as 80% leaving the world with around 40% as average and 26% for Europe

INTERNATIONAL REQUIREMENTS
UN GOALS AND EU DIRECTIVE

As a local water utility, you have the responsibility to ensure a safe water distribution for your consumers. However, it is a global challenge to take care of our water resources and ensure clean drinking water for all. Therefore, sustainable water supply is on the international political agenda.

EU Drinking Water Directive requirements
Digitalisation of the distribution net not only provides the transparency needed to support making the right decisions. It may also prove necessary to meet the efficiency requirements in international legislation.

The purpose of the EU Drinking Water Directive is to ensure safe and clean drinking water. It concerns materials in contact with the drinking water and limit values to be accepted in water distribution, and it focuses on risk management and lowering water loss.

In case of leakages and pipe bursts, there is a risk that contamination enters the pipe system. Therefore, each member state must evaluate and set targets to reduce water loss. New technology can efficiently support utilities in meeting these new targets by improving the way pressure can be managed, leakage can be monitored, and theft can be detected and avoided.

Member states must ensure that the complete distribution network is subject to a risk-based approach. A proper risk assessment includes considering how all access points to the water is managed and protected. Any risk assessment should also consider the risk posed by inappropriate pressures in the distribution network. Too low pressure entails risk on intrusion of contamination while too high pressure means higher leakage level and increased risk of bursts. Pressure and temperature sensors in the network and remote monitoring of hydrants and gate valves will ensure managing the risks the best possible way.

UN goals for sustainable development
The 17 UN Sustainable Development Goals (SDGs) are designed to lead the world in a more sustainable direction. A digitised distribution network allows the water utilities to increase efficiency and reduce water loss – and thereby ensure protection of our resources. This way, it contributes significantly to the UN SDGs 6 and 11 to ensure clean water and sanitation and safe, resilient, and sustainable cities.

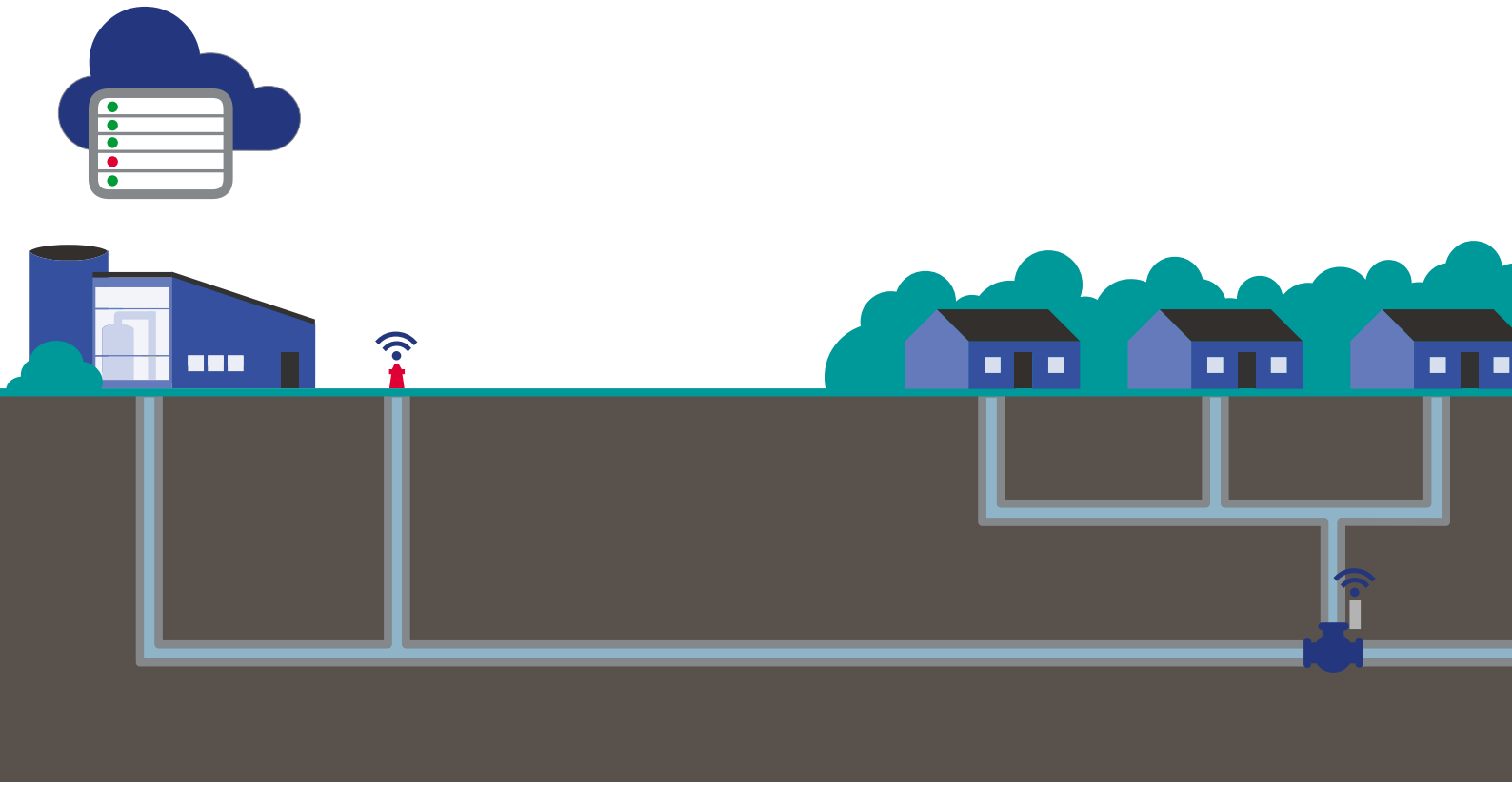
TRUST YOUR NETWORK THROUGH **DIGITAL MONITORING**

In many countries, utilities responsible for delivering clean water to consumers use data to control and monitor their distribution network. They have smart meters installed in most households, so they can bill consumers based on actual consumption.

However, between the water works and the consumers, there are so few sensors installed that this area sometimes is considered a black box. In that area it is next to impossible for utilities to know exactly what is going on because the area is huge, and most assets are installed in the ground. This leaves them with uncertainty about the position of valves, difficulties locating leaks, and challenges with acquiring data in a sufficient quality.

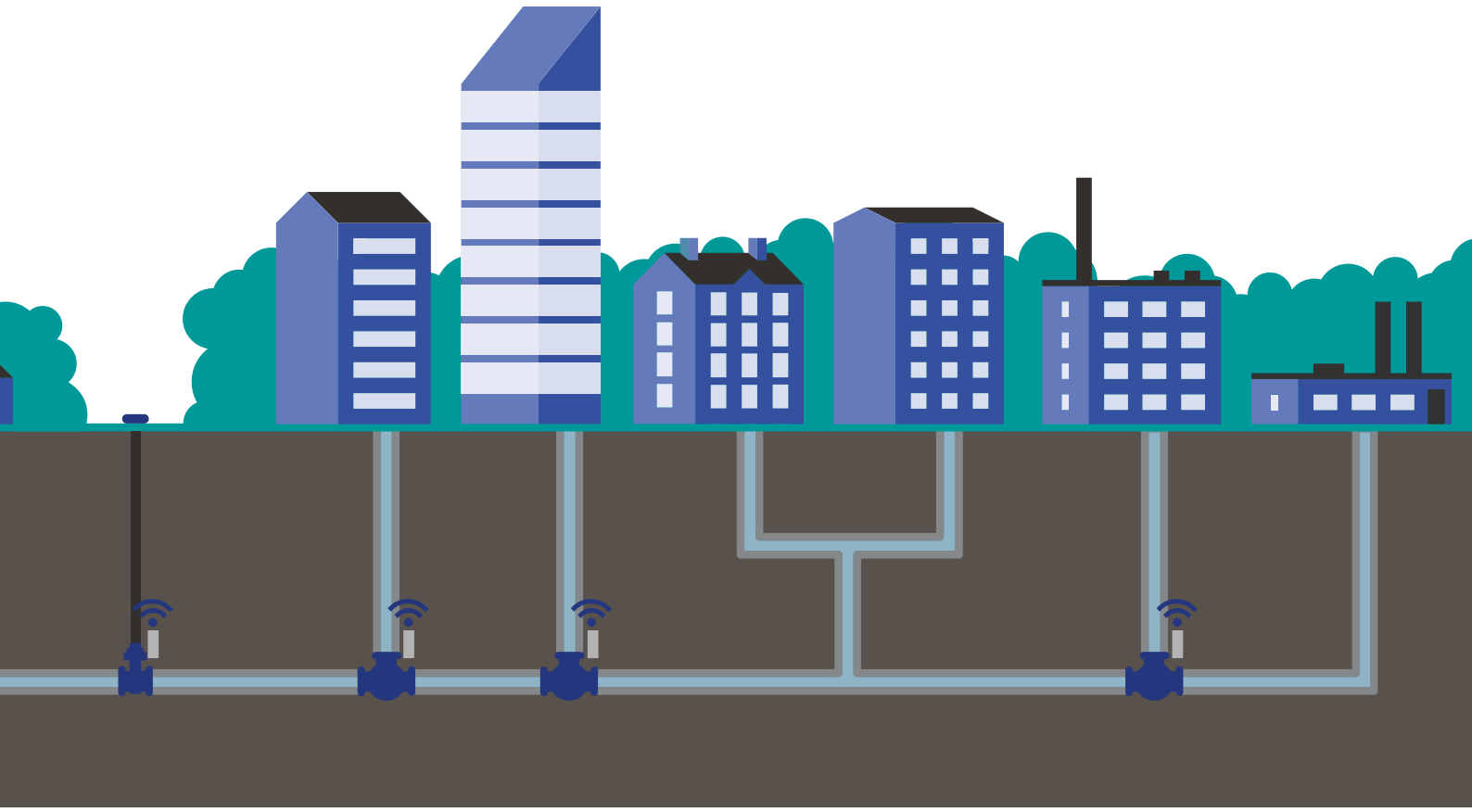
But in the network, there are thousands of valves, fittings, combi-crosses, and hydrants installed, and each of these assets are ideal points to collect data from. AVK Smart Water makes it possible to collect this data by providing intelligent sensors that can be installed in the distribution network. This means that the water utility can acquire data from their assets and turn the black box into a more transparent water network.

With a transparent water network, you can localise leaks faster, extend lifetime of assets, save resources by minimising truck rolls, and save energy by only pumping the needed capacity. These are just a few of the advantages you will receive by introducing the AVK Smart Water solution in the water network.



32 BILLION M³

TREATED WATER LEAKS EVERY YEAR FROM URBAN WATER SYSTEMS



AVK SMART WATER SOLUTIONS FOR WIRELESS DIGITAL MONITORING

AVK Smart Water is a new concept consisting of battery-operated wireless sensors ready for data collection, and a software platform for visualising the complex data, and turn it into valuable insights.

The sensors are developed for AVK core products such as gate valves, fittings, and fire hydrants. When installed, the sensors will provide data directly from applications in the water distribution network and send the data to the dedicated software platform. This digital monitoring solution makes it possible to optimise the operation of a water network by saving resources, reducing water loss, and optimising the general planning and operation activities in the network.

Monitoring with state-of-the-art technology
By installing AVK Smart Water's sensors in the distribution network, utilities can achieve a transparent network that makes it possible to remotely monitor and diagnose problems, prioritise, and manage maintenance issues, and optimise the entire network's efficiency.

AVK Smart Water sensors include:
- VIDI Positioner for valves and hydrants
- VIDI Cap for fire hydrants
- VIDI Open/Close
- VIDI Flow, VIDI Pressure and VIDI Temperature
- VIDI Level

The sensors send data to VIDI Cloud, a software platform developed and provided by AVK Smart Water. Through an API, the sensors can also send data into your preferred IT system. This makes it easier to compare data and compile a complete overview of the distribution network.

Through digital monitoring, AVK Smart Water paves the way for reduced water loss from leaks, increased workflow efficiency, and clearer overview of network conditions.

Effectively lower water loss
One of the most efficient methods to reduce background leakage and bursts is better pressure management. VIDI Pressure sensors provide the data needed to efficiently manage pressure, which will help utilities minimise leaks throughout the distribution network.

In addition, with the leak detection feature in VIDI Cloud, advanced algorithms use data from VIDI Flow sensors to monitor leakage levels. This will enable utilities to prioritise resources and reduce leak run-time.

With VIDI Caps on hydrants and VIDI Positioners on valves, utilities will receive an alarm when assets are operated. That way, utilities can limit the water loss due to tampering and theft from hydrants and public accessible gate valves.

Increase workflow efficiency
Intelligent pressure sensors from AVK Smart Water will provide utilities with the data needed to manage pressure throughout the distribution network. This will result in less truck rolls as there will be fewer bursts to repair and lower energy consumption for pumps as the set point can be reduced, and generally it will extend the lifetime of your assets.

VIDI Pressure and VIDI Temperature provide the transparency needed to efficiently support customers' calls as all relevant network information is ready at hand. Utilities will thus be able to improve customer service while spending less time on support.

VIDI Positioners and VIDI Caps eliminate time wasted on investigating status of valves and hydrants while streamlining maintenance work. The solutions automatically keep track of the latest use and increase efficiency throughout the distribution management.

Better overview of network conditions
There are many risks related to water distribution. Low pressure entails a risk of intrusion of polluted water and poses a serious health risk for consumers. With VIDI Pressure sensors, utilities will be warned if pressure falls below a certain set point.

Hydrants and publicly accessible gate valves are potential entrances for pollutants either by mistake or intentionally. VIDI Caps for hydrants and VIDI Positioners for gate valves help manage this risk by alerting utilities if hydrants or valves are opened.

The overall solution from AVK Smart Water keeps track of the current state of the water network. VIDI sensors register changes in the hydraulic setup e.g., when a valve is opened or closed or when the pressure, temperature, or flow are abnormal in the network. With such misconfigurations, utilities risk loss in hydraulic performance and pressure, which can result in increased energy costs.

Due to the wireless nature of IoT, the pressure sensors can be installed at any critical point in the distribution network.

Underground gate valve with VIDI Positioner that detects when the valve is operated.

Hydrant with VIDI Caps installed. The use of a hydrant deeply affects the pressure in an area. Therefore, it is important for the utility to know when the hydrant is being used in order to distinguish between a pressure drop coming from regular use or from a pipe burst.

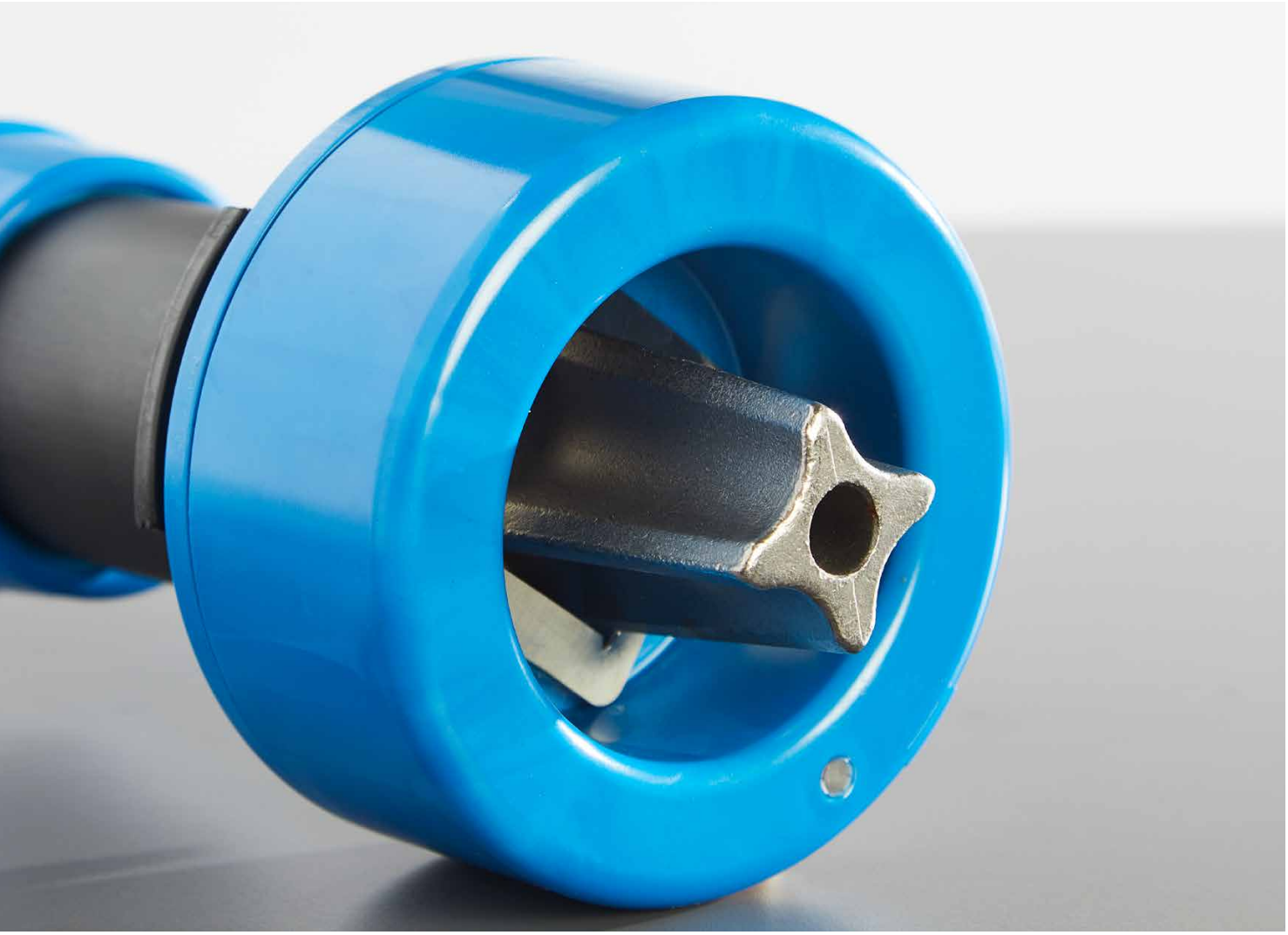
INCREASE THE QUALITY OF DATA WITH **VIDI POSITIONER**

Valves are a very important part of the water distribution network, and utilities have thousands of them installed. Here, they all serve a variety of crucial functions such as dividing and isolating subsections and controlling pressure and water flow.

Most valves are buried in the ground, which makes it difficult to know exactly where they are, if they are opened or closed, and whether they are damaged or not. Worst case scenario, a wrongfully opened or closed valve can influence other measurements such as flow or pressure, and thereby give incorrect information about the distribution network's real condition. This can affect the utility's ability to ensure a fully functional water network and the best service for consumers.

Optimise operation by checking the quality of measurements
VIDI Positioner will provide utilities with valuable insights by digitally monitoring the position of valves. With its open/close feature, VIDI Positioner can detect whether the valve is opened, closed, or any percentage in between.

With VIDI Positioner installed, water utilities will receive data from critical points in the water network and give them the opportunity to check the quality of other measurements such as pressure and flow. Based on the data, water utilities can optimise the operation of the water distribution network, extend the lifetime of assets, and perform efficient NRW reduction.



INCREASE WATER SUPPLY EFFICIENCY WITH VIDI PRESSURE

Water utilities all supply water under different conditions and in different terrains. Large differences in the terrain makes it difficult to avoid high pressure in some parts of the network. High pressure is known to increase the leakage level.

However, it is not always due to high pressure that pipes burst. It can also be due to fluctuations that force the pipes to continually expand and contract. That is why pressure monitoring is an important tool in the efforts to lower water loss.

Fight water loss with pressure management

To prevent pressure fluctuation, utilities must have intelligent pressure sensors installed at important points in the distribution network. With intelligent sensors installed, they are ensured detailed knowledge about the pressure, which will enable them to optimise and stabilise the daily operation.

VIDI Pressure helps utilities monitor the pressure level in the water distribution network. With the information from VIDI Pressure sensors utilities will know when to regulate pressure, and thereby:

- Reduce stress on infrastructure
- Extend assets' lifetime
- Minimise maintenance costs
- Reduce water loss
- Minimise risk of water contamination
- Reduce energy consumption

KNOW THE STATUS OF HYDRANTS WITH **VIDI CAPS**

Hydrants are meant to be resilient and durable. They appear everywhere in the streets, in neighbourhoods, and in industrial areas, where they are expected to always work. But if not taken care of hydrants are likely to be out of order when they are really needed.

Other than slow costly inspections, fire hydrants have not been easy to monitor at a regular basis, meaning theft, vandalism, and water theft can go unnoticed for long periods of time. A way for utilities to get a better overview of what is going on with fire hydrants in the distribution network, it is beneficial to install intelligent sensors.

Detect when hydrants are operated

Hydrants are often spread out across the distribution network, which makes it difficult to monitor them manually. That is where VIDI Cap comes in. With VIDI Cap sensors installed on aboveground hydrants, utilities will know when a hydrant is being used.

The VIDI Cap sensors register when they are removed from their coupling, which means utilities will know when one of their hydrants are being used. A cross check with the fire department and contractors in the area will help water utilities identify vandalism or water theft. It will become easier to separate water loss through fire hydrants from water loss through bursts with data directly from the hydrants.

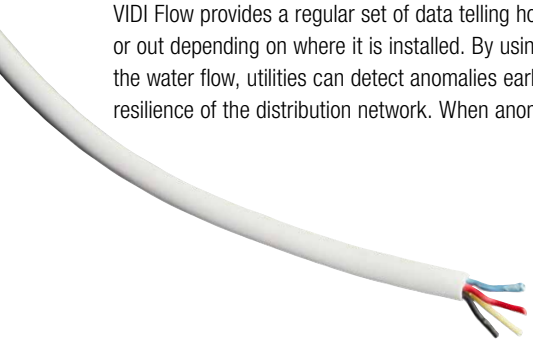
UNBOX FULL NETWORK POTENTIAL WITH IOT SENSORS

Lower water loss in the network with VIDI Flow. Every day, millions of cubic meters of water flow through the water distribution network with the sole purpose to be delivered to consumers. However, it is no longer enough to produce water to meet the general demand. It is also important to control the effectiveness of the water supply, and minimise the water lost during production and transportation to the consumers.

By continuously monitoring how much water flows through the distribution network, water utilities will be able to detect anomalies, and they can decide what measures need to be taken.

Detect anomalies to discover leakages faster

VIDI Flow provides a regular set of data telling how much water flowing in or out depending on where it is installed. By using VIDI Flow to measure the water flow, utilities can detect anomalies earlier and improve the resilience of the distribution network. When anomalies are discovered faster, utilities can also minimise water losses, decrease costs related to leaks, and increase consumer satisfaction.



For water utilities to detect leakages and bursts, it is important to measure water flow at strategic points in the distribution network on an ongoing basis. By installing VIDI Flow at section/DMA inlets, it is easier for utilities to detect smaller leaks as well as narrow down the search area.

Improve level measurements with VIDI Level. There are often certain risks related to drainage pipes, as they can be subject to sludge or clogging. Sand traps are supposed to protect against this from happening. Over time sand traps are slowly being filled with sand; thus, it is important to empty the traps continuously to avoid flooding.

Reduce the risk of intrusion and deterioration from flooding

Level sensors are needed in sand traps, where the medium rise over time. In relation to large water flows, full sand traps can lead to floods and cause damages to properties or pollution of the environment.

VIDI Level makes it possible to remotely monitor sand traps. Thus, utilities can avoid unnecessary inspections of sand traps, as it will provide a clear view of the sand level. A level sensor can be used in different applications such as:

- Level of sand in sand traps
- Level of water or wastewater in buffer tanks or basins
- Level of water in pits, wells, and chambers
- Level of water in lakes and streams

Monitor your valve positions with VIDI Open/close. There are many valves installed in the water distribution network e.g., swing check valves, penstock valves, and butterfly valves to name a few. They all serve a variety of crucial functions such as controlling the pressure and flow in the network as well as boundary valves at each section in the distribution network.

Information about these key assets is often based on assumptions, as they are typically buried in the ground. Not knowing the open/close position of them can affect the level of water loss and affect the overall operation of the water distribution network.

Optimise distribution network and prolong asset lifetime

VIDI Open/Close can be used with several valve types e.g., on a regular gate valve with a handwheel or on a swing check valve with a lever. The most beneficial place to install an open/close sensor is on critical valves that needs monitoring 24/7. With the VIDI Open/close sensor installed on these key assets, utilities will receive regular and reliable information about the open/close position of these assets.

Whether it is installed on a gate valve, a swing check valve, or a penstock valve, VIDI Open/close provide the necessary data for utilities to monitor key assets continuously. With this reliable information about, water utilities can optimise their general operation of the network and extend assets' lifetime.

Track water conditions with VIDI Temperature. Supplying consumers with clean and safe drinking water is the main goal for water utilities. Therefore, they are met with high expectations and demands to ensure that the drinking water for consumers is of the highest quality.

A huge part of ensuring clean drinking water depends on a controlled temperature all the way from the suppliers to consumers. Water temperature is known for influencing the network both when the temperature is too high (risk of bacteria) or too low (risk of bursts of blocked pipes).

Reduce risks of bacterial growth or pipe bursts

If the temperature increases, the risk of bacterial growth increases as well. VIDI Temperature will give a clear indication of the temperature in the network, and if it increases utilities can make informed decisions based on data directly from the water pipes. That way, water utilities can ensure that the water is safe to drink for consumers.

At the same time, if the water temperature drops, the VIDI Temperature sensor provides the utilities with the exact temperature enabling them to decide when action needs to be taken. So, if the water temperature drops below freezing temperature, utilities know that they must be aware of pipes bursting or clogging.

USE LEADING TECHNOLOGY FOR SUPERIOR COVERAGE

AVK Smart Water uses the wireless IoT technology NB-IoT (Narrowband Internet of Things) for all sensors to ensure great radio performance, long battery life, and high data security. NB-IoT makes the sensors simple to install and easy to operate. Once sensors are installed, the only expense for utilities is a small subscription fee, and data is delivered as a service.

To make digital monitoring of assets more convenient for utilities, all AVK Smart Water sensors use API (Application Programming Interface) to easily integrate data directly into any preferred IT system.

Utilities have different requirements in relation to reading and using data. AVK Smart Water ensures that utilities do not have to worry about changes in protocols or security systems. With API, the complexity of IoT and smart products is removed from utilities and handled for them. That way, utilities can focus their efforts on more important tasks.

WHAT IS NB-IOT?

NB-IoT or Narrowband IoT is a wireless communication standard for Internet of Things (IoT) using the existing telecommunication infrastructure.

Due to its wide coverage, improved indoor coverage, and its energy efficiency, NB-IoT is suitable for wireless devices installed in areas with poor coverage and that demands maximum battery lifetime.

TAKE CONTROL OF YOUR ASSETS WITH AVK ASSIST

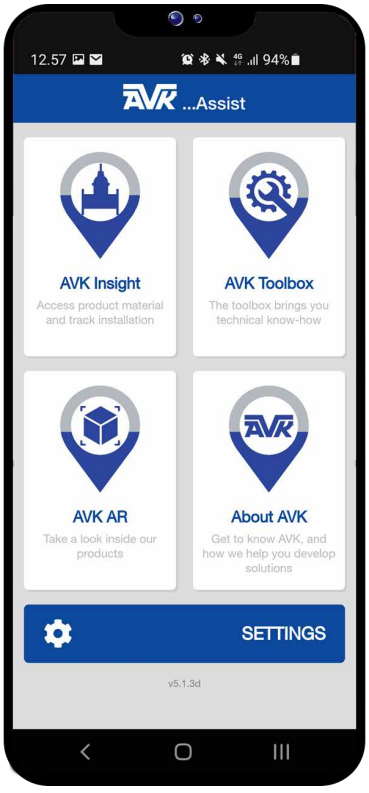
Most utilities highlight asset mapping and network management as ongoing issues in the daily operation of the water network. AVK Assist can offer a huge contribution in the efforts to improve asset and network management.

It is an application made up of four key elements:

- AVK Insight
- AVK AR (augmented reality)
- AVK Toolbox
- AVK Info

AVK Assist's many features will help customers fully record, track, and identify exactly where all their assets are located, including alternative products to AVK products. It will enhance traceability of products by using digitally recorded quality and test data from the point of production. AVK Assist provides customers with a variety of calculators for common industry activities, and a virtual reality tour of AVK products installed.

As a result, utilities will have better insight into their distribution network and the assets in it.



CONVERT DATA INTO VALUABLE INSIGHTS

AVK Smart Water offers software solutions that include a dedicated web platform for data visualisation and software packages with different features to cover customers' needs.

AVK Smart Water offers solutions that include a dedicated web platform for data visualisation and different feature packages to cover the utilities' needs.

There are three feature packages:
- VIDI Basic
- VIDI Advanced
- VIDI Premium

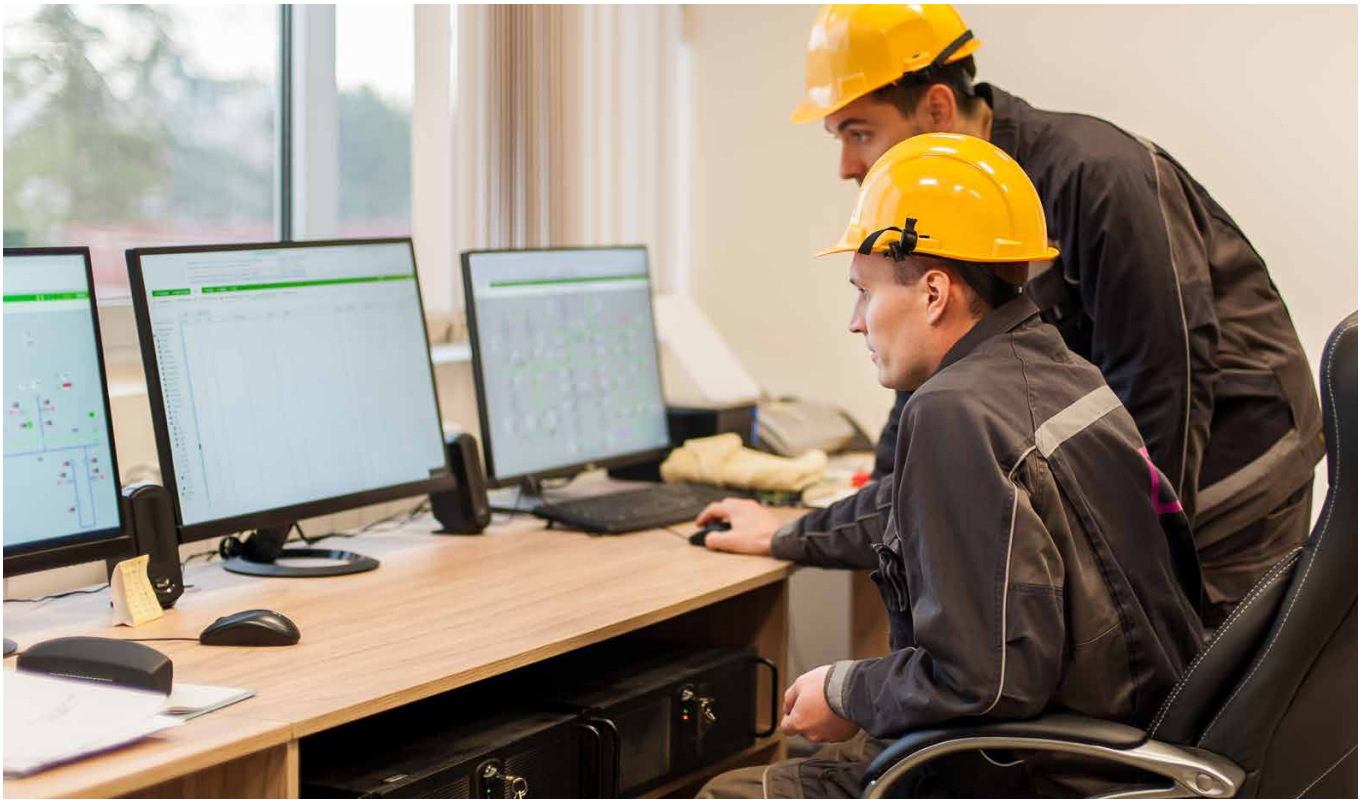
Simple and user-friendly
VIDI Basic is the simple and basic tool for visualising and monitoring assets in the network. It provides utilities with a map-based overview of the data from the AVK Smart Water IoT sensors. It is intuitive as it provides a quick overview of the most important information for daily operation such as abnormal conditions.

More functions more possibilities
VIDI Advanced offers the same features as VIDI Basic. But in addition, it provides alarm dispatching, which gives the utility the opportunity to react instantly, minimise water loss, and optimise the general maintenance of the distribution network.

Through the alarm dispatching feature, users can set up multiple notification messages in case of specific events. Notifications can be dispatched by both e-mail, text message and/or automated Telegram bot to a specific crew member. The given crew member can then interact with the alarm by either acknowledging or ignoring it. If the alarm is not responded to, it will reappear within a time frame predefined by the utility.

The complete package
In addition to the features of VIDI Basic and VIDI Advanced, VIDI Premium offers a complete package with monitoring, visualisation, and assets management on one platform. VIDI Premium provides the leakage detection module with individual DMA thresholds and District Metered Area (DMA) reports.

The leakage detection module analyses the water balance in each DMA. By visualising the trends in consumption, utilities will have an instant indication of potential leaks and bursts. In addition, the module considers the water consumption related to seasonal changes and public holidays.



FROM MAN-DRIVEN TO SYSTEM-BASED MANAGEMENT: OPERATING WITH AN OPEN SYSTEM

In the past, Herning Vand has been dependent on individuals knowing everything worth knowing about the utility's water distribution system. For example, how the system is built; why it is built this way; where valves are placed and whether they are opened or closed. Concurrently with system growth, this approach has challenged the utility over the years, as it can be difficult to maintain a crystal-clear overview of a growing distribution system based on assumptions.

CASE STORY

Sometimes the utility struggled with time-consuming efforts to track down information about specific assets in the system, because only few individuals knew the status and the exact location of the assets. But now Herning Vand has decided to become more system-based and has therefore started the process by sectioning the water distribution network in Herning. Part of this process is the digitalisation and retrieval of data from critical points in the system.

Data from IoT devices paves the way for efficiency

Herning Vand has initiated a development and structural planning of the entire distribution system in Herning municipality. In the search for technological solutions for water systems, the utility has entered a development project with AVK Smart Water. The project includes installation of VIDI Positioners on selected gate valves and smart hydrant caps with an alarm function on selected hydrants.

"Basically, the purpose for us is to obtain as much data as possible from the system and use it both for operational and planning purposes," says Mads Riber Rasmussen, Project Manager at Herning Water. He adds: "We want to be able to see our entire distribution system and see the actual operational position of our most important assets. That is why we teamed up with AVK Smart Water."

AVK Smart Water develops intelligent alarm devices for valves and hydrants that detect changes in the hydraulic setup and then send the data to a cloud platform. The VIDI Positioner detects whenever a valve is opened, closed or anything in between. It sends an alarm when the valve is operated and sends a regular update of the valve status. The smart hydrant cap also detects the open/close status of a fire hydrant and sends an alarm whenever the hydrant is opened or closed.

Unique grid insights improve decision making

Valves and hydrants play an important role in water management. Some are more important than others, and not knowing the status of these critical assets can affect a utility's water loss, its ability to provide safe drinking water, and its general operation. Valves that are not fully opened or fully closed can result in disruption of meter readings, but even worse, it can affect the pressure in the consumer's water supply.

In fact, the utility experienced a specific situation where a waterwork suddenly had an extremely high consumption of water, but they could not tell why. It could either be a major leak or a hydrant being opened in case of a fire. Therefore, the employee on duty had to call around to find out what was going on. A time-consuming task that could have been avoided with alarm devices installed.

The VIDI Positioner installed in a plastic surface box.

The VIDI Positioner is calibrated and ready to detect the position of the gate valve.

"You can't keep an eye on all assets all the time – the distribution network is simply too large," says Mads Riber Rasmussen. He continues: "But with VIDI Positioners on our valves, we get an alarm if a valve is opened or closed. We can also continuously monitor the actual operational status of valves at critical points in our system."

The VIDI Positioner from AVK Smart Water enables Herning Vand to monitor the position of carefully selected valves in the water network. The device detects and sends an alarm whenever the valve or hydrant is opened or closed. It also sends status updates continuously, and the utility can see the actual operating status of the valves in the distribution network.

FACTS

18,000 consumer meters

Around 730 km water distribution system

6 people to operate and renovate the water distribution system and consumption meters

Temporary inlet on a new construction site with a sensor installed in the lid.

AVK Group
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Expect...