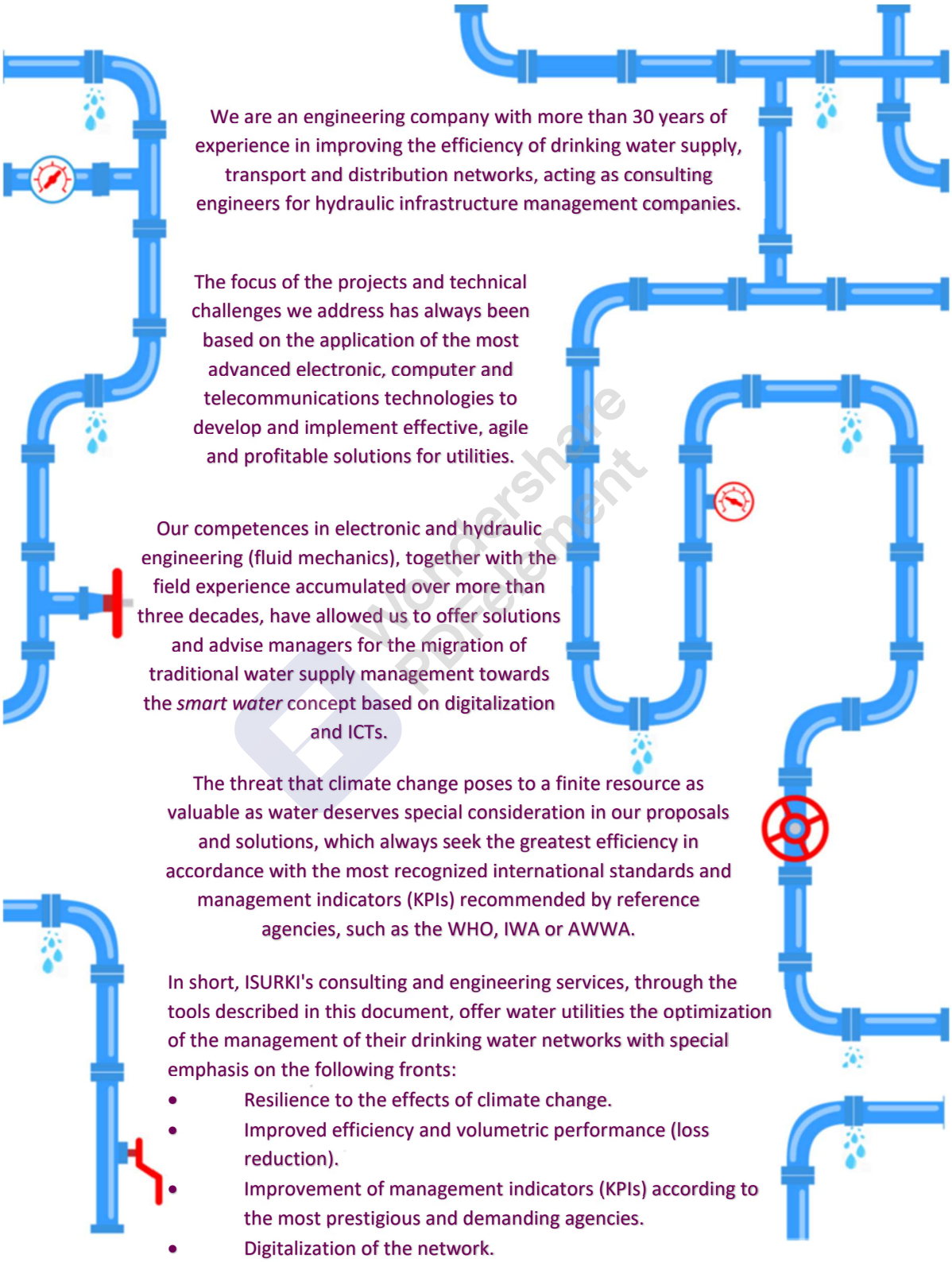
isurki
water engineering

Smart Water



We are an engineering company with more than 30 years of experience in improving the efficiency of drinking water supply, transport and distribution networks, acting as consulting engineers for hydraulic infrastructure management companies.

The focus of the projects and technical challenges we address has always been based on the application of the most advanced electronic, computer and telecommunications technologies to develop and implement effective, agile and profitable solutions for utilities.

Our competences in electronic and hydraulic engineering (fluid mechanics), together with the field experience accumulated over more than three decades, have allowed us to offer solutions and advise managers for the migration of traditional water supply management towards the *smart water* concept based on digitalization and ICTs.

The threat that climate change poses to a finite resource as valuable as water deserves special consideration in our proposals and solutions, which always seek the greatest efficiency in accordance with the most recognized international standards and management indicators (KPIs) recommended by reference agencies, such as the WHO, IWA or AWWA.

In short, ISURKI's consulting and engineering services, through the tools described in this document, offer water utilities the optimization of the management of their drinking water networks with special emphasis on the following fronts:

- Resilience to the effects of climate change.
- Improved efficiency and volumetric performance (loss reduction).
- Improvement of management indicators (KPIs) according to the most prestigious and demanding agencies.
- Digitalization of the network.
- Migration towards the concept of smart water.

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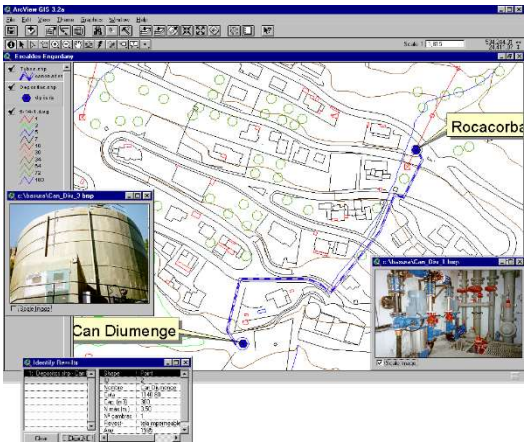
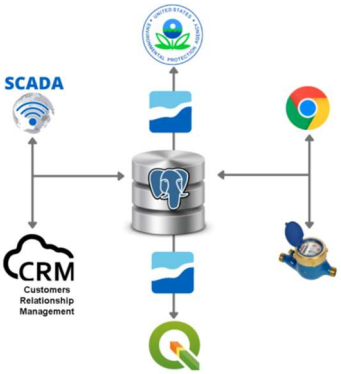
1.- DIGITALIZATION and GIS

The first step towards the intelligent management of a water utility is the digitalization of the infrastructure. The rigor applied in this stage is fundamental, as the rest of the tools used subsequently for analysis such as scenario prediction, event simulation, and decision-making assistance are based on this layer, which contains all the constructive data of the network and its typology.





It requires the active collaboration of the utility technical staff in close collaboration with ISURKI for the technical and financial inventory of the infrastructure, as well as the continuous updating with each action in the field on a Geographic Information System (GIS).

In addition to providing the necessary information to the rest of interdependent computer tools, the implementation of a GIS is an invaluable resource for:

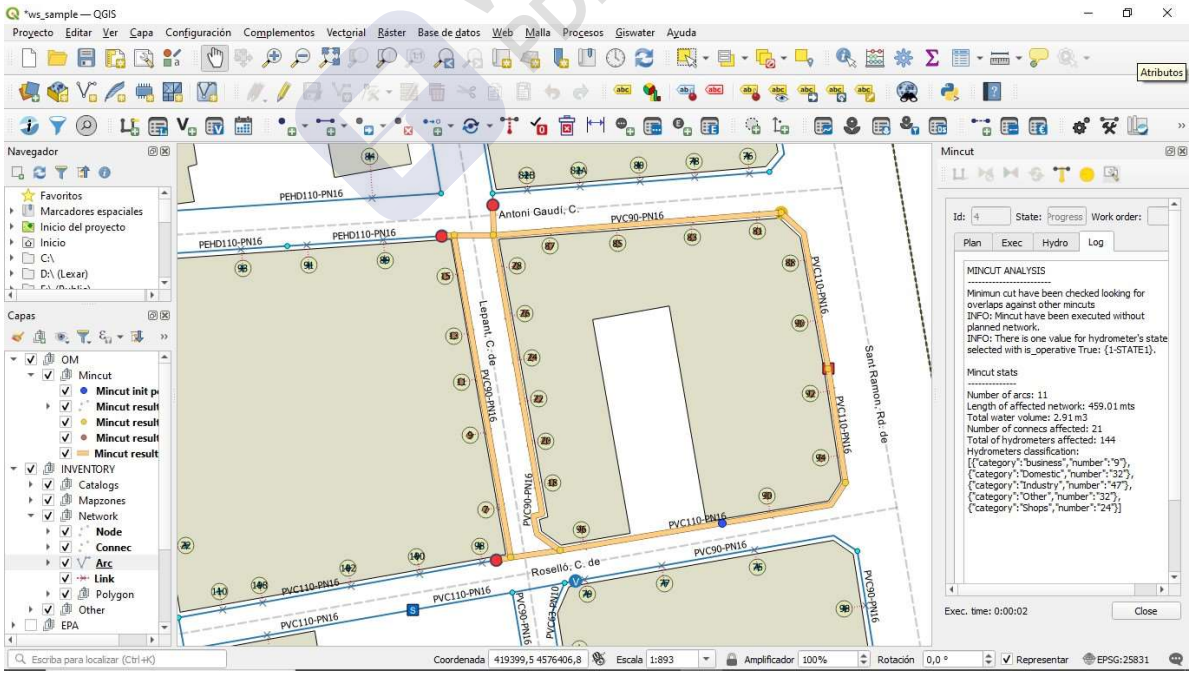
- Optimize asset management.
- Reduce operating costs (OPEX).
- Help in the creation of a database that allows to immediately locate a singular element (pipe, valve, meter, connection, hydrant ...) on the municipal cartography, showing to the user its specific attributes, features and characteristics.
- Unify the technical management of the whole utility in a single tool for the different levels and ranks of the personnel involved, with different levels of access.

Practical examples of functionalities to which the user can have access are:

- **Operation**, based on the following tools:
    - *Cutting polygons*: the GIS proposes to the user the list of shut-off valves that must be actuated, including all the information associated with them, in case the intervention on an element of the network and its associated cut-off operation are necessary.
    - *Flowtrace*: allows to know, previous to the on-the-ground cut-off operation, the area and elements affected up and downstream of the device (for example, a

valve) on which it is planned to perform an action or a change of operating state (open, close, regulate a pressure / flow setpoint ...).

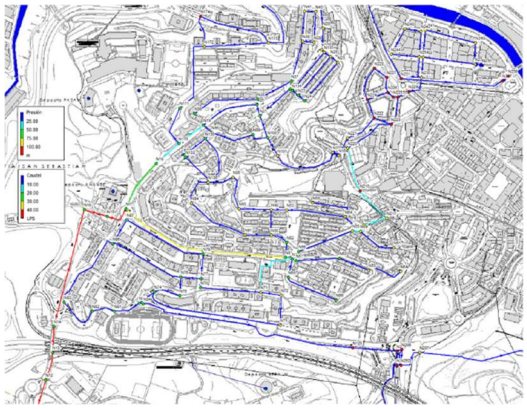
- **Maintenance**:
  - Plan maintenance operations and manage the evolution of the life cycle of each hydraulic element of the network.
  - Actions and repairs on the network. After delimiting the affected area:
    - Visualize graphically (plans, diagrams, photos, videos ...) the details of the hydraulic devices object of the action.
    - Inventory all affected material with its technical characteristics.
    - Generate a list of affected subscribers and meters.
    - Simulate the effect of the action on the operational state of the network[1].
    - Simulate the supply to the affected sector from an alternative supply point.
- **Water quality**:
  - Represent sampling points on the network.
  - Schedule sampling campaigns according to regulatory requirements on water quality.
  - Relate the GIS to the analytical laboratory.
  - Generate a database with the evolution of analytics at each point.
- **Asset management**, based on the following tools:
  - Masterplan: valuation of the water network with automatic update.
    - Calculation of the patrimonial value of each element.
    - Calculation of the cost of actions in delimited areas or sectors.



[1] Requires the modelling module.

2.- MODELLING

The basic purpose of the commissioning of a computerized model (or mathematical model) of a hydraulic network is to serve as support in the planning and development of a coherent and optimal hydraulic policy from a technical-economic point of view that ensures continuity in the supply to users in the hygienic-sanitary conditions stipulated by current legislation and before any contingency and consumption scenario that can be characterized in the computer tool on which the model is based.



Some specific aspects that can be addressed with this solution are the following:

- Immediately know the status of the hydraulic parameters of the network (pressure, flow, speed, head loss, consumption ...) and quality (concentration of reagents [residual free chlorine], transit time, percentages of origin ...), at any point of the network and for the desired environmental conditions.
- Detect leaks and anomalous consumption, both from the network itself and from users.
- Predict and simulate network behaviour under scenarios such as:
    - Supply to new urbanizations, industries, hotels, buildings, etc ...
    - Use of fire hydrants, hydrants, etc ...
    - Massive influx of floating population (punctual tourist occupation).
    - Supply cuts due to breakdown/maintenance and their alternatives.
    - Meshing of the network to improve water quality.
    - discharge of a polluting substance, predicting the affected areas (safety perimeters).

- Study the expected evolution of hydraulic parameters and water quality over time, allowing to simulate the response of the network to future challenges (population growth, new demands for agricultural / industrial uses, new sources of supply ...).
- Simulate the effect of investments aimed at improving the service: new layouts and meshing, pressure regulation, new tanks, new chlorinations and treatments, etc ...

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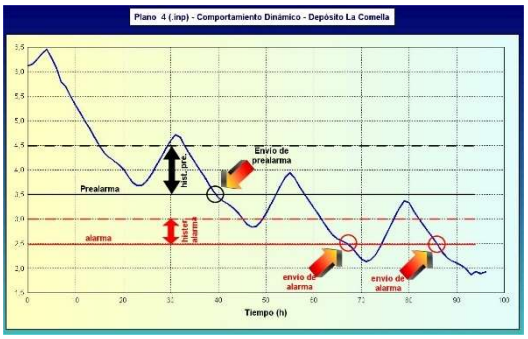
3.- IoT and TELECONTROL

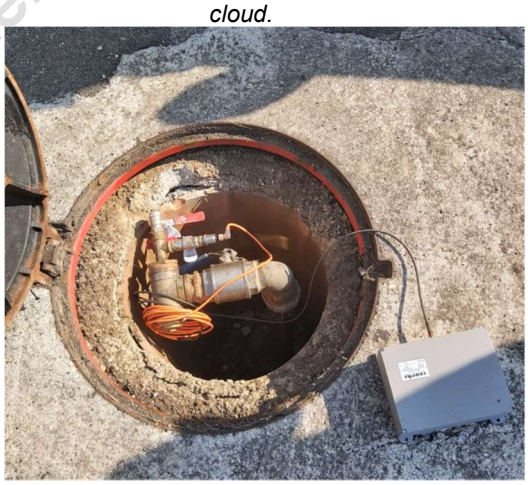
Since 1.992 ISURKI has supplied telecontrol systems for drinking water distribution and sewage networks, always based on its own technology and developments. Our current **IRIS IIoT** ecosystem offers the latest IoT technology for cloud scada hosting, without the need for a license and accessible from any device with an internet connection.



The implementation of an IoT telecontrol system that provides real-time information on both the flows of drinking water supplied from the regulating tanks to the distribution network and the pressures and flows measured at strategic points of the same are essential for:

- The calibration and validation of the computer model.
- The query of operational values in real time.
- The online calculation of indicators of the efficiency and technical management of the network (KPIs).
- Real-time leak detection.
- The notification of alarms of parameters outside the acceptable range of operation, using free messaging systems of wide diffusion, such as email or Telegram®.
- The automatic generation of a historical record that allows analyzing the temporal evolution of the technical parameters of the network and tracing critical episodes.
- The automated upload of data to the cloud.
- The operational control of the network for its automatic adaptation to the instructions and strategies established by the intelligent management software **WISE**

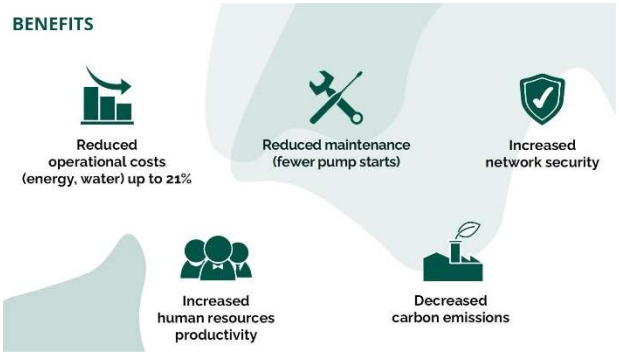
⇩ *ISURLOG datalogger transmitting pressures from a distribution network to the cloud.*



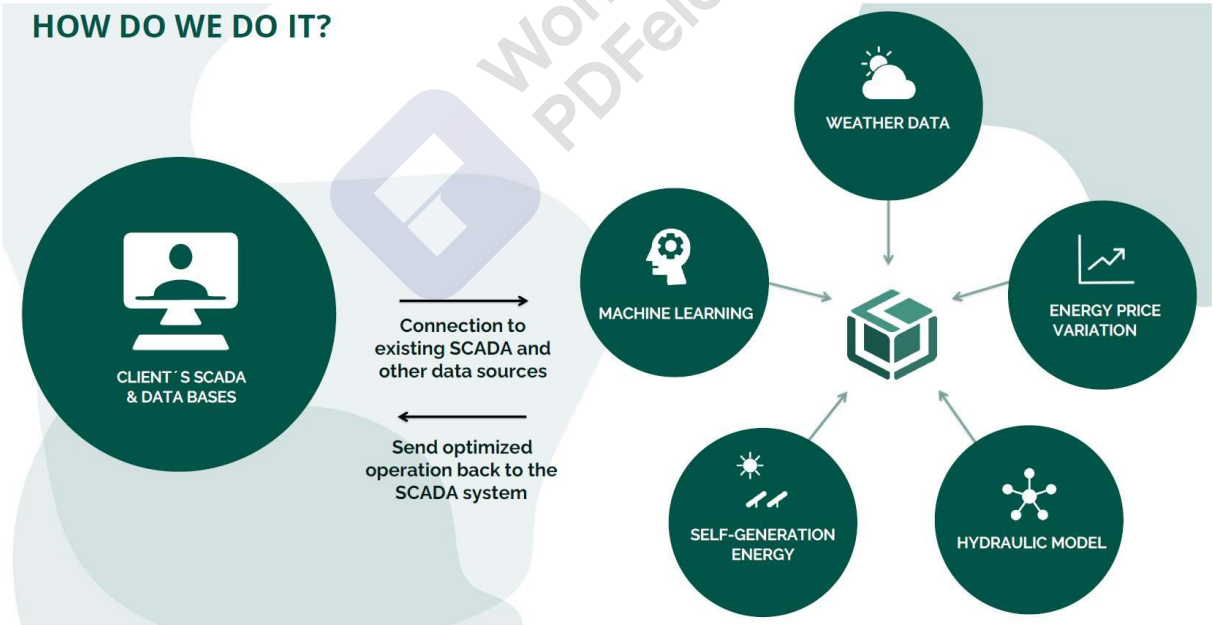
4.- ENERGY EFFICIENCY

To address this section ISURKI has the collaboration of the renowned Portuguese company SCUBIC, serving as a technological partner of recognized prestige and extensive experience in improving the energy efficiency of water utilities.

The SCUBIC platform promotes the transformation of data, which is extracted in real-time and in an automated way, from internal and external sources, into real insights. It improves operational and energy decision support of the water systems, reducing waste and increasing security.



Our digital operator works 24/7/365, interconnected with the SCADA system and database, to monitor network resources, to forecast future water needs and to optimize operational and energy costs by studying the most economical and appropriate time to pump the required amount of water.



5.- COMPREHENSIVE SOLUTION FOR SMART WATER

WISE
Water Infrastructures' Software based Efficiency

ISURKI's **WISE** solution is an expert system support system in operational decision making for water utilities. Its main goal lies not only in collecting reliable, representative, and real-time data of the water infrastructure, using the **IRIS IIoT**[2] **ecosystem** but in ***convert this data into valuable information and automatic control routines to improve the resilience and operational adaptation of infrastructure to the effects of extreme weather events***.

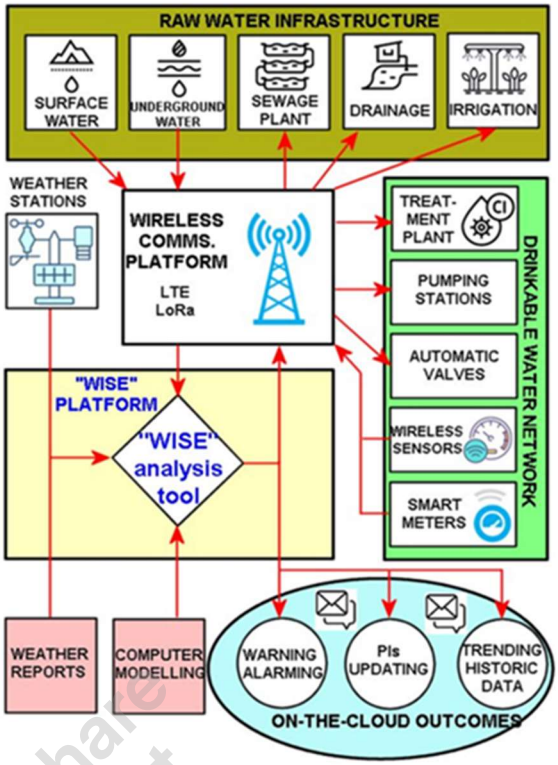
WISE addresses the improvement of infrastructure management by covering the integral water cycle:

- Raw water – High pressure collection and transport infrastructures: on-the-ground and underground resources, water bodies, reservoirs, open channels, high pressure pipes, flow and pressure regulation facilities.
- Water treatment plants, converting raw water into drinking water ready for consumption.
- Drinking water – low-pressure distribution infrastructures: regulation tanks and distribution network to the points of consumption.
- The wastewater network from the points of consumption to the wastewater treatment plant.
- Any installations to recharge water resources and raw water bodies with effluent from wastewater treatment plants.

The main purpose of the implementation of the **WISE** solution is to provide a set of tools to help management companies make *the best decisions in critical scenarios derived from climate change,* improving the performance indicators (KPIs) of their facilities in accordance with the recommendations of the International Water Association (IWA) and the World Health Organization (WHO), also making them more resilient and adaptable to extreme events such as floods, heatwaves and droughts resulting from climate change, and helping decision-makers and operating managers of water utilities to meet these new challenges.

[2] *Industrial Internet of Things*.

To this end, **WISE** adapts the operational strategies of the infrastructure anticipating unforeseen alterations in the quality and / or quantity of the incoming raw water, ensuring the continuity of the service in the supply to its final users through automatic action on the treatment facilities in case of heavy rainfalls causing a marked destabilization in the analytical parameters that can cause the collapse of the facilities. In the same way, **WISE** reacts automatically to unforeseen changes in consumption patterns and modulation curves of subscribers, acting on the pressure and flow control devices installed in the distribution network.



The analytical core of the software will be based on the so-called M-A-D model:

Or, in a nutshell:

To achieve these goals, the main tasks managed by a **WISE** solution include:

- Automatic feeding of data from the sensors of the water network (field data) through the **IRIS IIoT** (Industrial Internet of Things) ecosystem deployed to the analysis software.
- Comparative analysis between real-time data from field sensors with computer-simulated data, reporting discrepancies to those responsible for operational management of the asset.
- Quantification, updating and reporting of benchmarking parameters:
  - KPIs (Key Performance Indicators).
  - NRW (Non-Revenue Water).
  - UARL (Unavoidable Annual Real Losses).
  - CARL (Current Annual Real Losses).
  - ILI (Infrastructure Leakage Index).

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- Diagnosis, identification and classification of the problems to be addressed and proposal of solutions.

In each project, the convenience of adding relevant analytical parameters such as free chlorine, pH, conductivity, dissolved solids, temperature, etc. is evaluated.

Tangible outcomes

- Automatic response, through the adaptation of the operational control of the network, against critical episodes derived from severe effects as a result of climate change.
- Improving the quality of drinking water.
- Reduction of operational costs (OPEX).
- Reduction of water losses due to leakage.
- Energy savings and carbon footprint reduction in pumping stations.
- Prevention of the collapse of treatment facilities in extreme weather events.
- Convergence of KPIs towards the most demanding standards.
- Migration toward the *smart water* concept.
- Improving the public image of the utility.
- Asset Management optimization.

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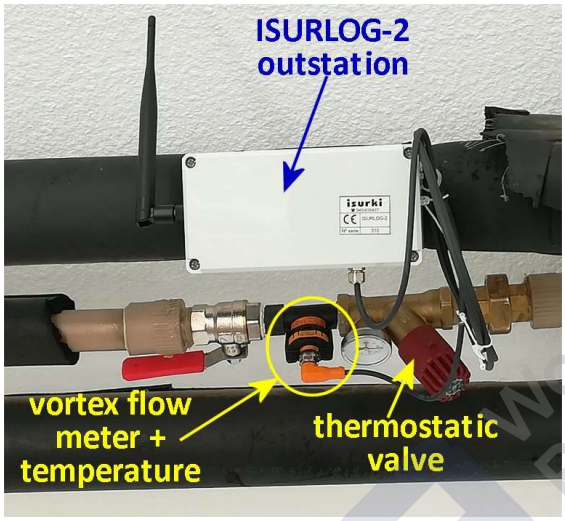
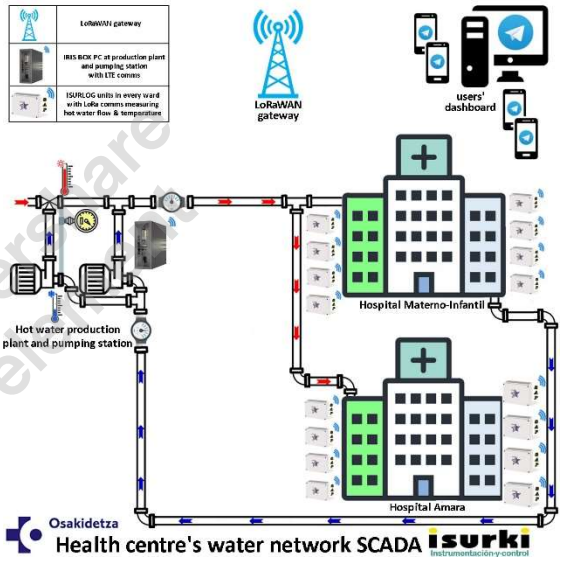
6.- LEGIONELLA'S OUTBREAK EARLY WARNING SYSTEM

The application of the **IRIS IIoT** ecosystem in the health sector has demonstrated its effectiveness in the early detection of favourable conditions for the proliferation and spread of Legionella in hot water networks of public buildings such as hospitals, sports facilities, hotels, residences... allowing the adoption of measures that ensure the supply according to the new regulations in force in this matter.

The system is based on a series of temperature and flow sensors with data in the cloud managed by the **ISURLOG ΔT** outstations, which have the novelty of being **energy self-sufficient**, **not requiring batteries or any other kind of power sources, operating based on Energy Harvesting technology**.



⇧ *ISURLOG datalogger transmitting to the cloud temperature and flow values of a branch of an ACS network in a health center.*



⇧ *IRIS IIoT ecosystem for the integral control of the hot water network in the building complex of the Donostia University Hospital.*

Customer's opinion	
	"*The implementation of the hot water network control system based on the ISURKI's IRIS IIoT ECOSYSTEM solution has enabled us to effectively detect any undesirable scenario that could favour the proliferation of Legionella in our network and to optimise the management of the technical installations concerned*". Daniel López Ortiz. Engineer at the Projects and Infrastructures Dept. OSAKIDETZA – OSI DONOSTIALDEA

7.- WATER QUALITY

In the **online analytical** section, ISURKI offers instrumentation and control systems to dose reagents as well as to monitor and detect out-of-range values in real time and in the cloud with respect to the admissible ranges stipulated by the different regulations in force for the following applications:

- Treatment stations and drinking water distribution networks.
- Continuous dosing and analysis of chlorine for drinking water.
- Control of lixiviates in landfills.
- Fish farms and hatcheries.
- HVAC networks.

⇩ *Residual free chlorine analyzer in a hot water network measuring at 60 ºC and 6 bar.*

8.- FLOW MEASUREMENT AND CONTROL IN WATER CATCHMENTS

ISURKI offers its 30 years of expertise as hydraulic engineers in the design of gauging solutions for open channels and pressurized pipes regardless of their constructive and hydraulic characteristics, with direct measurements in channels of regular section and known slope (Manning), Parshall channels, weirs (triangular, rectangular and trapezoidal), as well as with indirect measurements through the automatic interrogation of the instantaneous power in energy meters (IEC 870-5-102 protocol) and its conversion to turbined flow in hydropower plants.

Our services and solutions are aimed at managers of industrial facilities (hydroelectric power plants, fish farms, etc.) that use water collected from natural resources such as rivers, reservoirs, lakes and underground water.

The opinion of a customer in the aquaculture sector	
	"The implementation of this telecontrol system based on the ISURKI's IRIS ECOSYSTEM solution has made it really easy for us to comply with the authorities' requirements regarding the installation of diverted flow control systems." Mr. Mario Somalo Vallecillo, Maintenance Manager at RIVERFRESH.

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The opinion of a consolidated partner	
	***"For 30 years ISURKI has been a strategic and regular collaborator in the design and consulting of hydraulic solutions that are part of civil works projects for the water sector, both nationally and internationally."*** **Mr. Josep María Vila, CEO at SUPORT Enginyers Consultors, a consulting company in civil engineering in the international field founded in 1,987.**

A BIT OF HISTORY

ISURKI was founded in 1.992, with the vocation of offering the most advanced technologies in the fields of electronics, computer sciences and industrial communications to optimize the control of industrial processes and the operational management of utilities and civil infrastructures, especially those related to the transport, treatment and distribution of drinking water and environmental surveillance networks.

The extensive knowledge and experience accumulated both as designers, manufacturers and implementers of instrumentation and control systems and consulting engineers in the water sector allow us to project, execute and accompany the client in the optimization projects of water infrastructures of all kinds, covering the integral water cycle.

The combination of knowledge in the aforementioned technologies allows us to design customized solutions adjusted to the requirements of each supply, offering an extremely competitive final result in prices and benefits.

Company headquarters at Irun (Gipuzkoa)

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