Waternamics
Veolia’s Solution for Intelligent Water Networks

Resourcing the world

VERSION: MAY 2017

Veolia Australia and New Zealand
National Office: Level 4, 65 Pirrama Road | Pyrmont | NSW | 2009
Email: nationalanz@veolia.com
www.veolia.com/anz
Introduction

The Australian and New Zealand water industry is facing numerous challenges:

> Aging infrastructure significantly increases the risks of failure/crisis, maintenance costs, and the need for large investments to renew assets;
> The levels of legal constraints and reporting requirements are constantly increasing;
> Water utilities face the impact of climate change, and especially increasing risks of drought and the resulting water scarcity;
> Water utilities are required to meet Greenhouse Gas (GHG) emission reductions set by governments;
> Population growth in Australia and New Zealand forces water utilities to augment infrastructure to increase their capacity to produce and distribute drinking water, and collect and treat wastewater.

In addition to these technical and environmental challenges, Australian and New Zealand water industries must face customers’ growing expectations. For example, a recent survey performed in Victoria* revealed the following:

> Basic service: Customers expect their water utility to at least provide safe drinking water (78% of customers consider it important that their water utility ensures that everyone in the community has access to safe and affordable water), collect and treat sewage, and fix and maintain infrastructure.

> Water usage information: 79% of customers would like more information on their water consumption, for example, through more frequent meter reading. The survey also indicated that 71% of customers would value a more personal communication. In particular, 79% would like recognition or reward when an effort is made to decrease water consumption.

> Environment and sustainability: 82% of customers expect their water utility to care for the environment. Because of climate change and recent droughts, 70% of customers are also concerned about water shortages in the near future, and 72% would like to see their utility making more efforts to minimise the risks of water scarcity.

New technology enablers
In parallel to these increasing challenges faced by water utilities, recent years have seen the development of technologies that are now available:

- A high volume of historical data (water quality, customer complaints, work orders, etc.) and online data (asset status, network sensors, field crew GPS position, etc.) are now recorded by water utilities;
- Data analytics has been proven to be very useful in numerous fields, such as power distribution, medicine, traffic management, etc. For example, machine learning techniques such as neural networks can automatically identify defects in sewer networks by analysing CCTV inspection footages, something which traditionally requires lot of resources when performed manually;
- Mobile devices are commodity products and can be used to exchange large volumes of information with water utility employees and customers;
- Recent developments of new type of sensors and communication options (IoT solutions) allow for better insights into what is happening in the network more economically than ever before, and;
- The development of cloud-based solutions allows water utilities to access powerful digital solutions while avoiding large investments and providing access to constant system updates.

Wateramics
More than just a platform, the collaboration between Veolia and IBM draws on Veolia’s 160 years of experience in water and wastewater services around the world and realises the full range of Veolia’s water and wastewater technology and management expertise.

Wateramics has been developed to integrate all data sources collected at water utilities in the same platform, and to enhance ‘situational awareness’ of network and operations. Wateramics is based on IBM’s Integrated Operations and Analytics platform (IOC), which is used by a number of utility companies in the UK, US and Asia, and has been adapted by Veolia to address the needs of water operators. More than just a platform, the collaboration between Veolia and IBM draws on Veolia’s 160 years of experience in water and wastewater services around the world and realises the full range of Veolia’s water and wastewater technology and management expertise.

The jointly developed solution was initially implemented concurrently in Lyon (France) and in Tidworth (UK), where Veolia operates water and wastewater services. Subsequently, when Veolia was awarded the water services contract for the city of Lille (France) in 2015, Veolia proposed the same advanced supervision (‘hypervision’) platform, and deployed it in less than six months. Veolia and IBM have implemented the Wateramics solution for several cities in Europe. In the Australian market, a number of sandpit environments have been deployed and an ongoing implementation with IWN (Intelligent Water Network) in Victoria investigates the capability and value of Wateramics.

Recognising the emerging need of water companies for smart solutions to help drive performance, quality and transparency of service, Veolia turned to IBM to draw on its expertise in data management and analytics.

Wateramics is composed of a base platform allowing visualisation of integrated data and automation of standard operating procedures (SOP). Additional modules offer more advanced and specialised functionalities to ease operations for the entire water cycle.
Base Platform

Map view: geo-localised data is integrated on the same map, allowing users to visually correlate information usually only accessible through different systems.

Chart view: all time-series data related to assets can be drawn and explored visually on a chart window.

Dashboard: the base platform offers the possibility to display information in the form of a dashboard gathering key indicators relevant for specific operations. This can be customised depending on your utility requirements.

Reports: information can be provided to users in the form of a report providing a summary of network and assets status. Reports can be automatically generated and sent by email on a scheduled basis.

Street view: Waternamics also allows users to easily access street view, providing an overview of the position of assets (i.e. fire hydrants). Works can be better planned and managed based on specific site constraints (i.e. parking, street directions, and traffic control required).

List view: assets details can also be viewed in a list format to quickly browse through all the managed objects such as pipes, valves and pumps.
Base Platform

Alerts and alarms: Waternamics will draw attention to specific issues, as triggered by external systems (SCADA) or internal analytics, for example, by flagging low pressures or high flow rates.

Logical connection view: enables an exploration of the logical connections between the different layers of information, for example visualisation of the connection between customers and meters, meters and connections, and connections to mains.

Actions needed to address an alarm as listed by the corresponding SOP.

Details of the standard operating procedure associated with a water quality event.

Logical connection view:

- Customised for end-users to specify what to look for in terms of assets, geographical location, events, etc.

Alerts and alarms: Waternamics will draw attention to specific issues, as triggered by external systems (SCADA) or internal analytics, for example, by flagging low pressures or high flow rates.

Logical connection view: enables an exploration of the logical connections between the different layers of information, for example visualisation of the connection between customers and meters, meters and connections, and connections to mains.

Standard Operating Procedures: Waternamics allows users to generate Standard Operating Procedures (SOPs) to integrate business processes directly in the platform. For example, in the case of a detected burst, Waternamics can assist the users to trigger and follow up the different steps required to address the issue: determining the location of the burst, contacting and providing all information to the field crew, and informing customers of current work orders.

Logical connection view:

- Enables exploration of the logical connections between different layers of information, enabling visualisation of connections between customers and meters, meters and connections, and connections to mains.

Standard Operating Procedures: Waternamics allows users to generate Standard Operating Procedures (SOPs) to integrate business processes directly in the platform. For example, in the case of a detected burst, Waternamics can assist the users to trigger and follow up the different steps required to address the issue: determining the location of the burst, contacting the field crew, and informing customers of current work orders.

Logical connection view:

- Enables exploration of the logical connections between different layers of information, enabling visualisation of connections between customers and meters, meters and connections, and connections to mains.

Hotspot analysis: the green polygon represents the network area impacted by an issue.

Hotspot: The platform also includes a Hotspot functionality which can combine different network events (for example SCADA alarms such as low pressure or high flow rate, customer complaints, etc.) to identify critical network areas. This functionality can be used for instance, to cluster low pressure and high flow rate alarms to identify bursts on the network. It can be completely customised directly by the end-users to specify what to look for in terms of assets, geographical location, events, etc.
Use Cases and Benefits

Waternamics is designed to offer numerous possibilities to improve access to contextual information and facilitate water utilities operations. Below are some examples of how Waternamics can be used and what benefits your utility can expect.

Customer call management

> By integrating data related to network operations, work orders and customers, Waternamics provides easy access to all the information required by Call Centre staff to address fault and emergency complaints.
> By automatically clustering customer complaints, network events and work orders (hotspot analysis), Waternamics can help the Customer Service Centre to determine if a fault has already been reported by another customer to avoid duplicate work orders.

Work orders management

> By integrating asset data, customer information and complaints in the same environment, Waternamics provides enough information for operators to detect if issues are the customer responsibility and therefore reduce occurrences of non-necessary work orders.
> By crew vehicle position via GPS tracking, roads, work order locations and traffic conditions in the same platform Waternamics can help the Operation Centre optimise field crew dispatch to increase work order efficiency.
> By having access to street view directly into the platform, operators can quickly assess the location of the job regarding traffic management, parking possibilities etc. in order to minimise the time to spend on site.

Wastewater treatment plant management

> By analysing online and historic data collected at wastewater treatment plants, your utility can optimise its processes to maximise treatment efficiency.
> By modelling the diffusion of odour around wastewater treatment plants, Waternamics can identify affected areas to develop odour mitigation solutions.

Water resource management

> By having access to a simple synoptic view of the water treatment plants, staffs at all levels are aware of all issues and are able to take this into consideration while communicating with customers or dispatching crew on the field.
> By optimising the different water resources according to demand, availability and tariff, Waternamics can automatically determine the best water source to supply a specific area in order to minimise risks of water scarcity and water treatment costs.

BENEFITS

CUSTOMER SATISFACTION
PROCESS EFFICIENCY
ENVIRONMENTAL IMPACT REDUCTION
STAFF SAFETY
FINANCIAL SAVINGS

CUSTOMER SATISFACTION
PROCESS EFFICIENCY
ENVIRONMENTAL IMPACT REDUCTION
STAFF SAFETY
FINANCIAL SAVINGS

PROCESS EFFICIENCY
ENVIRONMENTAL IMPACT REDUCTION
FINANCIAL SAVINGS

FAULT RESPONSE TIME DECREASE
NRW REDUCTION

ENVIRONMENTAL IMPACT REDUCTION
FINANCIAL SAVINGS
Use Cases and Benefits

Drinking water network operations
• By analysing drinking water network data, Waternamics can optimise the location and number of sensors to maximise the efficiency of pressure and water quality sensors on the network.
• By analysing the inflow and outflow rates of network zones (DMAs), Waternamics can detect the network areas affected by leaks in order to prioritise actions to minimise NRW.
• By analysing network asset information and the history of leaks and bursts, your utility can forecast potential future failure and optimise its pipe renewal program accordingly.
• By reporting leaks located by leak noise correlators, your utility can fix small leaks before they become major bursts in order to reduce the volume of physical losses.

Energy management
• By implementing an energy management dashboard to consolidate real-time information of power consumption your utility can optimise energy load to offset electricity price, balance water security and optimise pumps preventative maintenance.
• By analysing energy usage and power tariff profiles, Waternamics can optimise the energy procurement contract to minimise energy costs.
• By integrating data from energy sub-meters with Waternamics energy management module, your utility can identify underperforming assets, detect, and prioritise anomalies such as long terms drift of energy consumption in order to optimise and reduce its energy bills.
• By combining energy usage patterns, power tariffs, and water tank levels, your utility can optimise the schedule of water pumping to minimise costs associated with energy usage.

Water quality management
• By integrating water quality data, network information, and current status of work orders in the same platform, Waternamics can help Water Quality Agents to quickly identify causes of issues and make informed decisions in the case of water quality events.
• By analysing and correlating water quality data from grab sampling or online sensors, your utility can have better insights on the water quality condition in the network and optimise its consumption of chemicals at the treatment plants (e.g., chlorine).

Wastewater network management
• By combining weather forecast, hydraulic modelling, and historic data, Waternamics can predict overflow situations and provide management strategies to minimise the impact of overflow events.
• By analysing and correlating flow and rain gauges data in the wastewater network, your utility can identify sources of inflow and infiltration. This allows the volume of water requiring treatment during storm events to be kept below the treatment plant’s maximum capacity and defer any augmentation investment.
• By modelling the concentration of H2S in the wastewater network, Waternamics can determine areas subject to H2S corrosion and optimise the location of effluent air stream treatment stations.

Digital metering
• By analysing data transmitted by digital meters, your utility can identify issues related to billing, tampering, or under-registration due to incorrect sizing or aging of the meters in order to minimise commercial losses.
• By integrating digital meters’ data, your utility can automatically detect issues beyond the meter to provide better and timely information to customers on their water consumption and potential leaks.
• By triggering early alerts on backflows, your utility can prevent the contamination of the drinking water network to ensure safe drinking water to the community.
Previous Implementations

Prague, Czech Republic

In 2001, Veolia won an international tender for the privatisation of the water operation company of Prague (PVK). Veolia is responsible for the management of the entire water cycle for the city of Prague and its surrounding areas until 2028, serving around 1.4 million inhabitants.

As part of Veolia’s implementation of smart water systems for the city, Prague now has a state of the art management centre, integrating all networks and facilities. Called ‘SWIM’, this system is able to provide complete water traceability and fully transparent operations information. Millions of pieces of data are recorded and sent to SWIM, which provides a global view of:

- Water infrastructure management;
- Production and water consumption monitoring;
- Cost optimisation;
- Incident management;
- Scheduling of preventive maintenance and repairs, and;
- Resource management and information for customers and the general public.

After the first year of operation, improved event monitoring and planning yielded an 8% reduction in the average cost of repairs on the network. In addition, the time taken to repair leaks on the drinking water network was reduced by 80%.

Benefits realised in Prague, Czech Republic

Lyon, France

In 2013, Veolia was awarded the concession contract for water supply to the Greater Lyon area, the second largest French metropolis with a total population of 1.3 million. The tender required a smart water solution that included online sensors on the drinking water network and a platform integrating data from internal and external systems. Wateramics played a major role in this success.

Veolia took control of operations in 2015 and faced several challenges:

- Aging infrastructure: approximately 400 leaks per year;
- Heterogeneous water demand: While the water demand was decreasing in the South East districts of Lyon, the water demand increased in central areas;
- Increasing customer expectations;
- Climate change: the increasing occurrence of freezing episodes and the increase of associated risks of blowing pipes;
- Emerging chemical pollutants: The Rhone River (one of the main sources of drinking water in the area) is no longer considered as a sustainable water source.

The renewed operational contract has focused on innovation and digital solutions, and relies on the provision of Wateramics, together with the implementation of thousands of sensors (including acoustic leakage sensors, water quality sensors, and digital meters) to dramatically increase the performance of the network, improve the efficiency of the field teams, and upgrade service levels to customers.

Benefits realised in Lyon (France) after one year of operation
1. Selecting use cases

Waternamics can be used for multiple applications and it is important to first determine how the platform can be used to benefit the most to your utility. This use case selection is related to individual challenges met by utilities and will be discussed at the beginning of the project during meetings or workshops with the different departments.

2. Assessing the business processes

Once the use cases have been selected, it is of prime importance to start the project by assessing the business processes relevant to each use case considered. For example, if Waternamics is to be used at the Call Centre to enable Call Centre agents to better address customer complaints, it is necessary to first understand the business process that follows from a customer complaint to the reported issue being fixed. It is also required to identify in this phase the main stakeholders (Call Centre agents, Operation Centre, field crews, etc.). During this phase it will also be explored how Waternamics can streamline these processes for the water utility to be more proactive and efficient.

3. Identifying existing data sources and functionalities needed

The modules, functionalities, and data sources that must be integrated in the platform will be identified to prepare for solution design. The availability and quality of the data systems collecting these data sources will then be assessed, for example by investigating where and how the data is stored, at what frequency it is collected, etc.

4. Platform stand up and data sources integration

As the data systems differ across water utilities, the integration effort (in terms of time and resources) will be evaluated. In the case where data integration is difficult or expensive, a range of options with different levels of integration (i.e. different number of data systems) will be offered to your utility.

5. Change management plan

Effective change management is critical to the success of integrating a system like Waternamics into your utility operations. Unless staff adopt and integrate the functionalities into operating processes and procedures, the impact sought, and benefits expected will not materialise. Further, there is also a significant risk that any improvement achieved in the short term may not become sustainable improvements in your utility performance. The adoption of smart approaches, through this tool and beyond, can be expected to necessitate parallel changes in management and decision-making processes (based on access to, and synthesis of information), operational procedures, staff skill and capability requirements, and operational performance.

In parallel to the implementation of the platform Veolia proposes that the most effective approach is to work with your utility in an integrated peer-to-peer manner to support the enhancement of organisational, procedural and personnel capabilities to enable and sustain demonstrable performance improvements. Veolia’s approach to supporting authorities in the implementation of Waternamics as a digital transformation moves beyond the provision of the system, technical assessment and programming phase. Our transformation includes four additional elements that can be customised to the relevant maturity and capabilities of your utility.

To ensure integration, Veolia also work with utilities to design and implement new work processes, to build and support an effective performance management system and to ensure effective project governance, in developing and maintaining supporting communications, and capability building with your utility’s employees including where appropriate, training and coaching of operations and management staff.

Further development

Once in use for the initial suite of capabilities, it is inevitable that your utility will find new and additional functions that Waternamics can help to implement and new optimisations of existing processes that it can be used to enable. At the same time, Veolia and other users will continue to develop more uses and improved analytics that will be made available to clients.

Utilities can build their own capabilities in the development and implementation of new features, and can also retain a commercial relationship with Veolia to capture these ideas, to adopt and adapt new functionalities to address further needs and opportunities as they arise.

Performance partnership

For each utility, the path to procurement and implementation of digital solutions on their road through the digitalisation of the industry will differ. Veolia’s strong preference is to operate in collaboration with adopting utilities as a partner, supporting the development of the solution and its integration into your specific organisation and circumstance to ensure successful implementation and to achieve real and demonstrable benefits and savings.

In doing so, Veolia proposes to share the journey of transformation, including remaining engaged for long enough to ensure success, supporting the process with rigorous measurement and verification of impact, providing demonstrable benefits, and supporting internal performance management.

Such commercial relationships, while resembling in some aspects, alliance type partnerships, are unique in our industry and Veolia strongly recommends that utilities considering Waternamics, or any similar transformational change, consult with the market to explore and develop the most opportune commercial approach.
Urban Pulse

Easier communication between citizens and local authorities

Recognizing the central importance of citizens in the management of public services, Veolia developed 'Urban Pulse' to ease the communication between citizens and public authorities. This mobile application gives urban citizens access to information regarding public services (bus hours, waste collection, water network issues, etc.). Urban Pulse also allows citizens to actively participate in the management of their city. For example, citizens can report bins that need emptying or roads that need repairs. The application has been designed to benefit from usual mobile features, including the possibility to geo-localise issues or attach pictures to help local authorities to fix the reported issue.

Urban Board

An easy access to information for local authorities

Digital transformation is not limited to water utilities but impacts most of public services: waste management, public transports, safety, etc. While local authorities now have access to many data sources, this overflow of information can be overwhelming for fast decision making. To address the need of local authorities to access essential information, Veolia developed Urban Board, a dashboard that only displays the information needed for fast decision making. This dashboard can be entirely customised depending on local priorities and availabilities and can include information on:

- Public services
- Safety
- Transport
- Environment

Operational data can be displayed in many forms (maps, trends, level indicators, video, etc.) to capture all essential information. On top of operational information, Urban Board also displays global citizen satisfaction, based on the integration of social media data.

Urban board and Waternamics

Waternamics has been designed to integrate with Urban Board. Essential data can be transferred from water utilities to local authorities such as city councils, including data regarding the current status of work orders, the number of faults on the water networks, customer complaints, or water quality. Urban board has the potential to ease the reporting effort requested from water utilities to inform local authorities.

Urban Pulse and Waternamics

Urban Pulse can interact with Waternamics by easing the communication between citizens and water utilities:

- Citizens can easily report issues on the water network through Urban Pulse. For example, customers can easily report a burst by sending a geo-localised message to water utilities. The ability to include photographs can also help water utilities to organise the repairs by knowing exactly the magnitude of the burst.
- Citizens are also informed on the current status of the water network and work orders in their area.