

# Infosheet Smart water Grids Thema Wetsus

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**Overview.** The Dutch water supply network is continuously providing very high quality drinking water, and all of this needs to be transported in the water mains. These mains vary in age between being laid today and a century ago, with many different materials and laying methods used. The replacement value of the whole network is estimated to be more than €30 billion, so it is key to carefully replace end-of life parts. As indicated, there is much variety in the quality and operational state of the network: one specific section of the network could be leaking while another section, a metre further up, could be in perfect condition. There is much uncertainty about the quality of these mains, because it is hard to gauge.

Accurate information is vital to be able to predict end-of life parts and to replace them in time, to prevent downtime, keeping the quality of the water high, efficiently deploying materials and effort and assure good operation of the network. New technologies are needed, such as better inspection methods and measurement systems, combining data streams and a bright future look to anticipate for changes, because of the long term investments associated with water mains. The ambition for this theme is to develop methods for the in-line and on-line inspection of water mains, and the ability to make well-founded decisions about the possible replacement of pipelines.

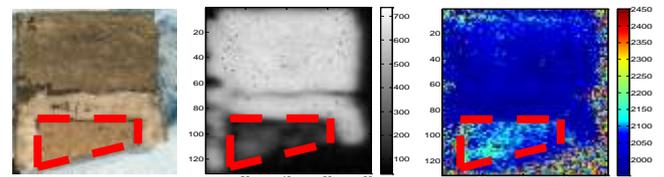
**The Smart Water Grids** theme is a research theme running in the Wetsus framework. It has PhD projects on multiple areas, but they are all closely intertwined and directed towards better asset management. The research in the Wetsus Smart Water Grids theme has delivered good understanding of PVC push fit joint placement in relation to lifetime, the development of a method to characterize PVC material and concrete. Now, new ultrasonic inspection techniques are developed, allowing the condition of pipelines and appendages of concrete and plastics to be determined. The theme initiated the idea of an autonomous inspection robot, with the development of a prototype, this led to a commercial initiative. Data processing research delivers now unprecedented insights from existing data streams and future projects are aimed on better understanding of sensor placement, remotely sensing and predicting the state of the mains.



It is an intellectual-property-bound theme, with member companies Vitens, Brabant Water, PWN and Acquaint B.V. These companies sponsor the scientific research with membership contributions. Together with knowledge institutes University of Wageningen (WUR), the University of Twente and the financial contribution of the Ministry of economic affairs, infrastructure and environment, Northern Netherlands Provinces and the City of Leeuwarden this research is made possible. Within this theme the following projects are running.

**Smart Pipes** is a project wherein a new approach for monitoring water mains based on various know-how disciplines is proposed: it is based upon detecting the operational state of water mains, involving material science, sensor technology and signal processing. Questions are as how many, where and which kind of sensors are necessary to obtain valuable information. The proposed Smart monitoring system is able to inform the asset manager directly about the current state of their assets and will give insight in the remaining lifetime.

In project **Ultrasonic Inline mains inspection**, newly developed ultrasonic inspection techniques are further improved and evaluated, in order to be successfully applied in real life inspection scenarios. Close collaboration with technology partner Acquaint has led to a number of successful inspections using the newly developed algorithms. The ongoing research is continuously improving signal algorithms, which are directly used and evaluated in the field, and results in new insights and inspection methods. In this research it is now possible to successfully detect deterioration in both concrete cement and PVC mains by means of Non-Destructive measurements.



The research objective of the **SMART detection project** is to improve quantitative and qualitative knowledge of operational water mains by data processing, with the aim to extract more knowledge about maintenance efficiencies, (including power usage) and detection of abnormalities and their causes with potential mitigation strategies in the water distribution process. Advanced data processing techniques using recursive algorithms for real-time data-mining and learning are used, and the possibility of back casting data in order to find abnormalities or errors in the sensor data is investigated. The project initially uses the Vitens water distribution process in a restricted area in the province of Friesland (demo site NE Friesland) as a data source.

