

## CASE STUDY

# Improving Water Service through Smart Metering



Deterioration of water pipes and the gap between metropolitan and provincial pipeline networks are among the causes of water loss. Photo credit: ADB.

*Faced with periods of drought, Seosan City in the Republic of Korea uses smart technologies to manage limited water resources and reduce leakages.*

## Overview

Cha-ri, a small village in Seosan City, Republic of South Korea, has a high rate of nonrevenue water at 32%. Nonrevenue water is the difference between the amount of water put into the distribution system and the amount of water billed to consumers.

To prevent water leakage and improve water service, several smart water management technologies, including smart metering, was introduced. As a result, the rate of nonrevenue water was reduced to 10% and customers' water usage was reduced by 55%. The cost for customers was also reduced to about 70%. This amounted to about KRW 610 million (\$514,925) in savings.



National avg.	84.30%	Chung Cheong Nam Do	79.90%
Seoul	95.10%	Jeolla Nam Do	68.50%
Busan	91.70%	Jeolla Buk Do	68.50%
Daegu	91.20%	Gyeong Sang Buk Do	69.00%

Source: Water Supply Statistics 2015, Ministry of Environment

**Table 2: Comparison of the water flow rates from 2015 and 2016  
(Cha-ri Water Supply Area, Seosan City)**

Water Flow Rate	March	April	May	June	July	August	September
2015	59.20%	63.50%	62.20%	71.20%	65.60%	73.80%	71.50%
2016	62.50%	73.40%	69.40%	73.20%	70.40%	88.40%	90.20%
Variation Rate	?3.4%	?9.9%	?7.2%	?1.9%	?4.8%	?14.6%	?18.7%

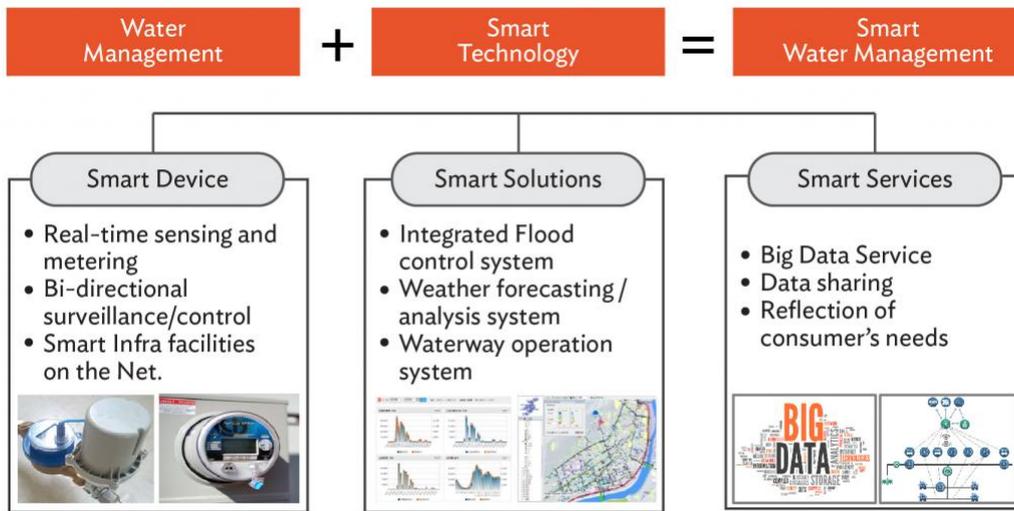
Source: K-water internal data.

## Solutions

In 2016, the Seosan city government asked K-water, which operated the local waterworks system, to install a smart metering system as part of measures to cope with periods of drought.

Smart water management technology is essential as it allows operators to use real-time information to cope with the challenges. It is comprised of three main categories—smart devices, smart solution, and smart service. Each category provides essential monitoring tools, including real-time sensing and metering, control systems, and data service.

**A future-oriented water management strategy by ICT-based, for securing the stability, safety and efficiency of water**



Smart metering is the technology that transfers flow rate, pressure, and water quality data to the monitoring center in real-time. The use of digital meters and Internet of Things (IoT) technology as an alternative to traditional analog meters allows operators to read meters remotely as well as manage the water usage rate in real-time. The smart meter monitoring program analyzes usage, abnormal flow, and indoor leakage from the metering information, and provides usage and tariff information to customers through the internet and a mobile application. Hourly data was transmitted four times a day through a paging network system in Cha-ri Village.

Previously, flow pressure and water pressure were managed in one District Metered Area. With the application of smart meters, the District Metered Area is divided into three to five Sub-District Metered Areas. The management of the daily water flow rate enables quicker responses. Smart metering makes it possible to quickly identify leakage locations to quickly correct inaccurate or damaged meters, reduce supply costs, improve asset management efficiency, and ultimately enhance customer satisfaction. Immediate detection can reduce leakage from burst pipes and reduce NRW.

In Seosan City, improvements were made by installing smart metering and creating nine Sub-District Metered Area systems within the existing two District Metered Areas. Nonrevenue water analysis was conducted daily. It was previously done on a monthly basis. Water flow monitoring was expanded to 12 branches from only three.

Also, through the smartphone application, the level of customer satisfaction is evaluated.

## Results

After installing smart metering, intensive leak detection was carried out on vulnerable sections, reducing flow meter errors. Upon comparing the flow rate in the District Metered Areas and the total flow rate of the water supply area in Cha-ri, a difference of 430 cubic meters per day was found, inflow meter failures were detected, and flow meters were substituted.

After analyzing the patterns of both seasonal and hourly customer usage through smart metering, water pressure management is now conducted hourly. Automatic control of the decompression valve through

Supervisory Control and Data Acquisition facilitates adjustment according to usage, depending on seasons and holidays. There is now greater flexibility in managing the response times required to address complaints of service failure. Installing the first smart metering system in June 2016 resulted in a nonrevenue water rate of 10% from 32%.

With the indoor leak detection improved, the nonrevenue water rate was reduced, and customer satisfaction improved. The control system allows for the analysis of customers' usage patterns according to the time of day. It also provides a "leak suspicion" alarm that enables inspectors to quickly visit a site and take recovery action if a leak is detected. This has resulted in approximately 55% reduction in customers' water usage and a consequent 70% reduction in cost to the customer.

Based on the results of the operation monitored over 2 months, the net financial benefit is expected to be about KRW 610 million over the next 8 years with a 20% improvement in the nonrevenue water rate and a reduction in water leaks of 190,000 cubic meters every year.

## Lessons

In a large area where the population is spread out, dividing District Metered Areas into small blocks using smart technologies can improve effectiveness and efficiency of water management.

Conducting capacity building programs to train experts for leakage detection, instant recovery, and analysis of collected water data is also recommended.

To know more about consumer needs, and promptly address their concerns, there should be active communication between water network operators and consumers.

## Related Links

R. Frauendorfer and R. Liemberger. 2010. The Issues and Challenges of Reducing Non-Revenue Water . Manila: Asian Development Bank.

Development Asia. What Is Smart Water Management?

Development Asia. Sustainable Water Management for Smart Cities



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Hanyong Cho is the manager of the Local Water Supply team at K-water. He has over 24 years experience in planning and managing the construction of water supply and tidal power projects. He

passed the Fundamentals of Engineering Exam administered by the National Council of Examiners for Engineering and Surveying. He is currently responsible for managing the water supply system in Seosan City.



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Chijun Park is the manager of Local Water Supply Modernization Project team at K-water. He is interested in Construction/Management of water supply facilities, and construction technology standards. He graduated from Chonnam National University, and has a Professional Engineer license in Civil Engineering Execution.

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