Integrated Water Supply Information System

Abstract - Introduction

The monitoring of hydraulic operating effects (flow, pressure and water consumption), remote reading of consumption and the detection of water and energy losses within the water supply distribution network all need to be the components of the same integrated water supply information system, and not mutually independent solutions, independent even of the model of the water supply system. This article focuses on the reasons for the mutual dependence of these components and their dependence on the model of the water supply distribution system, and the need for their integrated planning and development.

1. Components of an Integrated System and Their Interdependencies

1.1 Distribution Network Model

Objectively speaking, the results of a model with the assumed characteristics of a water supply network are as valuable as the direct assumptions of these results. More realistic results can only be obtained with models that rely on the actual characteristics of a given network. However, this requires the calibration of the model and the identification of actual network characteristics, but this is not possible without the telemetry of hydraulic operating effects, consumption readings and the detection of water and energy losses within the water supply distribution network. At the same time, using a model of the distribution network determines the reference points and zones of telemetry, reading and detection of hydraulic operating effects, consumption and water and energy losses in the water distribution network.

Fig. 1 Model of the water supply distribution network
1.2 Telemetry of Hydraulic Operating Effects in the Distribution Network

Hydraulic operating effects of a water distribution system (pressure, water flow and consumption) are realized within the areas of distribution and the distribution network itself. The water level, flow and pressure conditions on the network's boundary facilities (pumps and reservoirs) are the causes and consequences of the above operational effects. Therefore, the measurements of these conditions solely in these boundary facilities do not provide the information on the operating effects of the water supply. In short, if the operational effects are not measured within the network, they are unknown, and if they are unknown, they cannot be managed. At the same time, measuring these effects provides the data needed for the calibration of the model of the distribution network and the data necessary for balancing the consumption and water losses in the AMR and DMA zones of the network.

![Telemetry of hydraulic operating effects in the distribution network](image1)

Fig. 2 Telemetry of hydraulic operating effects in the distribution network

1.3 AMR/AMI – Automatic Meter Reading of the Water Consumption

Modern legislation favors laws and policies which allow for consumers to be charged only for what they actually consume. It also requires that all consumers be given free and easy access to their real-time consumption and unit pricing information. These policies are only implementable using Automatic Meter Reading/Advanced Metering Infrastructures (AMR/AMI), processing the data and its publication in real-time. At the same time, this produces data on water losses on the consumer side of the watermeters, data on water consumption in the representative blocks of the watermeters of the telemetry system and data to calibrate the model of water consumption and the model of the distribution network.

![AMR/AMI – Automatic meter reading of the water consumption](image2)

Fig. 3 AMR/AMI – Automatic meter reading of the water consumption
1.4 Detection of Water Leaks from the Distribution Network

Successful reduction of water leaks is not possible solely through relying on spontaneous or experience-based occasional patrols of the distribution network. Since water leaks change in time and space, they also need to be constantly automatically detected and localized. Once properly detected, the water leaks can be verified, located and effectively treated by sending "pinpoint" crews to more restricted areas. Detecting water leaks from distribution networks at the same time results in the correction and completion of the AMR/AMI system data and the water consumption model data, major water leaks telemetry data and data to calibrate model of the water distribution network.

Fig. 4 Detection of water leaks from the distribution network¹²

2. Integrated Communication Network

Due to maximizing the compatibility of all components of an integrated water information system, the above should be in the same communication network. Due to safety and the exclusion of potential external influences, it is preferred that it be a closed private communication network. To ensure the constant availability of the communication channel and a two-way packet transmission of large quantities data over long distances, it is desirable that it be a private TCP/IP network. Due to the spatial spreading of the distribution network and its reference measurement and sensor points, it is desirable that it be a wireless network with high signal coverage. Due to the cost of development and use, it is desirable that the communication network be based on an existing public infrastructure and the services of an existing professional operator. All the above requirements can be fulfilled by using an already existing GSM communication network and its GPRS/EDGE/UMTS protocol.

3. Practical Experiences

The development of such systems has already begun in several European countries. The development was also initiated in a single waterworks in Croatia. This, however, led to certain restrictions, which might not be specific only to Croatia.
Today’s market already offers many diverse solutions, from the already outdated, conceptually ill-conceived or merely partial solutions, to the sophisticated sensor integrated solutions for the telemetry, detection, monitoring, control and security of water distribution systems. Those making the final decision find it very difficult to assess which of the solutions could lead to a rational, efficient and reliable solution to their problem as a whole. This is often why the already begun development of such a system is neglected or, due to some specific reasons, even diverted, so that it is finally abandoned and left without any actual and exact results and effects.

In short, it is shown that, first and foremost, waterworks need to be rapidly trained in order to accept new technology more quickly and to better find their way through the plethora of different offers, in order to make independent and rational decisions and independently lead their projects to their successful, rational, efficient and reliable implementation.

Related links:

- Integrated GPRS Telemetry, AMR/AMI and Leak Detection in Water Distribution Network
  Coprogram Ltd. Zagreb, Croatia
- Why integrated Telemetry, AMR/AMI and Water Leaks Detection System ?
  Coprogram Ltd. Zagreb, Croatia
- Modern methods of reducing water losses and causes frequently poor results of their applicatione
  Coprogram Ltd. Zagreb, Croatia
- IWA/AWWA Balance Methodology and Water Supply Information System
  Coprogram Ltd. Zagreb, Croatia
- Energy Loss in the Water Supply Distribution System
  Coprogram Ltd. Zagreb, Croatia


2 Companies Itron Inc. and Sensus GmbH. are given a permissions to use their graphics illustrations, in the background of figures: 2,3 and 4.

Copyright © 2012 Coprogram Ltd. All rights reserved.