

Reduction of Apparent Losses Using the UFR (Unmeasured-Flow Reducer) – Case Studies

Sharon Yaniv, Ph.D*

*A.R.I Flow Control Accessories, Kfar Charuv, 12932, Israel, 972-4-6761612,
Sharon@ari.co.il

Abstract

The demand for water is increasing due to population growth and technology development whereas water is becoming a scarce resource. There is an urgent need to find innovative solutions for water loss in water supply systems. Apparent losses (often referred to as non physical, paper losses or commercial losses) are in many cases the most expensive water losses that a water system will encounter. The water meter is the cash register of the water utility and therefore any losses occurring from the meter or the handling and processing of the data there after will be lost at sales revenue value per unit of measure. There are four major reasons for apparent losses: meter accuracy curve error, data transfer errors, data analysis errors and unauthorized consumption. Water meter accuracy error is considered to be a significant component of the apparent losses in a water system. The error curve of the water meter can affect the unregistered water volume. Every meter type has its own rate of decay of the accuracy with time. The meter may be influenced by external parameters such as the quality of water (scale, sand etc.) and suspended particles. Most water meters don't measure low flow rates (less than 12 liters per hour), consequently the uncertainty about their real performance at low flows will always be greater than at higher flows. The innovative solution, *UFR (Unmeasured-Flow Reducer)*, is a product of A.R.I. Flow Control Accessories. Its main objective is to reduce the apparent losses by changing the flow regime through the water meter at low flow rates. At low flow rates there is not enough energy in the flow to activate the water meter register. The UFR begins to operate at very low flow rates and creates batches of flow that the water meter can measure. Due to the change in the mode of water flow to batches, the UFR enables the water meter to measure low flow rates. The UFR regulates the water flow so that there is no water flow at all part of the time, while the rest of the time, the flow is high enough to be measured. Changes in the flow discipline at low rates allow the existing water meter to measure at all water flow rates passing through it. When the flow rate increases over the water meter's measuring threshold, the UFR remains permanently open, so that it does not interfere with measurements. The UFR also acts as a non-return valve and prevents backflow (it closes when the downstream pressure and upstream pressure are equal). The UFR is designed in such a way that the pressure difference required to open it is more than that required to keep it open. The pressure difference to open the UFR is 0.4 bar, whilst the pressure difference to keep it open is 0.1 bar. When a leak develops (a flow rate below the measurement threshold of the water meter) the downstream pressure drops. When the downstream pressure drops below 0.4 bar of that of the upstream pressure, the UFR opens and allows for a flow rate above that of the measurement threshold. The free flow of water through the UFR equalizes the pressure across the UFR and allows it to close. The continuing leak downstream to the UFR will make this operation repeat itself over and over again. Every time the UFR opens, a quantity of water passes through the water meter at a flow rate above the measurement threshold of the water meter and so the flow is

measured. In order to determine the contribution of the UFR the following steps were taken:

1. Selection of a DMA (district metered area) consisting of reasonable number of meter connections with a single feeding source with a main master meter.
2. Establishing the current water loss without UFR by comparing the reading of the main meter with the sum of the domestic meters.
3. Installation of UFR - and re-measuring the difference between the readings of the main meter and the sum of the domestic meters.

The case studies conducted around the world showed that leakages and other unmeasured water flows at low flow rates were found in many of the households tested. The UFR succeeded in the reduction of unmeasured flow and was found very effective in reducing apparent losses. The UFR had a significant effect on the flow registration of the water meter; it increased the water meter registration by 5% to 10%.

Keywords

Apparent losses, UFR, water meter accuracy curve error.