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Water loss in Timişoara

Dascălu Oana Denisa[1] Florescu Constantin[2]

Abstract: The paper analyzes the loss of water in the city of Timisoara. Reducing water losses in its distribution represents a significant economic task. Loss detection saves resources, ensure quality and reduce costs. Leak detector must be an integral part of the strategy of the institution. It must be well organized. For this you must use specially trained staff and experienced companies. Loss detection results should be documented in a statistical damage and thus the basis for systematic renewal of the distribution network. It is recommended that initiation detection of losses and training to be done in cooperation with companies producing equipment.
Keywords: corrosion, damage, defects, loss of water

1. INTRODUCTION

Continuous monitoring of water losses in water supply systems is important for operators as it has influence on economic performance and relational consumers.

Water losses in distribution systems have multiple implications on the functioning of the need for technological equipment including treatment increased capacity , the additional costs due to increased energy consumption and reagents drinking water , environmental protection through reduction of water supply, energy pollution and seepage .

2. CAUSES OF WATER LOSS

Factors influencing the water lost in a delivery system are :

A. THE AGE OF DISTRIBUTION NETWORKS

As the life span exceeds length , the losses are greater. According to statistics from France , water losses are more than 50 % of the volume transported on networks with a length of more than 50 years, and according to statistics from Moldova and Ukraine, the volume of water lost in a network with a length more than 50 years of operation may be approx. 60 times the volume of water lost to commissioning.

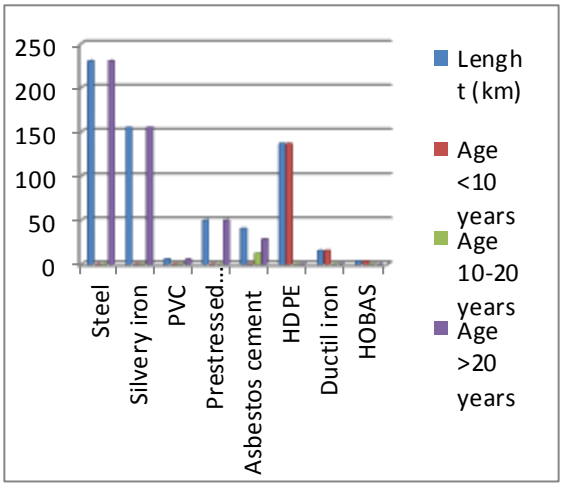

Figure 1. Current state of water distribution networks

In Timisoara, over 20% of water pipes have ages exceeding 50 years. In addition to physical wear , also appears another kind of aging . The materials that were used extensively in the past, have become over time less and less used , replaced with new ones. With the development of the city, silvery iron pipes , made since 1914 could not provide the required flow for new consumers . These pipes with diameters between Ø50mm and Ø150mm , have other problems , such as shearing and tearing pipes due to temperature changes. The damage thus generated is significant , given the weight of about 30% of their global network of the city.

B. THE MATERIAL USED FOR THE IMPLEMENTATION OF DISTRIBUTION NETWORKS

In the historical development of water distribution networks materials used were: silvery iron , asbestos cement , steel, prestressed concrete , PVC, HDPE, ductile iron and composite materials (HOBAS - fiberglass) . Over the years it was found that old water networks made of silvery iron or asbestos cement pipes are susceptible to external factors (traffic, improper bed laying and filling , etc.) , factors leading to the occurrence of transverse cracks . The variation of water temperature , especially in winter, the supply of water to the surface its temperature falls below 4 ° C, the tube length is reduced and cracks appear in the joint area .

[1,2] Politehnica University of Timişoara, Departament of Hydrotechnical Engineering, George Enescu Street, no.1A, Zip code 300022, Timişoara, Romania, e-mail: o.dascalu@yahoo.com ; constantin.florescu@upt.ro

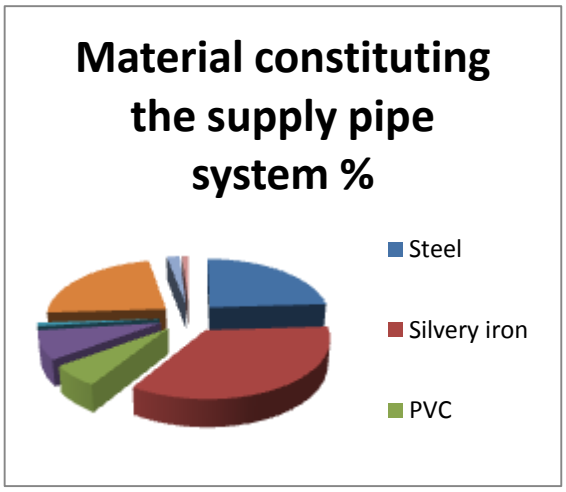

Figure 2. Material constituting the supply pipe system

It is noted that 73.77 % of the current distribution network of Timisoara is constructed of steel, silvery iron, prestressed concrete, PVC, cement, with a lifetime of over 30 years. Aging water distribution networks made of steel leads to obstruction of the tube, resulting in increased water velocity and consequently increasing losses by the need to increase pressure pump or the corrosion of the tube, thus reducing its wall thickness , cracks and thus increase loss of water.

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Inside these pipes are produced deposits that modify the coefficient of roughness, negatively influencing hydraulic parameters of flow rate and pressure. Successive stops and starts and any change leads to dislocation flow regime deposition and water staining. After each stop is necessary to wash the pipes to remove water suspensions. The presence of the suspension has a negative impact on consumer perceptions, raising doubts on water quality.

C. LOCATION AND EXECUTION OF WATER DISTRIBUTION NETWORK

Bad execution laying bed water distribution networks and fillers may in time lead to uneven subsidence causing cracking tubes. In time this can be aggravated by other factors, such as aging network sensitivity soaking ground , groundwater aggressiveness , variation in groundwater levels, location of road network in the system .

In Timişoara generally occurs due to damage locating water distribution networks in more than 50 % below the road with heavy traffic and very hard , also the corrosion process is accentuated by the change in groundwater levels found in connection with the Bega River that crosses the middle of the town from East to West.

D. CORROSION OF WATER DISTRIBUTION NETWORKS

In Timisoara drinking water comes from two sources , over 70% comes from surface water source , Bega river , characterized by varying the salt content of the rainy to the dry period , but relatively low limits and high variation of temperatures 1 º C to 26 º C , the rest comes from aquifers , characterized by relatively constant salinity and temperature .

Internal corrosion is a complex phenomenon and is affected by various factors including : the quality and composition of the water carried , the change in temperature , the biological activity . Water aggression is manifested particularly on water distribution networks between the treatment plant and the consumer, materialized by both corrosion and destruction of network and distributed by altering water quality .

External corrosion is given by the corrosivity soil is influenced by the following parameters : the chemical composition and the content of clay in the soil , aerating the diffusion of oxygen and the presence of the variation in the groundwater level , the pH and buffering capacity of the soil , the soluble salt content , content of the microbiological, organic , electrical conductivity and stray currents induced by power lines in the absence of cathodic protection .

This phenomenon occurs especially in Timisoara, where the length exceeds 134 km of tramway lines and the length of the distribution network of steel tubes is around 154 km , located in the general vicinity of tramway lines , the influence of stray currents which are generated by direct their movement being facilitated by the configuration of the soil and groundwater .

E. OPERATING MODE OF DISTRIBUTION NETWORKS AND PRESSURE AT WORK

Pressure is an essential element on which depends the amount of water loss . The volume of water lost is proportional to the pressure , the proportionality coefficient depending on the size and shape of the openings through which water is lost . In variable pressure distribution network throughout the day according to consumption , thus resulting in a variation in water loss . As night water consumption is reduced and consequently the pressure in the system is large, the volume of water that is lost through holes is greater. Frequency pressure variations in the system is important in " fatigue " corroded areas of the tubes and finally produce new damage , and this is accentuated by surges . Age of the pipes contribute to increasing the number of failures in systems with pressure fluctuations .

Pressure management in the city began in 1999 when it was put in function the pressure monitoring system of water distribution network. Through 24 transducers mounted 24 key points of the distribution network pressure was monitored continuously. Acquired data are transmitted to an on-line central dispatcher (DC) through radio stations installed at each point. Monitoring and storage of data is done using a software application. This monitoring system has been optimized and developed in 2009-2010 by increasing the pressure monitoring points at 32 and transmitting data to DC. But this mode, on / off or

manual adjustment of the pump did not solve completely the pressure variations in the system which is why in 2002 was put in command and control system for water distribution equipment consisted pumps water distribution in the most important. Pumping station provides 70% of its water, static frequency converter thus ensuring at all times required flow and pressure by increasing or reducing the speed of the rotor. The order to reduce or increase the speed of the rotor is given by the variation of the pressure to set point pressure taken pressure monitoring system.

The main benefits derived from these investments in addition to reducing specific energy consumption were:

- maintaining a constant pressure in the distribution network regardless of consumption;
- reducing shock to the system caused by starting / stopping the pump and consequently repeated reduction of damage in pipelines;
- reducing water losses by maintaining a constant pressure to the minimum level set and establishes a program of day and night.

In Timisoara pressure management ensures control the system pressure and maintain it's relatively constant through the automation of pumping stations and establishing operating conditions day and night.

F. DENSITY OF LINKS PER KILOMETER OF DISTRIBUTION NETWORK. BRANCHING, FOUNTAINS, HYDRANT

The main assets that make up a water distribution network that are directly related to the pipe body are fountains , hydrants , taps and fittings . The higher their density is, the risk of loss is greater. They depend on achieving quality joints and restoring quality outdoor protection .

G. NUMBER OF DAMAGES. THE QUALITY AND TIME OF EXECUTION REPAIRS

Number of damages depends largely on the age of the network , the tube material , the location and construction of distribution networks for corrosion, operating and working pressure and external factors those household interventions on groundwater. The volume of water consumed is directly proportional to the number of accidents, during the remediation of damage , type and form of damage , pipe size and pressure.

This activity is monitored and kept under control in the area of operations by introducing a performance indicator which requires that:

- 75% of damage dispute should be resolved within 24 hours of notification;
- 20% of the damage can be solved notified within 2 days of the notification;
- Only 5% of cases the damage can be solved within 3 days of the notification.

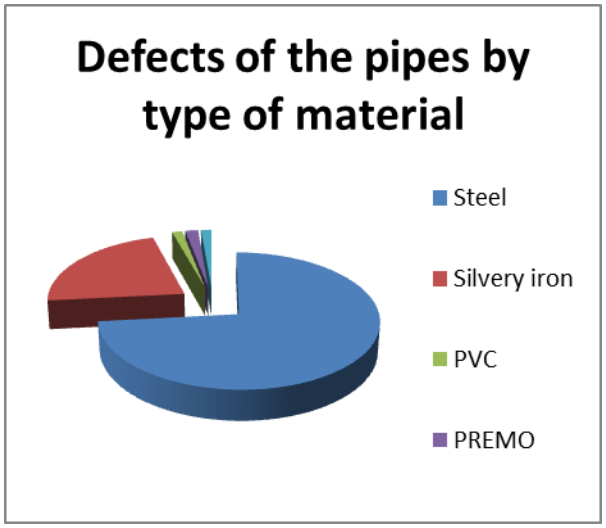

Figure 3. Defects of the pipes by type of material

4. WAYS TO REDUCE LOSSES

- Ongoing modernization of the pipeline;

Of the total length of the distribution network of 650 km, so far 300 km have been replaced. The asbestos cement pipes will be replaced priority.

- Installing pressure relief valves;
- Dividing of the distribution network in zones and subzones (DMA - District Metered Areas);

DMA is an area for distribution system specifically defined (usually by closing valves), and in that the quantity of water entering and leaving the area is metered. The water pressure is analyzed to determine the level of losses in the area to allow the loss seeking to determine which most beneficial location to conduct water loss is.

- Water monitoring networks by inspecting the apparatus to detect losses (cracks, faults).

The active control of losses is made by the periodical or regular listening of the pipes. This method is probably the most common method for detecting losses. The method is based on the capture of vibration that occurs when the water comes out through an orifice of a pressure pipeline. To locate leaks in water distribution networks are generally used the noise of water pressure out through the breach. Output fluid through the gap leads the generation of acoustic waves, which are worn on both the water column and on the pipe walls. Sound waves are transmitted through the water column at both ends sinusoidal.

Where the waves reach the pipe material that vibrates. It is the sound vibrations produced in the pipe. The more sound waves away from the source, the weaker they become. There is a point where the waves in the water column cannot reach the material. To this is added the quality of the soil, its density, it is made of pipeline material, the mains water pressure, the diameter of the pipe and other factors.

Management information system is the basis of this active control of losses. Depending on the information stored in the system one can make a prioritization analysis showing a list of the most

urgent actions that should be made. In most cases, this means scheduling inspections and monitoring activities of the network. Depending on the result can be made immediate repairs or change the original program according to information derived from network inspection.

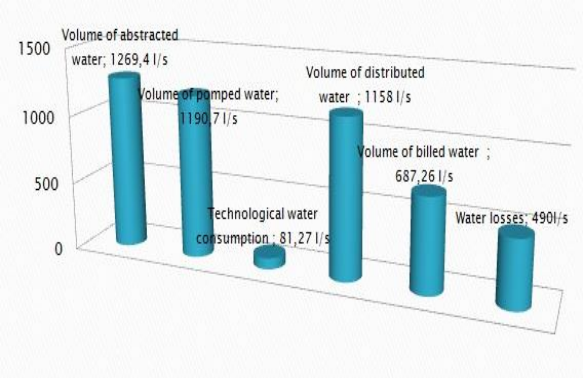

Figure 4. The volume of water entered the system and water losses

3.CONCLUSIONS

The water supply in Timişoara is provided from surface water Bega rate by 2-4 Water Works and groundwater through Water Plant 1 and Plant Water 5.

Sources captured by gravity or by pumping, are undergoing a process of modern drinking water , and the water is sent to consumers via pumping stations arranged in waterworks .

Compensation flows between the captured and consumed is via tanks in waterworks .

The existing system has been designed on the distribution required population and consumption situation existing industry before 1989. Situation is reflected by the difference between the flows captured in 1989 of 3600 l/s and the ones captured in 2012 of1200 l/s

For this reason the operation of the distribution system should be made with consideration of the required interventions for cleaning pipes , in order to avoid sedimentation and stationary for more than seven days in the water pipe .

Highlighting these issues was made in Figure.4 of which emphasize :

Following the analysis, resulted the following conclusions :

• water losses in the distribution system are 41.61 % , about 5.6 % above the limit of SR 1343/1-06 (35%) ;

• technological consumption represents 6.4 % of the flow captured , which comes under SR 1343/1-06.

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