Construction Maeconomics Conference 2014

DISTRIBUTION OF DRINKING WATER IN THE REGION MORAVSKOSLEZSKY

Marek Teichmann[1], Frantisek Kuda[2]

[1]*VSB – Technical university of Ostrava, Faculty of Civil Engineering, Department of Urban Engineering, L. Podeste 1875/18, Ostrava – Poruba, 708 33, Czech republic, Teichmann.marek@seznam.cz*

[2]*VSB – Technical university of Ostrava, Faculty of Civil Engineering, Department of Urban Engineering, L. Podeste 1875/18, Ostrava – Poruba, 708 33, Czech republic, frantisek.kuda@vsb.cz*

Abstract

The paper deals with the distribution of drinking water in the Region Moravskoslezsky, discusses the development of water needs and the current, often quite unsatisfactory condition of structures which ensure the supply of water, which are an integral part of every state, city or town, without which it would not be possible in this area today inhabit . These buildings directly affect the comfort setting urbanized area throughout its life, it is essential therefore to realize that their continuous functionality we depend on each and limit the functionality brings with it not only the limitations set standards, but also affects public health and hygiene. It is therefore necessary to ensure their constant management, maintenance and renewals, without impeding the sustainable development of the city.

Keywords

Distribution of drinking water; network losses; Region Moravskoslezsky; water consumption; water supply.

Introduction

Water in the MSR is from 97,8% to ensure surface water from water reservoirs Kruzberk, Sance and Moravka, the others being more local underground sources of water. In the 90 years, these resources are often overloaded, and for this reason there was a gradual interconnection supply many of these resources and potential fluctuations or failure for individual sources are thus stabilized and can complement each other. From these sources is collected raw water, which is brought into the drinking water treatment plants, where it is further transported by distribution feeder to the storage tanks at the areas of consumption where it is either stored or discharged directly into the grid, which is delivered to the end consumer. [1]

Development needs of Drinking Water

In the Czech Republic and especially in the Region Moravskoslezsky in recent years seeing a rapid drop in demand for drinking water, which is mainly due to economic conditions, decreases in industrial production, and the use of efficient appliances or by reducing water losses in water supply network. The decrease in drinking water supplies is illustrated in load on each surface raw water sources.

It will be appreciated that a need has decreased from 1990 according to Figure 1 in more than half to today be required to produce about 2 m3 / s less. This fact brings both positive and negative impacts. The positive impacts include lower utilization of existing resources and the completion of hazing, restriction of rights to development investments in water resources, or the option to cancel some less problematic sources for its redundancy. Reduce the need for them, however, brought a number of negatives, two of the main problems with the existing oversized pipe possessing small operating pressures. Thanks to that carried water in water supply network delays much longer, which negatively affects the quality and the risk of harmful substances. You can also negatively perceived decline in economic needs, which will increase costs for the production of one cubic meter of drinking water and of course increase the price of water. [1]

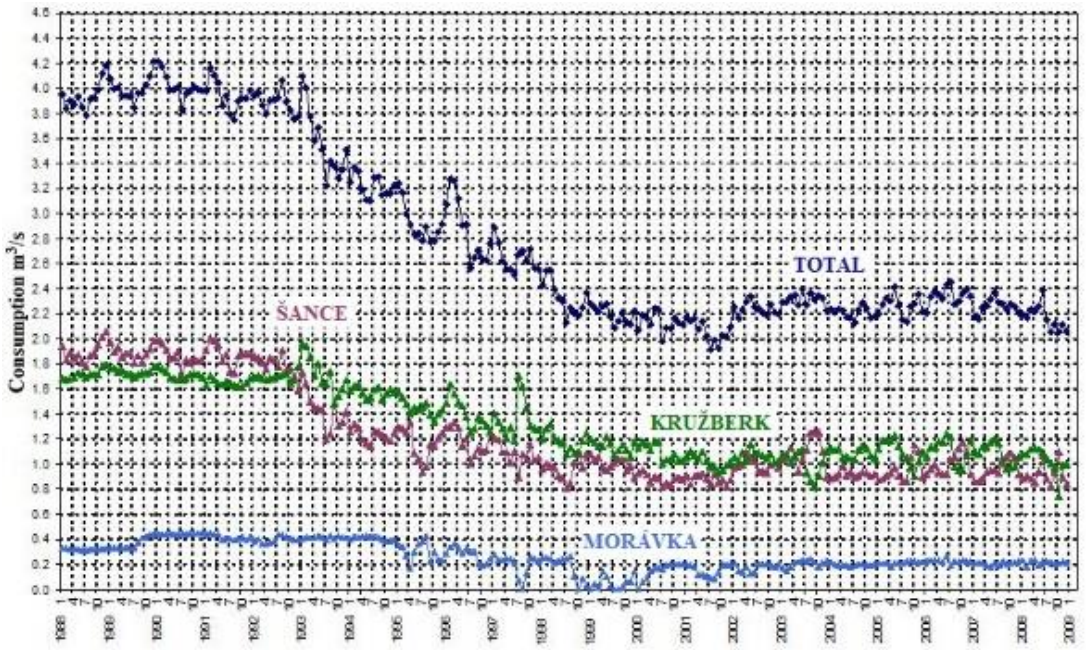

Figure 1: Development of consumption from water reservoirs in the Region Moravskoslezsky [2]

The current status of buildings for drinking water supply

It is important to realize that the biggest problem in drinking water today represents the actual water distribution network in the areas of consumption. While a building for example, to collect water from a source of drinking water treatment plants, pumping stations, etc. undergone extensive modernization, the actual distribution network was more extensively modified in any way and thus remains largely intact. The following Figure 2 shows that the greatest losses occur just in the distribution network.

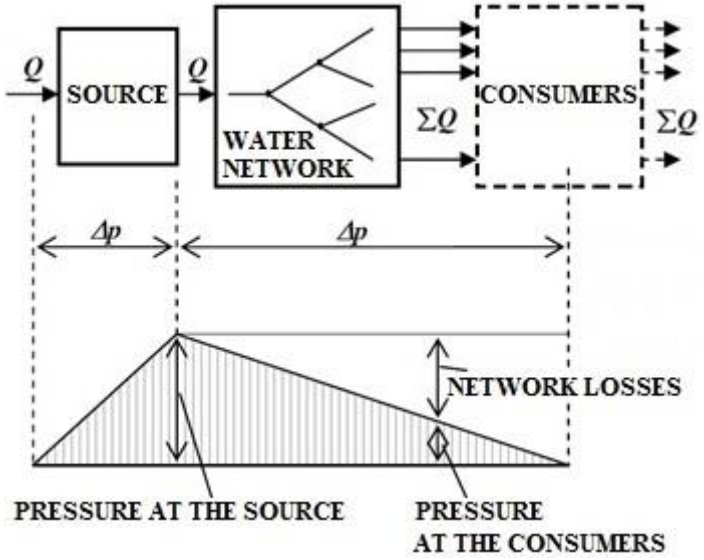

Figure 2: Progress of losses in the system of water supply [3]

Buildings for drinking water supply are an important segment of the city, but nowadays not contribute to the sustainable development of the city as they should, which is mainly due to the current state of these buildings , which often does not match the legislative requirements set incorrectly administration, maintenance , coordination. It is also wrong setting the overall concept of these structures, mainly due to the continued growth of the cities, resulting in a constant editing of existing networks, their configuration or building new networks. Often these works are carried out largely improvised and often arise as construction ills that may in the years to cause considerable problems. These infrastructure construction and loses its originally stated systematic and become quite confused mixture of routes, which is very sensitive to the emergence of potential failures and accidents. [4], [5]

It is necessary to note that the construction of water supply, as well as other buildings are not designed with an indefinite useful life and is necessary to calculate the wear, which of course entails considerable investment in maintenance and rehabilitation. The very life of these structures is dependent on many operating pressures, which can include materials such as natural aging, poor quality materials, poor or unskilled labor for installation, but also the poor implementation of the management and maintenance, changes to operating pressures, or changes in their characteristics and Last but not least, the effects of external factors, namely for dynamic effects, pressure, but also the effects of root penetration, stray currents, etc. As a rule, the building is subject to the combined effects of these influences at once and life is so reduced several times faster. Recently, however, more frequent cause of failure of utilities is a mechanical disruption of the implementation of the modification or reconstruction of neighboring networks, where their earthworks extend up to the protected area network side, which is mainly due to poor synergy between the administrators or bad Devising network. Today's legislation imposes a mandatory process documentation as the last phase of actual construction and the manager's obligation ends, respectively, remain in it, whether new

interventions management documented. It is therefore necessary in the implementation of the new construction project to make precise geodetic survey of nets in a given territory to determine their condition, then transfer this data into digital form and then keep all the information up to date and reliable. [4], [6]

Management, operation and maintenance of buildings for the supply of drinking water in this concept can not be understood only as a simple process of mapping the routes of these utility lines, or their exchange. The correct solution is necessary , all data on all elements of the public space, not just their planimetric data , but also data Altimetry , the depth of a , possibly saving scheme , the materials used , their dimensions , age , repair, modification , or actual cuts in street profiles . These data must then be the maximum extent possible accurate and up to date, because the only way we can achieve effective results. It is therefore important to ensure the verification of such data, since their re- tracing entails considerable expense.

Effect of aging and wear material thus dramatically reduces the service life of these structures and gives them a gradual increase expended funds for repairs more frequently occurring disturbances. The following Table 1 shows that the water distribution networks in the Czech Republic escapes average more than 20 % of distributed water and Slovak , it is even 32 % water. It is, however, that in fact these losses may be much larger. In addition to these leaks caused mainly material penetration or leakage connections are also often encounter problems of flow profiles affected by corrosion, clogging or blockage even , which often has the effect of possible hydraulic losses. It is therefore clear that the constant improvised repair solutions are already insufficient and need to proceed to the renewal of technical equipment of the city. [6]

Table 1: Overview of the state of system water supply – a comparison of Czech Republic and Region Moravskoslezsky

Year	Area	The proportion of the population supplied with water from water supply (%)	Water producted in total (th. m^3)	Water producted intended for implementation (th. m^3)	Water invoiced in th. m^3		The proportion of losses of water produced for implementation (%)
					total	of which households	
2006	ČR	92,4	698 673	694 716	528 070	337 410	20,7
	MSK	97,5	93 420	85 109	67 405	45 310	16,3
2007	ČR	92,3	682 804	679 169	531 697	342 417	18,6
	MSK	97,3	90 220	82 252	67 362	45 204	14,2
2008	ČR	92,7	667 114	664 483	516 479	332 439	19,4
	MSK	97,8	87 799	80 133	65 553	43 779	14,6
2009	ČR	92,8	653 338	649 018	504 613	328 490	19,3
	MSK	97,9	85 344	77 840	63 947	43 923	14,5
2010	ČR	93,1	641 783	636 362	492 542	319 582	19,7
	MSK	98,4	84 330	76 322	61 816	42 159	15,5
2011	ČR	93,4	623 059	617 421	486 019	317 163	18,5
	MSK	99,9	82 048	75 245	61 921	42 418	14
2012	ČR	93,5	623 534	616 444	480 745	315 875	19,3
	MSK	99,7	84 045	76 329	60 484	41 015	17,1

Conclusion

As already described above, in the present state of the distribution network of drinking water in poor condition and need to proceed to its recovery. A well planned renewal of technical equipment is of strategic importance for the sustainable development of the city. There is therefore almost inevitable use of sufficiently high quality facility management, which will be relevant in the long term

building control and manage. Using the most advanced facility management tools with the highest possible and most accurate amount of data about managed buildings can be achieved very good optimization of individual network hardware and associated structures, which naturally brings considerable financial savings. At the same time as we are able to model the service life of engineering structures and strategically plan their timely recovery, which can prevent potential failures and accidents on construction of technical infrastructure.

In the case of accession to the renewal of the technical infrastructure of the operator is forced to consider possible alternatives, which are primarily dependent on the actual condition of individual buildings which do not comply mainly due to the leakage of material or individual communications, breach of the walls and the like. Following the decision of the administrator then either proceed only to the reconstruction of existing lines, or complete recovery. Decide whether these actions will be carried out in an open trench or use of trenchless technologies. The actual decision is not a simple process, as you need to consider many criteria, including in particular economic aspects of each solution. It is therefore necessary to take into account not only financing of the work itself, but also the associated costs, which may be for example the cost of temporary use of public spaces, diversion, etc. It is also necessary to take into account the condition of urban public spaces and pay attention to the use of such procedures to the maximum possible extent avoid unnecessary damage or disruption of other elements found in this area.

Acknowledgement

This work were supported from the funds of the Student Grant Competition of the VSB – Technical University of Ostrava. Project registration number is SP2014/140.

References

[1] Information on: www.smvak.cz [online]

[2] Information on: www.pod.cz [online]

[3] STRAKOS, V.: *Optimization of engineering network*. Ostrava: VSB – TUO, Faculty of Civil Engineering, 2003. ISSN: 0474-8476 (in Czech)

[4] SRYTR, P. ET ALL: *Civil Engineering 2*. Prague: Academia, 2001. ISBN: 80-200-0440-8. (in Czech)

[5] TEICHMANN, M., KUDA, F.: Program renewal of technical infrastructures. *Správca bytových domov*. Kosice, Slovakia: V.O.C. Slovakia, s. r. o., vol. 6/2013, pp. 6-8. ISSN: 1336-7919. (in Czech)

[6] TEICHMANN, M., KUDA, F. and PROSKE, Z.: Emergency supply of drinking water. *Applied Mechanics and Materials*. Pfaffikon, Switzerland: Trans Tech Publications Ltd, Vols. 580-583 (2014), pp 2346-2349. ISSN: 16609336. DOI: 10.4028/www.scientific.net/AMM.580-583.2346