

ISSUES OF CHANNEL LOSS EVALUATION IN WATER SUPPLY SYSTEM

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Abstract

This article considers the problems of the efficiency of the work of water supply companies serving the urban settlements connected with the huge channel losses. An attempt was made to evaluate channel losses through their classification according to the type of occurrence in water supply system and peculiarities of their accounting features and existing problems and to present priority measures aimed at reducing water losses in the system and increasing their efficiency.

Key words: water supply system, water loss, technical loss, commercial loss, technological loss.

Introduction

The issues of increasing the efficiency of water supply systems (both technical and economic) is of strategic importance to any service provider of water supply. One of the most common indicators of efficiency assessment is the level of unaccounted water or losses the current high level of which (average loss rate in Yerevan is 80-75%) is a serious problem for both service providers and individuals and user entities as those losses are partially compensated by inclusion in tariffs. The high level of water losses in the system also leads to an increase in direct operating costs, deterioration of

the financial and economic indicators of the organization, overload of powers and the occurrence of artificial water shortages.

Conflict setting

Considering that the solution of the above-mentioned problem is essentially highlighted aimed at further development of the sector, raising tariffs and increasing the financial viability of the system organizations, the classification of losses and the development of a separate action plan for each group is significantly important.

Research results

Water losses in water supply system can be classified into three main groups:

1. Technical losses (losses due to crashes and system exploitation),
2. Commercial losses (with illegal joints, water losses conditioned by stealing and as a result of incorrect or dishonest activity by water supply company or due to not including physical and legal consumers in the base of organization of water user etc.), i.e. losses occurred among consumers or unaccounted consumption.
3. Technological losses (dam washing, losses due to current technologies), i.e. losses happening during production and transportation [1].

“Veolia Water” Company which serves Yerevan has recently started and still continues to carry out zoning works of water supply network of the city in order to reduce technical losses. It supposes that each zone must be effectively separated from the other zones, pressure regulating valves must be installed, channel losses must be identified and pipes must be replaced which are in the worst condition. As a result of these works it was possible not only to reduce channel losses but also to ensure constant daily water supply.

Despite the above mentioned reforms, “Veolia Water” company is unable to solve one of its main problems - the high level of water losses much of which is the result of events classified as “commercial losses”.

All these are conditioned by:

- ✓ Low level of competency of the staff,
- ✓ Lack of application of modern knowledge and methods,
- ✓ Insufficient cooperation of technical and commercial services,
- ✓ Weak flow of information inside the organization,
- ✓ Absence of sufficient information for making effective decisions,
- ✓ Low level of interest towards the final results of the activity,
- ✓ Insufficiency of control system and responsibility of implementing governmental decrees,
- ✓ Aimless use of investments etc.

In this case the reorganization of the organizational and legal structure of any organization is considered to be the only effective method of solving the problem. It implies the transfer of the right to carry out a certain part of the company activities to another private company or companies.

As a result of current zoning of the city water supply network it became possible to accurately record the amount of incoming and outgoing water to each zone, each such zone can be considered as a separate potential area the operation of which can be transferred to another private company by concluding a relevant contract with the CJSC “Veolia Water” which will provide the water supply for

the users, collection of fees and necessary construction works to ensure the continuous water supply of the given zone.

In this case CJSC “Veolia Water” provides the necessary amount of water for the given zone, accounts the wholesale price, defines the norms which should be supported by the given private company and takes control over it [3].

Private companies are obliged to comply with the established norms which will mainly be related to the water supply network of the population, the quality of the supplied water, the collection of payments and the deadlines for eliminating crashes etc.

It is necessary to pay special attention to the issues of staff training and professionalism. Serious and effective incentives and sanctions need to be developed. One of the best ways to reduce business losses is to give your employees a sense of ownership over the company.

As for technological losses, it is not correct to consider them as a complete loss as it includes the inevitable and useful costs of water which must be taken into account when assessing the efficiency of the system. These costs are the own needs for the operation of the system structures: urban economy, fountains and water consumption for firefighting needs, watering of landscaping areas etc. In this case the company should not physically include those costs into the section of losses but should develop appropriate standards through which it will be possible to accurately record the actually consumed amount of water and to receive a corresponding payment from the state or state agency.

Currently water losses in Yerevan water supply system are considered to be evaluated as the difference between annually produced and consumed water amount in percentage in the following expression:

$$K_1 = \frac{Q_{pr} - Q_s}{Q_{pr}} \times 100\% \quad (1)$$

where

Q_{pr} - produced water amount (mln m³/year),

Q_s - consumed water amount (mln m³/year).

Expression (1) factually also assesses the efficiency of system work but this method of evaluation has certain shortcomings [2].

1. The expression (1) cannot accurately describe the dynamics of the change in channel losses from the system as it includes only the change in the amount of consumed water. The reduction is not taken into account in the formula as it leads to the simultaneous reduction of counter and denominator. As a result, the percentage of reduction in losses can be very small which actually happens.
2. It is not correct to consider the difference between the produced and consumed water amount as a complete loss. This includes the unavoidable and useful water costs mentioned above which should be taken into account when evaluating the efficiency of the system (as a result of studies these costs comprise 4,8% of the amount of produced water).

The amount of water actually used for the normal operation of the system but not accounted by the operating organization is accepted as normative loss while it should be taken into account when determining the cost-effectiveness of the system in assessing the efficiency of the system with clear criteria and scientifically based calculation methodology.

Water losses in the internal networks of apartment buildings also play a significant role in the structure of water losses in the water supply system. The deplorable state of the internal water supply and sewerage of apartment buildings (most of them are buildings built during the Soviet Union whose

internal water supply and sewerage has never been repaired) leads to many accidents especially during the winter. There are often misunderstandings between the population and water supply organizations regarding the non-detection of accidents in time and their elimination in terms of responsibility for the elimination of accidents. Although the service of apartment buildings is placed on the municipality, district offices and in some cases condominiums, we think that the water supply company should review its strategy of checking the amount of water entering the buildings.

Absolute reliability of the data of water meters in apartments is perceived as an axiom. At the same time the water meter is designed as a device to measure the amount of consumed water during the reporting period (months) according to the passport costs of the device. This period is defined by the device passport and according to the relevant standard. Based on the requirements of the standard, manufacturers produce A, B and C class water meters for domestic use (Class C meters are more accurate but quite expensive and have practically no demand). The most common are devices with a diameter of 15 mm. For classes A and B the minimum passport consumption is 60 and 30 liters per hour (for class C it is 15 liters), therefore the water meters are not sensitive to flow at a minimum speed. As a result, when the flow rate is below the sensitivity limit, the meters do not record it at all. Reducing the sensitivity limit of water meter is not beneficial for producers as the latter increases production costs, increases sales prices and reduces sales amounts and profits. The consumer, in his turn, is interested in purchasing a water meter with a higher sensitivity limit at a cheaper price. It should be noted that only the amount of losses from the entrance of the building to the consumer section is estimated at about 55%, 15% of which comes from the internal network pipes of the building and 40% comes from the inaccuracy of the metering device [2]. The research conducted by the experts of Moscow State University of Construction showed the following: water consumption in each apartment during the day has discrete character in average which means “technological consumption” with open taps and “outflow consumption” with closed taps. The duration of “technological consumption” is only 1-2% of the total time of the day (24 hours), during the rest of the day (98-99%) the water entering the apartment is consumed due to outflow. Even in the case of a small amount of long-term outflow, the total amount of water can underestimate 705 liters of water per day (30 liters - 24 hours x 0,98) at 98-99% of the time and at a water meter with a sensitivity limit of 30 liters [4].

Summarizing the above mentioned, we can conclude that there is a huge amount of water consumption in the area outside the service limit of the water supply company which is attributed to “water loss” due to the lack of accounting.

Conclusion

The first step in controlling uncounted water losses should be to draw up a real balance of water production and consumption and assessment of the economic efficiency of the reduction work.

The issues of the company needing urgent solutions are:

- Clarifying of bordering point and regulation of issues of further operation of inner network of water supply and canalization,
- Implementation of necessary legal amendments for clarifying responsibilities and rules of installation of water meters, their service, measuring and substituting and final decision of the problem,
- Development of scientifically justified methodology of evaluation of uncounted water amount in water system,
- Clarifying of further activities of checking water meters,
- Regulating water supply procedure aimed at antifiring and fire ceasing activities,

- Regulating water utilization from fountains,
- Monitoring of water supply network, clarifying the customer base and strict control aimed at reducing commercial loss in the system etc.

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ՋՐԱՄԱՏԱԿԱՐԱՐՄԱՆ ՑԱՆՑՈՒՄ ՀՈՍԱԿՈՐՈՒՄՆԵՐԻ ԳՆԱՀԱՏՄԱՆ ԽՆԴԻՐՆԵՐԸ

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Շուշիի տեխնոլոգիական համալսարան

Դիտարկվում է քաղաքային բնակավայրերը սպասարկող ջրամատակարար կազմակերպությունների աշխատանքի արդյունավետության հիմնախնդիրները կապված համակարգում առկա ահռելի մեծ չափսերի հասնող հոսակորուստների հետ: Ջրամատակարարման համակարգում ըստ առաջացման տիպի ջրի կորուստների դասակարգման միջոցով փորձ է արվել գնահատել դրանց ձևավորման և հաշվառման առանձնահատկությունները, առկա խնդիրները և ներկայացնել առաջնային միջոցառումներ ուղղված համակարգում ջրակորուստների նվազմանը և արդյունավետության բարձրացմանը:

Բանալի բառեր. ջրամատակարարման համակարգ, ջրի կորուստ, տեխնիկական կորուստ, առևտրային կորուստ, տեխնոլոգիական կորուստ:

ПРОБЛЕМЫ ОЦЕНКИ УТЕЧЕК В СЕТИ ВОДОСНАБЖЕНИЯ

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Рассматриваются проблемы оценки эффективности работы водоснабжающих организаций, обслуживающих городские населенные пункты, связанные с имеющимися в системе утечками, достигающими чудовищных размеров.

В системе водоснабжения путем классификации потерь воды по типу происхождения была предпринята попытка оценить особенности их формирования и учета, имеющиеся проблемы и представить первоочередные меры, направленные на снижение потерь воды в системе и повышение эффективности.

Ключевые слова: система водоснабжения, потери воды, технические потери, коммерческие потери, технологические потери.

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