

AUDITING AS IMPORTANT ELEMENT OF MODERN WATER SUPPLY AND SEWAGE SYSTEMS MANAGEMENT

The water supply and sewage segment is element of municipal infrastructure, in particular technical infrastructure, and water supply systems, are components of critical infrastructure.

We can say therefore that water supply and sewage segment task is to provide public services with municipal nature (water supply and removal of sewage belonging to water supply and sewage services), strategic importance (mainly water supply in crisis situations), and social nature (water supply for fire fighting or people and assets safety).

Keywords: water supply and sewage, operation systems, reference model, integrated model, auditing.

1. Introduction

Water supply and sewage systems determine and, at the same time, demonstrate economic development on their area. They also demonstrate the country's economic development. Therefore efficient and effective management of such huge assets as water supply and sewage systems requires modern management methods for their operation.

This paper presents auditing concept as modern management method for water supply and sewage systems operation. Generally, auditing is process of checking conformity of active operation system with reference models (e.g. operation system reference model, legal acts, operation standards, etc.). Therefore water supply and sewage system operation auditing is particularly important as it concerns operations related to water supply (strategic nature) and sewage removal (sanitary nature). The role of auditing in developing technical progress in water supply and sewage system operation is very important as – in consequence – it allows to eliminate anomalies and to improve their operation and therefore it allows to reduce operation costs which have high impact on water supply and sewage system development.

2. The purpose and tasks of water supply and sewage system operation

The water supply and sewage operation system constitutes the set of organization, technical, technological, economic, legal, ecological and social activities, fulfilled by teams of people according to sustainable development rule, using scientific methods and good operation practices aimed to utilize water supply and sewage objects and facilities according to their purpose in order to satisfy human needs as concerns water supply and sewage services. Therefore the main goals of water supply and sewage system operation include [1, 2]:

- usage;
- supervision (mainly as concerns goal fulfilling control
 - water quantity, pressure and quality and sewage flow rate, duct filling and sewage velocity),
- service (consisting in maintaining technical efficiency of water supply and sewage components),
- renovation (intended to restore technical efficiency of water supply and sewage objects and facilities).

Whereas, the main tasks of water supply and sewage operation systems include:

- supply of water in proper quantity, under sufficient pressure and with required quality, as well as removal of sewage and neutralization of sewage deposits,
- effective and rational management of water supply and sewage facilities,
- reduction of operation costs,
- environment protection.

The following drawing presents graphic illustration of water supply and sewage operation systems goals and tasks 1.

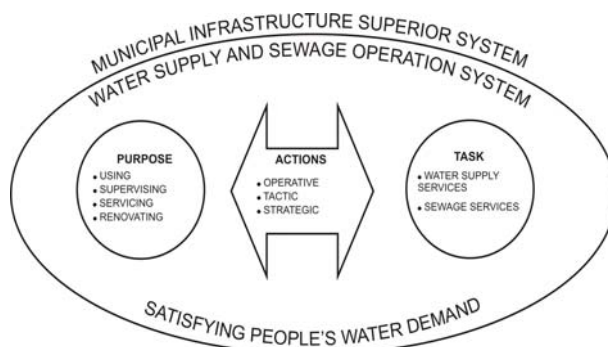


Fig. 1. Graphic illustration of water supply and sewage operation systems goals and tasks

The water supply and sewage operation systems objectives and tasks are fulfilled by organization units which operate in various legal forms (government water supply and sewage enterprises, commercial companies, budgetary agencies, etc.).

3. The common and distinguishing features of water supply and sewage operation systems

The more important common features of water supply and sewage operation systems include such features as complexity, hierarchization, dynamism, inertia, randomness and variety of events occurring in systems, uncertainty, high level of complication of individual processes and high level of automation. It is illustrated by Figure 2.

Whereas, features which differentiate water supply and sewage operation systems include:

- different functions;
- different operation conditions and, consequently, different parameters describing operation condition,

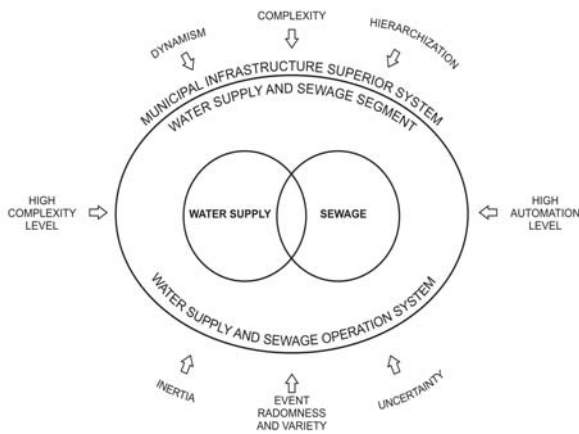


Fig. 2. Diagram of selected features specific for water supply and sewage operation systems

- different physical, chemical and bacteriological properties of conveyed agents (water and sewage);
- different operation process status models.

The last of mentioned above feature, i.e. different models of water supply and sewage operation process conditions, is particularly interesting [3]. It is illustrated by Figure 3.

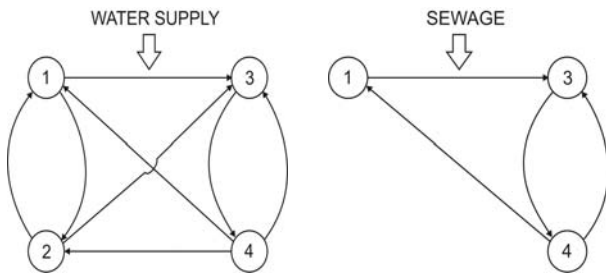


Fig. 3. Diagram of water supply and sewage operation process graphs [3]. Designations: 1 – operation, 2 – standstill, 3 – waiting for renovation, 4 – renovation

The difference in models of water supply and sewage operation process conditions results from fulfilled by them functions, that is: continuous water supply with standstill ability and not disrupted sewage removal precluding standstill situation. This results in different ways in designing sewage operation systems where actions aimed to maintain continuous sewage removal shall be provided.

4. The water supply and sewage operation system auditing concept

The essence of water supply and sewage operation systems consists in detailed examination of system operation in relation to adopted models, such as operation system reference model, legal acts in force or defined operation standards [4, 5].

Whereas the main goal of water supply and sewage operation system auditing is verification of conformity of implemented activities with reference models and, in case deviations are found, indicating specific correction actions and their profitability. Figure 4 presents concept for sequence of actions in water supply and sewage operation system auditing.

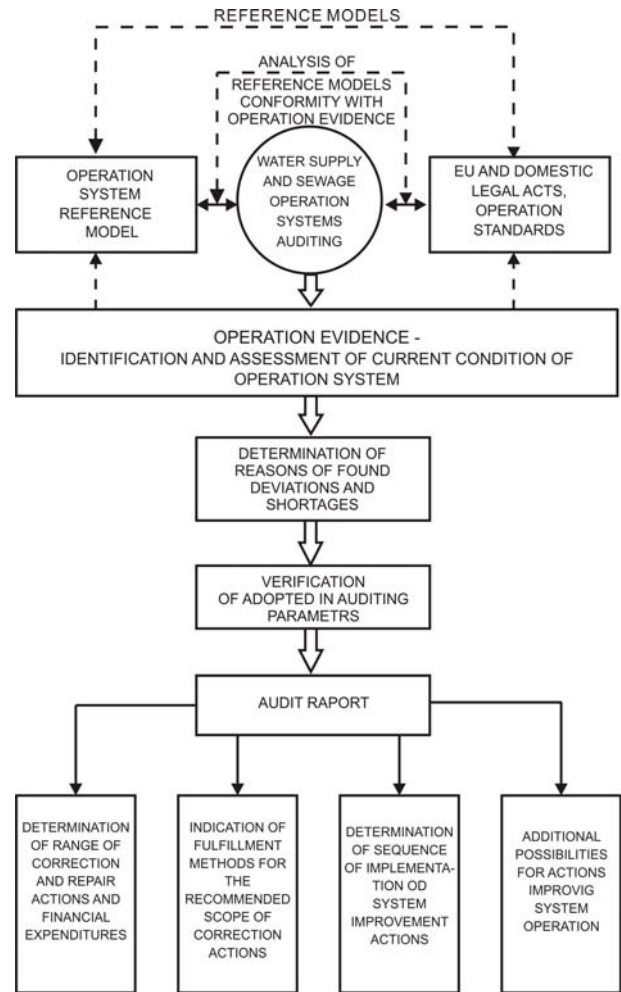


Fig. 4. The concept of water supply and sewage operation system auditing process flow

The application of water supply and sewage operation system auditing provides continuous verification of conformity of the examined system with the adopted reference models. It allows also for elimination of irregularities on the current basis.

The operation system reference model may have modular structure (e.g. organization, technology, controlling, etc. modules) corresponding to size and complexity of the examined system. The discovered and documented facts, gathered during observation, meetings with operation personnel and research in operation process constitute operation records.

The water supply and sewage operation system auditing is not control or evaluation. It is necessary to have attitude for checking correctness and consistence of procedures with the adopted reference models.

5. The proposal of positioning of auditing in water supply and sewage operation system structures

The structure of operation system complex model shall include such elements as: designing, implementing, verifying, operating, which shall be understood as the basic ones. Auditing, controlling, certifying and accrediting belong to the modern elements of operation system development [6-9]. Figure 5 illustrates

sequence of construction of complex model of water supply and sewage operation.

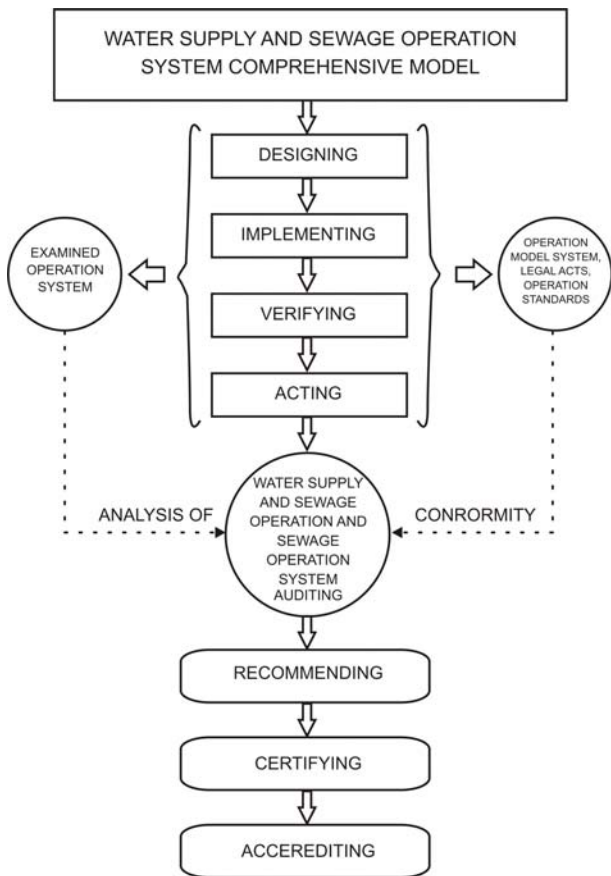


Fig. 5. Diagram of concept of complex model of water supply and sewage operation system

The main purpose for water supply and sewage operation system deigning is satisfying water demand of people by providing water supply and sewage services in long-term, reliable, safe, effective and efficient manner. Figure no 6 presents proposal for algorithm of complex model of water supply and sewage operation system.

The presented algorithm of complex model of water supply and sewage operation system includes all elements of modern management of such huge assets as water supply and sewage facilities.

6. Summary and conclusions

The provided discussion allows to say that efficient, effective and rational management of water supply and sewage operation system, based on modern scientific methods and applying modern techniques, such as auditing, shall secure reliability and safety for provision of water supply and sewage services. It also guarantees the high quality of provided services related to satisfying water demands of people. Even this superficial review of operation problems concerning water supply and sewage demonstrates their importance and conforms their significance for correct functioning of towns and villages and for economic development of country.

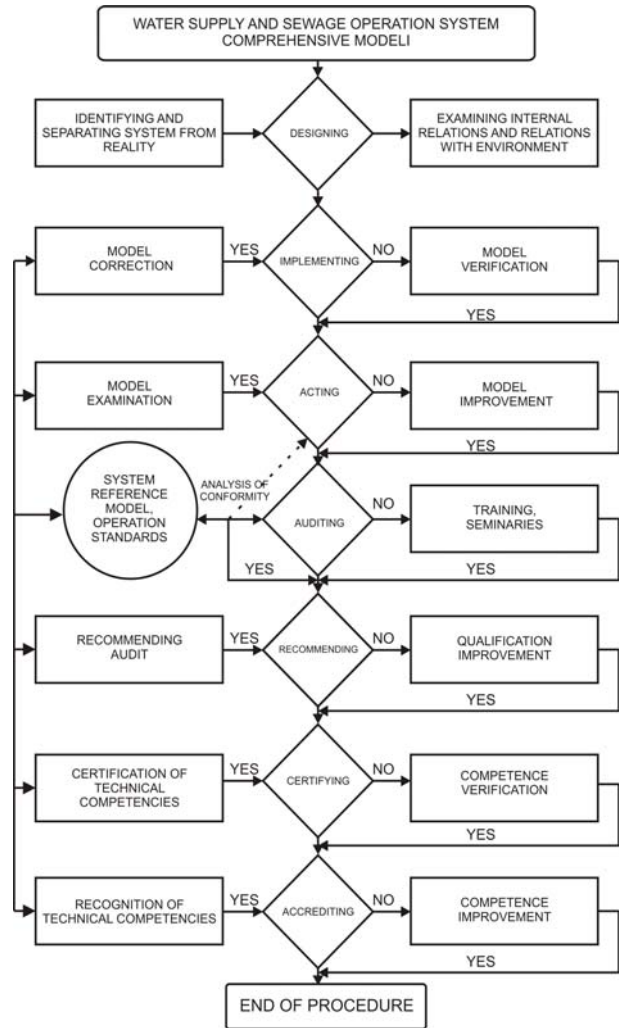


Fig. 6. Diagram of concept of algorithm of complex model of water supply and sewage operation system

The following conclusions are expressed in final summary:

1. The water supply and sewage operation system auditing constitutes the modern method for management of such resources as water supply and sewage facilities.
2. The auditing substance consists in checking conformity of the examined water supply and sewage operation system with the adopted reference models (reference operation model, operation standards, EU and domestic legal acts).
3. The presented auditing concept has cognitive nature with possibility of application in operation practice.

7. References

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