Analysis of key points and corresponding effects of the construction of water-saving institutions

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Abstract. The construction of water-saving institutions is an important part of the implementation of the priority policy of water-saving. In view of the current situation of the construction of water-saving institutions in Zhejiang province, the main problems in the constructions were summarized, and the key points of the constructions were put forward, which is of important reference significance to construct the water saving institutions. The main progress and experience was introduced and the water saving effect was analysed based an application case, which has a promising future for application.

1. Necessity of the construction of water-saving institutions
China is well-known for its shortage of water resources. The amount of water resource per capita in China is only 1/4 of the world average. The shortage of water resources constrains the economic and social development in the current and future. The construction of the water saving society is fundamentally a new solution of water conservation problems according to the priority policy of water-saving [1]. The construction of the water saving units is the main content of the construction of the water saving society [2]. Zhejiang province has carried out the construction of the water saving institution among the public institutions since 2014 according to the national deployment. The objects of water saving institutions involves government department and public institutions, such as schools, hospitals, hotels, etc. These institutions are special in the high density of people, the easier work of water saving and the water saving works and the significant demonstration. The construction of water saving institutions can not only provide experience to the society, but also be beneficial to improve the awareness of water saving in the whole society.

2. Standards and key points of the construction

2.1. Standards of the construction
According to construction standards of water-saving institutions published by the Ministry of Water, National Government Offices Administration and National Water Conservation Office, combined with the actual situation in Zhejiang province, Zhejiang Government Offices Administration, Department of Water Resources of Zhejiang Province and Water Conservation Office of Zhejiang Province published the notice of the construction of the water saving institutions in 2014, which provides the objects, the goals, the process of the declaration and the review, and the review content. In the same time, the construction standards of provincial water saving public institutions in Zhejiang province was published, which provides that the full marks is 105 points, only if it gets 90 points or better can be evaluated as a water saving institution.
2.2. Main problems of water saving diagnosis

Through the establishment of water-saving units for more than four years, there are still some problems in the water management and water-saving engineering construction of each institution, mainly as follows: ① the water consumption is borne by the unit, and the amount of water consumption has nothing to do with the water users, which results in low water-saving awareness, insufficient water-saving power or constraints; ② the measurement and monitoring facilities are not complete. The allocation rate of water monitoring facilities of secondary water consumption units is less than 50%, and the third level monitoring facilities are seriously insufficient; ③ the investment of water-saving projects is insufficient, the water-saving facilities are not complete, and the popularity rate of water-saving facilities is not high; ④ the management system and working system are not complete, the subject of liability is not clear, the maintenance management is not timely, and the phenomenon of leakage is widespread; ⑤ the utilization rate of unconventional water is insufficient. The construction of rainwater collection and utilization facilities and reclaimed water reuse facilities lags behind, and tap water is used for institution greening and road cleaning, which is seriously wasted.

2.3. Key points of the construction

2.3.1. Water-saving projects and equipment construction are the foundation. The construction of the water saving engineering and equipment mainly focus on reducing the leakage rate of pipe network and the selection of water-saving facilities and equipment. First of all, priority should be given to the selection of high-quality, solid and durable pipes for pipe network transformation, so as to reduce the leakage of pipe network; second, improve the popularity of water-saving facilities and equipment, focusing on Water-saving Transformation of faucets, squatting toilets, showers, dish washing and dishwashing equipment; third, efficient water-saving irrigation facilities such as sprinkler irrigation, micro irrigation or pipe irrigation should be selected for the planting in the institution, so as to reduce water waste.

2.3.2. The measurement and monitoring system of different areas and levels is the key point. The construction of measurement facilities in different areas and levels is the key point of water-saving institution construction. It is not only the need for the completion of water monitoring rate index, but also the premise and foundation for carrying out water-saving diagnosis in different areas. The construction of measuring facilities shall be in accordance with the requirements of general principles for the allocation and management of water monitoring facilities in water using units (gb24789-2009), so as to realize the full coverage of primary meters (water using units), secondary meters (secondary water using units) and tertiary meters (water using equipment). It is suggested to carry out the construction of monitoring facilities at the same time during the construction of metering facilities, and promote the construction of intelligent water management system in combination with the Internet of things, big data and other intelligent tools, so as to realize the real-time and time-sharing assessment and diagnosis of water-saving in different areas and levels.

2.3.3. The construction of water-saving management system is the core. Although the number of people in an institution is not large and the scope is not large, the role of each person in water-saving work is different. Only by establishing and improving the working mechanism, management system and reward and punishment measures, can we make everyone clear their responsibilities and tasks. Through macro system construction such as water-saving working mechanism, water-saving target responsibility system and assessment, and micro system construction such as patrol inspection, equipment maintenance, water planning, etc., a water-saving management system with clear responsibilities, specific tasks and targets, and evidence of rewards and punishments is formed.

2.3.4. Publicity and education are the guarantee. Through full participation and colorful publicity and education, all employees will further enhance their awareness of water saving, fully understand relevant
laws, regulations and policies, and systematically master water saving knowledge and key points. And through all the staff promoting their families, people around, and even the whole society's awareness and atmosphere of water saving, they can participate in water saving from the thought, to the action.

2.3.5. Unconventional water use is supplementary. We will encourage the development of unconventional water use technologies focusing on rainwater collection and utilization, and try to use unconventional water sources for greening irrigation and road cleaning.

3. Application case

3.1. Introduction to the institution

An institution covers an area of 5300 m², which has three office buildings and a total building area of 11000 m², including 6200 m² for building 1, 3300m² for building 2 and 1600m² for building 3. According to the water structure and layout of the institution, it can be divided into four main types of water consumption objects, namely, office (including: toilet, domestic water in boiling room), canteen (food, tableware cleaning and cooking water), car washing (car cleaning water) and green cleaning water (green irrigation, site cleaning water). The number of water users in this institution is 266, the total amount of water used in the previous year is 15040 m³ respectively, and the daily water consumption per capita is 125 L / (P.D).

The main problems in water use and management of the institution are analyzed, including three aspects: first, the construction of water-saving projects lags behind, including: Measurement and monitoring facilities, popularization of water-saving facilities and equipment, precise control measures, etc.; second, the water-saving management system is incomplete, which is manifested in: the main subjects of water-saving responsibility is not clear, the management objectives are not clear, and the management system is not complete; third, The construction of unconventional water utilization systems lag behind, such as rainwater collection and storage, air-conditioning water, reclaimed water and grey water reuse, so is the construction of water-saving irrigation system for greening.

3.2. Construction of water-saving projects

According to the current water consumption situation, the construction of water-saving projects includes the following steps:

3.2.1. Measuring facility project. Second level and third level water meters should be installed on the floors of building 1, building 2 and building 3, as well as the functional areas such as car washing, canteen, green cleaning and fire fighting, so as to realize the full coverage of the building, functional areas, floors and important equipment metering facilities. The third level metering equipment rate is 100%. The water meter has the function of data remote transmission and data access to the intelligent water management system.

3.2.2. Water saving facility transformation project. Repair, transform and update the existing water use appliances and equipment, check the rationality of each water use appliance parameter (water output, water outlet time) through testing, and improve the water use efficiency of water use appliances by adjusting local water pressure, water outlet aperture and other measures.

3.2.3. Reconstruction project of water supply with different quality. The toilets on the first floor and the second floor of building 1 and building 2 with high frequency and large water consumption are selected to transform their water supply network. Rainwater and air conditioning condensate are collected as toilet flushing water to realize water supply of different quality and improve the utilization rate of unconventional water.
3.2.4. Canteen water equipment renovation project. Purchase efficient water-saving dishwasher, dishwasher (drying, disinfection integration).

3.2.5. Pump house monitoring and control equipment engineering. It is composed of dispatching center, pump station monitoring center, communication platform, pump station remote measurement and control terminal, metering measurement, frequency converter and other equipment.

3.3. Construction of water-saving system
According to the construction requirements of the water-saving unit, combined with the current situation of the unit, the six systems will be improved focusing on the working mechanism, supervision and management, daily production management and protection, and water use links. See Figure 1 for details.

3.4. Intelligent water management system
The intelligent water management system is mainly composed of four modules: 1) leakage monitoring module: water leakage profile analysis of pipe network, with tree and ring pipe network area modeling leakage monitoring function; 2) balance test module: online real-time balance analysis, online period balance analysis (within a specified period of time), with output water balance test analysis table and statistical table function; 3) pump Room module: online monitoring of various pump operation parameters, including water pressure, flow, voltage, current, frequency, etc. Control the start and stop of the water pump, control the water inlet or drainage of the water pool or water tank; 4) water pressure module: monitor the water inlet pressure, outlet pressure and the most unfavorable point water pressure of the pipe network, monitor the fire pump outlet pressure and the most unfavorable point water pressure.

3.5. Water-saving effect
Through the construction and operation of water-saving system, the water-saving awareness of the institution has been significantly enhanced, the water-saving work system has been fully implemented, and all water-saving work has been carried out in an all-round and orderly manner. Combined with the construction (or transformation) of water-saving projects and the application of intelligent water management system, the unit's water use efficiency and water use level have been significantly improved. The per capita comprehensive daily water consumption has decreased from 125 L / (P.D) to 79.2 L / (P.D), the replacement rate of unconventional water is 21%, and the leakage rate of pipe network is 0.77%. The water-saving effect is significant.

4. Conclusion
The construction of water-saving institutions is an effective way to promote the construction of water-saving society. It is of great significance to improve the water-saving concept and consciousness of the whole society. The construction of water-saving institutions should grasp its key points, that is, the construction of water-saving projects and facility is the foundation, the construction of regional and hierarchical measurement and monitoring system is the key, the construction of water-saving management system is the core, and the publicity and education is the guarantee. The application of water-saving mechanism shows that the water-saving rate is more than 35% and the water-saving effect is remarkable.

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