

Discussion on Standardization and Automatic Flow Measurement of U-shaped Channel Water

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Abstract: In human life, water resources are inseparable. In recent years, China's population growth has accelerated, and the industrial level has been continuously improved, resulting in the rapid use and waste of water resources. The protection and rational distribution of water resources are the most pressing issue in China's water resources. At present, the water measuring facilities of the U-shaped channel mainly include a straight wall measuring pool, a parabolic throat measuring pool, and a long throat measuring pool. In view of the problems in irrigation measurement, the empirical water measurement of basic open-channel and automatic flow measurement system in irrigation district is summarized to improve the accuracy, fairness, and rationality of water measurement, and promote irrigation district management to a higher level.

Keywords: *U-shaped channel; water standardization; automated flow measurement*

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0 Introduction

The U-shaped channel is an open-type sink measuring device, which is a carrier of quantity. The measurement should be within the standard error range and strictly in accordance with national standards. The U-shaped channel is an open-type sink measuring device and is also the basis for the trade of water commodities. The two sides of the trade formulate the settlement method according to the content of water. U-shaped channel water is the most important measure of water trade and water use. It can not only effectively manage water

resources but also play a role in water conservation. In summary, the research in this paper is for water use and sustainable use of resources is of extraordinary significance.

1 The principles to be followed to determine U-shaped channel water standard technology

The principles followed by U-shaped channel water standard technology determination include simplified principle, unified principle, and coordination optimization principle, as shown in Table 1.

2 Second, the implementation of U-shaped channel sink standard

The standard can be implemented, and it is also an important performance to standardize the U-shaped channel sink^[1]. The implementation of the "U-shaped channel sink" standard should be based on the actual situation in each place, such as different natural conditions, different policies, and different masses. It is necessary to give full play to all favorable conditions, fully mobilize favorable conditions, coordinate the relationship between government technical supervision departments, water management departments, and water users, and jointly implement standard wells. When implementing the local standard of "U-shaped tank straight wall volume sinking," the following work needs to be done.

2.1 Establishing and improving the manufacturing system of U-shaped channel water tank

The measuring cell is a special product. First of all, it is an industrial product. Its product standard is stipulated

by the standardization law because it is a measuring device, so it is also regulated by the Metrology Act. It should comply with the law and related regulations^[2]. According to the standard requirements, the production of steering tanks must meet the standard requirements. However, the traditional manual casting method is difficult to meet this requirement. According to the relevant requirements of the “Metrics Regulations,” the “Measuring Appliance Production License” must be obtained and verified before use. In addition, industrialization is required in terms of technology and management^[3]. Therefore, in the production process, only the standardized production, standardization, and large-scale production of oil tanks can be realized, and the implementation and correct use of the standards can be finally realized. For the standardized manufacturing of the measuring trough, it is first necessary to establish a standardized prototype construction, which can be mass produced through the certification of the government and relevant departments. The contents of the relevant department certification include the specifications of the production line, production quality, and production process system. The prototype is the beginning of a qualified measurement product when the batch is in the production stage^[4].

2.2 Supervision of the implementation of U-shaped channel sink standards

The regulation of the U-shaped channel sink standard is mainly carried out from two angles: One is the government perspective and the other is the mass perspective, and the government supervision perspective needs to be carried out from two aspects: Industrial supervision and technical supervision^[5]. In terms of industrial supervision, it mainly monitors the qualification rate of measured products, while technical supervision mainly monitors the accuracy of measurement.

2.2.1 Technical supervision

Mainly through the technical supervision and administrative means of computing supervision, the standard instrument open-channel flow measuring instrument formulated by the technical organization shall, in accordance with the corresponding standards, formulate corresponding verification procedures to verify the open-channel flow measuring equipment, and the technical supervision and management departments at all levels should regularly inspect. If the measurement facilities are unqualified, they should be dealt with in a timely manner and punished in

Table 1. U-shaped channel water standard technology to determine the principles to follow

Specific principle	Specific contents
Simplification principle	For the measurement of the type of sink and the range of products, first select a high precision, advanced measuring tank. Second, the shape of the measuring tank is determined and measured. According to the measured size data, the relevant product series is formulated to ensure the accurate density of the used water tank series products, and the products are quantitatively produced to ensure the effective functioning of the products.
Unification principle	Unify the specifications of this series of measuring cell sizes and related technologies. The measuring accuracy of the measuring tank ensures the shape of the sink, so the size of the sink should be uniform, including the length and width dimensions of the throat, the size of the upper and lower process, and the marking position of the water level and the error.
Coordination and selection principle	Sampling of the water tank is required. In this process, there is a hydraulic relationship between the component and the channel, such as shrinkage, immersion, roughness, gradient and channel inclination, and the parameters of the receiver itself. The measurement relationship should be handled properly.

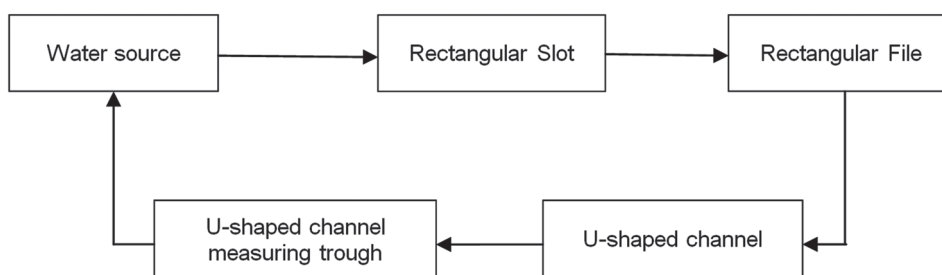


Figure 1. U-shaped channel measuring tank experimental process

accordance with relevant regulations. At the same time, it is also necessary to carry out technical supervision on the experimental flow of the U-shaped channel measuring tank. The general flowchart is shown in Figure 1.

2.2.2 Industry supervision

Industry supervision is the responsibility of the various water departments within the water measurement industry. It is necessary to fully combine the various methods, and urge the units and enterprises to continuously improve the quality of the water, and follow the U-shaped channel volume production accuracy checklist for inspection, as shown in Table 2.

2.2.3 Supervision by the masses

The supervision of the masses should give full play to the role of the mass organizations in the irrigation

districts, namely the irrigation water associations in the irrigation districts. The establishment of the Irrigation Districts Association is a new management model in recent years. Its nature is non-governmental and non-profit organizations. The main responsibility is to collect opinions from the masses, coordinate problems and disputes in the work of measuring water, and represents the benefits of water users^[6]. Therefore, farmers represented by farmer's associations are most suitable for supervising the use of water facilities in irrigation districts. Farmers can submit opinions and questions to the association. The association can give feedback to relevant government departments, take timely measures to solve these problems or negotiate directly with the agricultural cooperatives to establish a bridge between water supply and water use between the two sides to enhance mutual trust, ensure the accuracy and reliability of the indexing.

Table 2. U-shaped channel volume sink production accuracy checklist

Project	Claim	Results of testing	Each conclusion
Exterior	All parts should be firm and reliable, no cracks, and the measuring tank and its upstream and downstream $1 \times H_{\max}$ should be smooth. No obvious defects or bruises in the sink and mouth	Meet the requirements	Qualified
Roughness	The measuring tank and its upstream and downstream $1 \times H_{\max}$ should be flat, the roughness is ≤ 0.014	Meet the requirements	Qualified
Installation	The measuring tank and channel installation should be symmetrical and should not be subverted, slipped, broken, sunken, leaked, and deformed for various reasons.	Meet the requirements	Qualified
Sink height	Deviation $\leq 1\%$ of design value, $H=0.82 D$, $H \geq 6$ cm and $H \geq R(1-(1-\lambda^2)^{0.5})$	$H=33.0$ cm 3.6%	Qualified
Lining channel bottom and groove bottom plane deviation	1% of the length of the ramp Allowable deviation $\Delta h=55*0.0001$ length o	$\Delta h=0.5$ cm	Qualified
Ratio drop	1/200~1/400	1/300	Qualified
Channel inclination α	(0–15)	8°	Qualified
Slot bottom diameter D	Design value 40 cm	40.65	Qualified
Ramp width b	The width of the ramp is $\leq 0.2\%$ of the design value, and the design width is 22 cm.	$B=22.03$ 0.14%	Qualified
Long road length L	$L=1.25 B_0$ deviation is $\leq 1\%$. $B_0=44$ cm	54.98 cm 0.04% Deviation	Qualified
Front transition section L_1	The length of the front transition section is $\leq 0.1\%$ $L_1=0.7 B_0=30.8$ cm	0.08% Deviation	Qualified
After transition L_2	The length of the rear transition section is $\leq 0.3\%$ $L_1=0.7 B_0=30.8$ cm	0.19% Deviation	Qualified
Excessive curve before and after	Smooth and fluent, no obvious difference with the sample	Meet the requirements	Qualified
Head measurement position	$L\alpha=1.5 B_0=66$ cm	66.02 cm	Qualified
Observation well	The connecting pipe and well should not leak, the inner wall of the pipe should be smooth, and the bottom of the well should be 30 cm below the lower edge of the pipe mouth	Meet the requirements	Qualified

2.3 Strengthening the implementation of the U-shaped channel measuring tank standard in various aspects

In recent years, many units have built some water supply facilities in conjunction with channel improvement projects, but the quality is uneven. According to provincial standards, there are few quality requirements^[7]. Once supervision begins, most facilities will be assessed as unqualified and face downtime, reconstruction, or maintenance issues. For economic reasons, they will encounter greater resistance. For the administrative department, these situations will have different understandings and opinions in different departments, which will bring difficulties and pressure to decision-making. For the public, the publicity work will be negatively affected. Therefore, in the process of popularizing water measurement tools, especially in the early stage of popularization, some mandatory measures need to be taken. Leadership is the key to the implementation of mandatory measures. Therefore, the establishment of an intersectoral coordination mechanism is particularly urgent. Establishing a leading group with the participation of relevant department leaders is an effective way to achieve cross-sectoral coordination^[8].

2.3.1 Strengthen the intensity of system management

Strengthening system management mainly starts from three aspects: Formulating systems, implementing systems, and supervising systems. These include regular improvements and revisions to the system, as well as policies and regulations required for administrative measures. Most regions and provinces have a normative system. Its main role is to solve related problems and strengthen system management through measures implemented and supervised.

2.3.2 Technical training and publicity

The promotion and popularization of technology is the main means of implementing standardization, and technical training can also be divided into several aspects. First, the designer and the manufacturer of the water measurement equipment are trained on the model and quality of U-channel water measurement standard. Only when the designer fully understands the standard can a qualified U channel water product be designed, and they will select the appropriate type in the design to produce a qualified measuring instrument. Second, they will use them one by one^[9]. The training of the

crew technicians mainly involves the specification of the system and the maintenance and use of the water supply equipment to ensure the accuracy of the equipment. Advocacy and popularization should be carried out at different levels. Leaders should pay attention to the importance and necessity of propaganda. Technicians should promote their advancement and maturity, and users should improve their accuracy and reliability^[10]. Only when the parties have a unified understanding can the propaganda be effective, and the U-shaped channel water standard can be a conscious action and promoted.

3 Conclusion

Standardization is a long-term development process. It has undergone a change of modern characteristics with the main purpose of combating nature, dealing with people, and exchanging goods. Its main purpose is to improve the quality of work and increase productivity. The main purpose of modern standardization is to strengthen scientific management and promote the international division of labor and cooperation to develop high technology. The theory of standardization technology has matured in China through years of development, and its role in actual production and work has also been fully exerted. At present, it has become an important management method for the use and development of technology. This paper summarizes the determination of U channel water standard technology and proposes effective measures to implement U channel water standards. There is very little research in the academic world. I hope this article can play a certain inspiration.

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