GALAXY INTERNATIONAL INTERDISCIPLINARY RESEARCH JOURNAL (GIIRJ)
ISSN (E): 2347-6915
Vol. 14, Issue 3 March (2026)

METHODS AND MAIN ADVANTAGES OF DETERMINING WATER CONSUMPTION IN RIVERS AND CANALS

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ABSTRACT

Today, the need for rivers, lakes, glaciers and groundwater, which are considered sources of fresh water not only in our country but also on Earth, is increasing day by day, and the expansion of the national economy is an urgent issue. Providing water to agriculture, which is the main pillar of the economy, eliminating water-related problems, and ensuring sustainable economic development are of course the main tasks of quantitative study of river waters and their constant measurement.

Keywords: Water resource, river, agriculture, economy, canal, water consumption.

Annotatsiya:

Bugungi kunda nafaqat mamlakatimizda, balki yer yuzida chuchuk suv manbai hisoblangan daryolar, ko‘llar, muzliklar hamda yer osti suviga bo‘lgan ehtiyoj kun sayin ortib borishi barobarida, xalq xo‘jaligi tarmoqlarini kengaytirish dolzarb masala hisoblanadi. Iqtisodiyotning asosiy ustuni hisoblangan qishloq xo‘jaligini suv bilan ta’minlash, suvga bog‘liq bo‘lgan muammolarni bartaraf etish, iqtisodiyotni barqaror rivojlantirish uchun albatta daryo suvlarining miqdor jihatdan o‘rganish hamda uni doimiy o‘lchash, asosiy vazifalardan hisoblanadi.

Kalit so‘zlar: Suv resursi, daryo, qishloq xo‘jaligi, iqtisodiyot, kanal, suv sarfi.

Аннотатция:

Сегодня потребность в реках, озерах, ледниках и грунтовых водах, которые считаются источниками пресной воды не только в нашей стране, но и на Земле, растет с каждым днем, и расширение национальной экономики является неотложной задачей. Обеспечение водой сельского хозяйства, являющегося основной опорой экономики, решение проблем, связанных с водой, и обеспечение устойчивого экономического развития, безусловно, являются главными задачами количественного изучения речных вод и их постоянного измерения.

Ключевые слово: Водные ресурсы, река, сельское хозяйство, экономика, канал, водопотребление.

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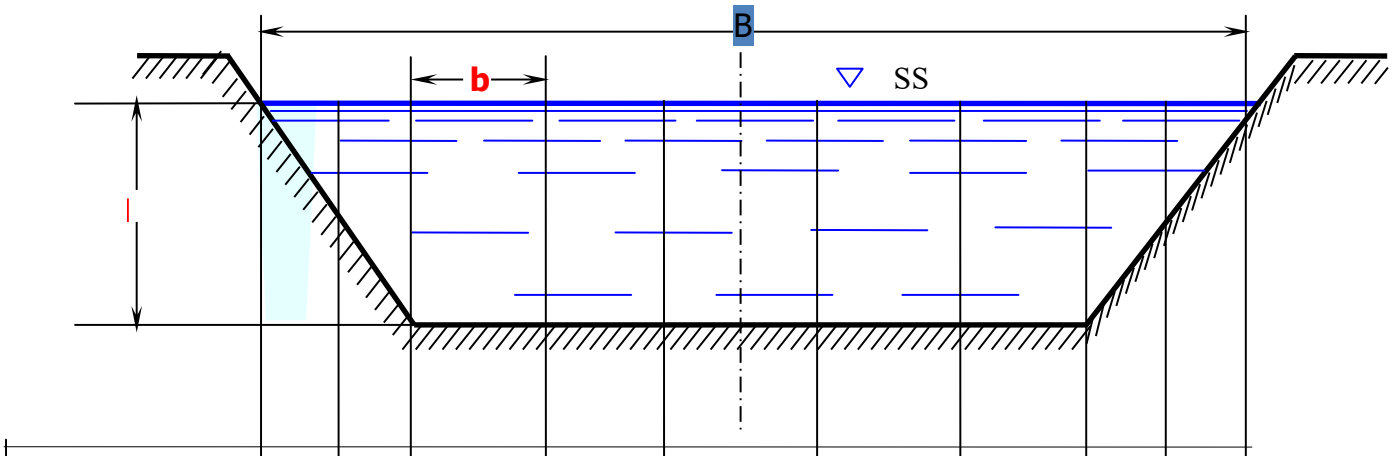
INTRODUCTION

The main criterion for the use of water resources is to accurately calculate the flow of water from its first source, reservoir, river, canals, directly to the consumer farmer's field. In order to implement an effective method of water distribution and management, we must have accurate water measurement capabilities. If we can measure the exact amount of water from the reservoir to the main canals, from the main canals to the inter-farm canals, from the inter-farm canals to each ear, we guarantee that we will achieve our goal.

When determining the characteristics of the main shape and size indicators of rivers and canals, depth measurements are mainly carried out twice in the direction from the left bank to the right bank and vice versa to determine the cross-section of the flow of rivers and canals. The average depth (h_{yp}) on each vertical is taken to be equal to the arithmetic mean of the depths measured twice:



Verticals	1	2	3	4	5	6	7	8
distance, m	1,0	1,0	2,0	2,0	2,0	2,0	2,0	1,0	1,0
Water depth H,m	0,9	1,8	1,8	1,8	1,8	1,8	1,8	0,8

Figure 1. Cross section of a trapezoidal channel

Depth measuring instruments are mainly divided into 3 groups, which include simple instruments - rails, rods, and dipsticks, and mechanical instruments - mechanical dipsticks and ultrasonic devices (echophones). Simple instruments are mainly used to measure the depth of water in rivers and canals.

When the number of verticals from which the depth is measured is large, the bottom line between them is taken as a straight line. As a result, the area between the verticals of the depth is taken as a straight line, using the formulas for determining the area of precise geometric shapes - triangles and trapezoids, and the total area is taken as their sum (Figure 1).

Cross-sectional area of the stream:

$$\omega = \frac{h_1 \cdot b_1}{2} + \frac{h_1 + h_2}{2} b_2 + \ldots + \frac{h_{n-1} + h_n}{2} b_{n-1} + \frac{h_n b_n}{2} \text{ (m2) (2)}$$

Wetted perimeter of the stream:

$$\chi = \sqrt{b_1^2 + h_1^2} + \sqrt{b_2^2 + (h_2 - h_1)^2} \ldots\ldots + \sqrt{b_n^2 + h_n^2}\ (m)\ (3)$$

Hydraulic radius: $R = \frac{\omega}{\chi}\ (m)\ (4)$

There are currently several methods for determining the flow velocity, of which the following methods are widely used in practice:

a method based on counting the number of revolutions of the impeller (rotor);

a method based on calculating the speed of the flowing body:

a method based on determining the speed of the velocity gradient.

The point method is widely used in measuring velocities using a hydrometric impeller (vertical):

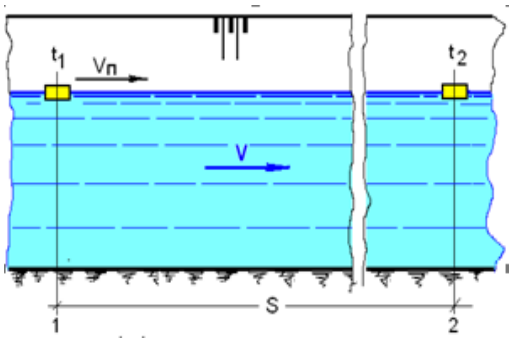
The essence of the point method is that the velocity at a point is determined using a hydrometric impeller at selected velocity verticals (Table 1) depending on the width of the river or channel, and the average velocity of the flow is determined along the total velocity vertical. When determining the velocity using the point method, the velocity is measured separately at each point with high accuracy. The vertical and horizontal distribution of the flow is determined more accurately. It gives reliable results, especially in hydrometric measurements, for example, in rivers. Allows you to detect uneven flow. The flow velocity is not uniform across the cross section. The point method shows changes in flow at different depths and widths. Practical and standard method.

Table 1 Conditions for determining the distance between speed verticals

№	Width of a river or canal, m	Distance between verticals, m
1	V<20	0,5-2,0
2	20-30	2,0
3	30-40	3,0
4	40-60	4,0
5	60-80	6,0
6	80-100	8,0

Figure 2. Hydrometric turntable

In the method based on calculating the speed of a flowing object, plugs are used to quickly determine the speed of water flow and save time in order to quickly calculate water consumption. Of course, although the error in the water consumption determined by plugs is high, it is possible to achieve amounts close to the actual water consumption through certain empirical coefficients. Determining water consumption using plugs is the cheapest and least time-consuming method, and any objects that move freely in water without sinking can be used as plugs. Plugs are divided into several types depending on the principle of operation, structure, and appearance: surface plugs; depth plugs; plug integrators can be given as an example.



t1; t2 – row numbers;
S – distance between rows;
T=t2-t1 – difference in specified times
Vn= speed of the ball
V=0.7 Vn – average speed of the water flow

Figure 2. Selected plot diagram

When the width of the river or canal is up to 100 m, it is recommended to use a circular (d = 15-30 cm; thickness 2-4 cm), and when the river width is greater than 100 m, it is recommended to use a (+)-shaped (length 60 cm; width - 20 cm; thickness - 4 cm) cone.

The determination of the velocity head is currently based on taking into account the static and dynamic head of water using an improved Pitot tube device (Figure 3). The flow velocity is measured in the following cases:

Flow velocity from 0.15 m/s to 3 m/s;

It is possible to measure water velocity even at a height of up to 5 cm from the bottom of the channel. No additional energy is required during the measurement process. The design is simple and does not require high qualifications to perform the measurement. The value is determined from the difference in water level in the Pitot tube.

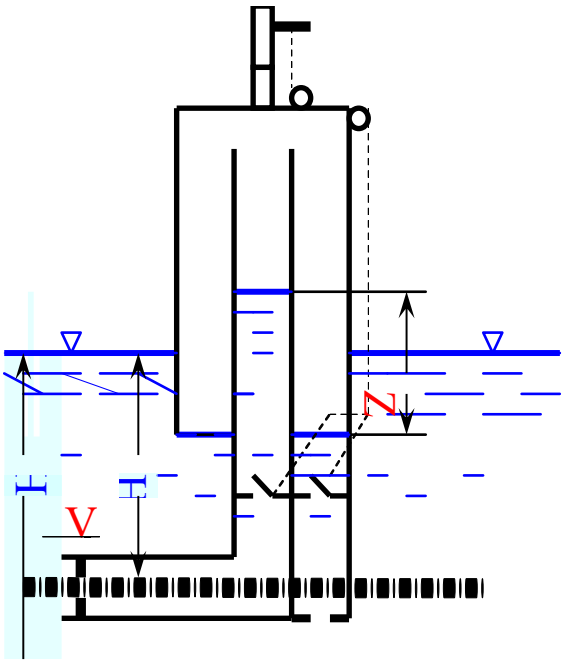


Figure 3. The principle of operation of an improved Pitot tube

The flow rate is determined using the following formula:

$$\vartheta = \sqrt{2g\Delta h};\ \text{m/sek} \qquad (6)$$

here: Δh – level difference;
g – acceleration of free fall;

Conclusion: When selecting and using hydrometric instruments to measure water velocity and flow, it is important to consider the morphometric shape and size of a river or canal. While initial data can be obtained by observing each water body, measuring its flow parameters provides valuable information about the flow regime and flow phases in the water over the

short, medium and long term. The most important thing is to pay attention to convenience and accuracy when using the instruments necessary for water measurement.

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