Czech
Journal of Multidisciplinary Innovations
Volume 10, October, 2022.
ISSN (E): 2788-0389
Website: www.peerianjournal.com
Email: editor@peerianjournal.com

Building A Model of Hydrotechnical Operating Modes of Shutter

Bobirjon Zayniddinov,
Senior Teacher.,
Uktam Mamirov,
Associate Professor. Tashstu.

Hydraulic segmental sluices of the water level entering reservoirs through rivers or canals Q_p value and the required level of the reservoir Q_d is an adjusting and controlling structure designed to control the difference between values.

If $Q_p > Q_d$ if , the upstream scope is used as storage and the upstream direction continues to increment. If this difference is maintained or the flow rate changes too quickly, the valve opens to prevent overfilling.

If $Q_p < Q_d$ then the level in the system until the valve upstream level reaches the minimum value Q_d allows to meet the demand of water discharge through the gate until equal to . If this difference is maintained or the rate of change of water consumption is fast, the valve is completely closed, the high flow level is maintained, but it does not meet the demand [1].

The operation of the zatvor is according to the level upstream Z_u and downstream Z_d The relationship between levels is described theoretically as shown in Figure 1 [2].

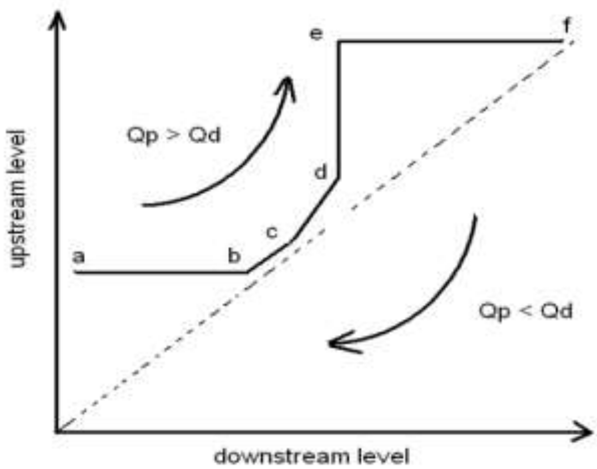

Figure 1. A graph of the change in the upper and lower levels of the water level

Czech
Journal of Multidisciplinary Innovations
Volume 10, October, 2022.
ISSN (E): 2788-0389
Website: www.peerianjournal.com
Email: editor@peerianjournal.com

Hydraulic structures of reservoirs are presented in (Fig. 2), where the volume of water entering the reservoir O_1 connected through a slot. Part of the flow passes through this slot and is directed to the water basin on the side. If the water flow is deep enough, O_2 and O_3 underwater slits or W_{10} through the pore can drop to the upper control volume of the reservoir.

Depending on the depth, the water is lowered through three different slots:

- O_4 the slot is always lowered and connects the upper reservoir with the lower reservoir;
- G_7 the net has a special shape, the width of which decreases as the water level increases;
- O_9 the slit flows right down to the top bef.

Bottom beef to keep the minimum level W_5 has a water supply. This is the state of the flow O_6 due to leakage through the slit.

Similarly, the average volume with the bottom flow O_8 connected to the water supply through a slot. The third part consists of a sector part fixed to the shutter using a metal frame [3].

This structure can move around the axis of rotation. Therefore, the shutter is opened or closed accordingly Z_3 and Z_4 only due to the difference in water levels downstream.

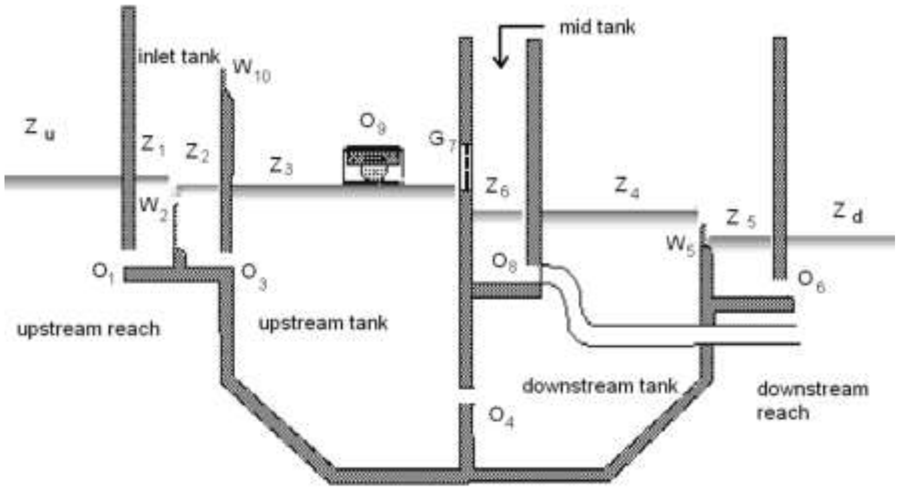

Figure 2. Hydraulic structures of reservoirs

The proposed model assumes that the flow at the inlet of the valve Z_u and downstream Z_d predicts that it will be in equilibrium for the level. Therefore, the transient dynamic effects of the zatvor, this situation between the reservoirs, are not taken into account Z_u and Z_d is associated with a short transition period compared to changes during water storage and release [3]. This completes the formalization of the relationship between the upper and lower levels, corresponding to the various physical devices included in the segmented gate.

Czech
Journal of Multidisciplinary Innovations
Volume 10, October, 2022.
ISSN (E): 2788-0389
Website: www.peerianjournal.com
Email: editor@peerianjournal.com

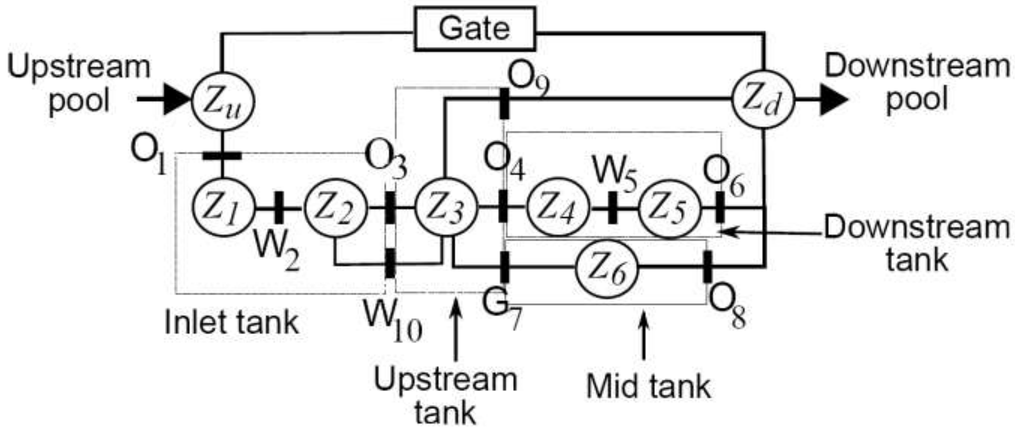

Figure 3. Block diagram of a segmental valve

Reflecting the actual level of water in reservoirs in hydrotechnical dam modeling $Z_u = f(Z_d)$ curve is taken into account.

Below is the discharge equation used to calculate the flows through existing hydraulic structures in sluices.

High flow for this hydraulic structure h_1, downstream h_2, diaphragm slit w, the equivalent width L, consumption coefficient C_d, the slot diameter D_0 and spending Q we accept the definition.

Below are the expressions for water discharge from the reservoir:

– for a dam with free flow $(h_2 < 2/3h$ and $h_1 < kD_0)$:

$$Q = C_d L\sqrt{2g(h_1)}^{3/2}.$$

– for a flooded dam ($h_2 > 2/3h$ and $h_1 < kD_0$):

$$Q = C_d \frac{3\sqrt{3}}{2} Lh_2\sqrt{2g(h_1 - h_2)}.$$

– for water consumption coming out of the gate in free flow ($h_1 \geq kD_0$ and $h_2 < 2/3h_1$):

$$Q = C_d \frac{2}{3\sqrt{3}} L\sqrt{2g\left(h_1^{\frac{3}{2}} - (h_1 - kD_0)^{\frac{3}{2}}\right)}.$$

For water consumption when the valve is partially open
($h_1 \geq kD_0$ and $h_2 < 2/3h_1 + kD_0/3$):

$$Q = C_d Lh_2\sqrt{2g}\left(h_2\sqrt{(h_1 - h_2)}\frac{2}{3\sqrt{3}}(h_1 - kD_0)^{\frac{3}{2}}\right). \qquad (1)$$

For water consumption when the valve is fully opened ($h_1 \geq kD_0$ and $h_2 \geq 2/3h_1 + kD_0/3$) :

Czech
Journal of Multidisciplinary Innovations
Volume 10, October, 2022.
ISSN (E): 2788-0389
Website: www.peerianjournal.com
Email: editor@peerianjournal.com

$$Q = C_d L k D_0 \sqrt{2g(h_1 - h_2)}, \quad k = \frac{w}{D_0},$$

where k [0, 1] is the coefficient representing the relative opening of the slits.

All the slots can be used as water flow downstream $(h_1 < w)$. Dimensionless depth to allow continuity of flow through slits and to account for compression for flow slits (h_1 / w) continuous increase using C_d is proposed to be calculated as follows [4]:

$$C_d = \frac{(C_{d0} + C_{dw})}{2} + \frac{(C_{d0} - C_{dw})}{\pi} \arctan(\beta \frac{h_1 - w}{w}), \qquad (2)$$

here $C_{d0} = 0.6$, $C_{dw} = 0.4$; β the parameter determines the steepness of the transition between the water injection flow and the diaphragm flow, $\beta = 10$ the value of this process increases steadily Q_c, h_1 correctly interprets in relation to .

Below, we describe the difference between the water level in the reservoir and the level in the downstream stream as follows:

$$D = Z_3 - Z_4, \qquad (3)$$

this condition is ensured by properly balancing the shutter as explained above.

Calculations are performed sequentially based on the following conditions:

- in the first step O_4, W_5 and O_6 in (Q_4) in storage of discharges Z_5, Z_4, and Z_3 count levels. We have a nonlinear system consisting of three discharge equations, equation (1) and 4 unknowns. The system calculated by dividing by two;

- in the second step G_7 is to calculate the current through the network. G_7 and O_6 the two discharge equations in Eqs Z_6 and flow in the center of the reservoir (Q_7) gives;

- in the third step O_9 flowing through the slit Q_9 flow Z_3 level and lower level Z_d is calculated according to;

- Z_2, Z_1 and Z_u water pits, hydrotechnical structures $(W_2, W_{10}, O_1$ and $O_3)$ through , the flow equations and the upstream discharge balance of the reservoir is determined by equation (2)

$$Q_3 + Q_{10} = Q_4 + Q_9 + Q_7. \qquad (4)$$

G_7 the net has a unique construction and its discharge Q_7 and Z_3 represents a certain relationship between This mesh consists of several horizontal slits, the width of which decreases upwards. Therefore, the discharge through this mesh varies as a set of hydraulic functions. To simplify, we L_7 we calculated the equivalent width determined by [5].

G_7 This equivalent mesh width is calculated from the wettable area and Z_3 and Z_7 depends on the difference between Z_3, Z_7 and L_7 taking into account , the current passing through the network is expressed in accordance with the conditions of its flow using equations (3), (4).

Czech
Journal of Multidisciplinary Innovations
Volume 10, October, 2022.
ISSN (E): 2788-0389
Website: www.peerianjournal.com
Email: editor@peerianjournal.com

References:

1. Ismailov G.Kh., Bolgov M.V., Fedorov V.M. A model of water resources management in the river basin taking into account water quality. 2008. No. 1. -FROM. 212-216.
2. Magomedov R.I., Magomedov I.I., Magomedova E.S. Modeling of the change in the amount of water in the reservoir using the stochastic differential equation // Bulletin of Dagestan State University. Series 1: Natural Sciences. 2020. #1. -FROM. 53-59.
3. Regular algorithms for the synthesis of adaptive controllers in problems of control of dynamic objects Igamberdiev, Kh. Z. Regular algorithms for the synthesis of adaptive controllers in problems of control of dynamic objects / Kh. Z. Igamberdiev, AN Yusufbekov. - Text: direct // Young scientist. - 2012. - No. 1 (36). - T. 1. - S. 13-16.