Decreasing the tense during the process of compensating and expropriating on water resourceshydroelectric works

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Abstract

The main goal of construction water resources hydroelectric works is to bring practical, long-term, proper benefits to the population. Due this reason, the bad implementation of process of compensating, expropriating, emigrating and resettling leads to negative effect to the original goal of works construction. In this article, we analyse the problem of counting range of emigration, which is closely related to the works of compensating, expropriating, emigrating and resettling on water resources hydroelectric works. The process of expropriating from low elevation to high elevation would also be proposed and analysed.

Keywords: Water resources hydroelectric works, Compensating and expropriating works, Range of emigration, Fundamental equation of water reservoir.

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1 The range of flooded area is not adequately computed, with the assumption that the water surface is horizontal

In computing the water reservoirs regulation, the fundamental equations are:

$$\frac{\partial Q}{\partial s} + \frac{\partial w}{\partial t} = 0, \tag{1}$$

$$-\frac{\partial z}{\partial s} = i - \frac{\partial h}{\partial s} = \frac{V^2}{C^2 R} + \frac{1}{2g}\frac{\partial v^2}{\partial s} + \frac{1}{g}\frac{\partial v}{\partial s}, \tag{2}$$

where: s: distance

w: cutting surface of reservoir

t: time

z: reservoir bed elevation (river bed elevation)

h: depth

V: speed

R : hydraulic radius

To solve two abovementioned equations in general is very difficult. In computing practice, one usually assumes some simplifications to make the problem easier. In facts, one assumes that: the area of water reservoir is very big, the depth is very big. It is assumed also that the waters entering speed is low so that V can be assumed to be zero ($V = 0$). The water surface is assumed to be flat ($I = 0$).

In these assumption, formulae (2) can be skipped, and the system becomes:

$$-\frac{\partial Q}{\partial s} = \frac{\partial w}{\partial t}.$$

After simplification, we can write

$$-\frac{\partial Q}{\partial s} dSdt = \frac{\partial w}{\partial t} dSdt, \tag{3}$$

where

$-\frac{\partial Q}{\partial s}$: the amount of water gathered in small period of time.

$\frac{\partial w}{\partial t} dSdt$: the amount of water increased in small period of time.

When we compute the flood regulation in water storage, this equation can be written as:

$$Qdtqdt = Fdh, \tag{4}$$

where

Q: Incoming flow
q: Outcoming flow
F: Storages area
h: Surcharge depth (See the pictures below)
Picture 1 Picture 2
(1) Normal pool level
(2) Flood water level
(h) Surcharge depth
(q) Outcoming flow
(Q) Incoming flow
(F) Storage surface area
Formulae (4) can be written as

$$Q - q = F\frac{\partial h}{\partial t}, \tag{5}$$

dt can be replaced by Δt, Fdh by Δv, and Q, q are respectively its average values, i.e $\overline{Q}, \overline{q}$. In this case, (5) can be written as

$$Q\Delta t - q\Delta t = \Delta v. \tag{6}$$

It is known that flood discharges depends on type of outlet works
- If discharge through conduit

$$q_1 = m_1.w.h^{1/2}. \tag{7}$$

- If discharge through spillway

$$q_2 = m_2.b.h^{3/2} \tag{8}$$

(There are some other interpretations, but give the same result, for example $q_1 = m_1 w\sqrt{2gH_0}$, $q_2 = m_2 B\sqrt{2g}h^{3/2}$).
Here
w - area of conduit cross section
B width of surcharge;
H - free water head;
H_0 - head from water from surface to conduit centre;
g - gravity acceleration;
m_1 - discharge coefficient through conduit;
m_2 - discharge coefficient through spillway.

From formula $(7), (8)$ we see that outcoming flow (q) is a function of surcharge depth (h). At the same time, we know that: The reservoirs volume (V) is also a function of free water head (H). When elevation of oulet is fixed then the free water head and (H) and surcharge depth (h) are differed by a constant. Hence V is also a function of (h), so it is easily to prove that outcoming flow (q) is also a function of reservoir volume (V), i.e $q = f(V)$.

From formulae (6) we see that if Q_1, q_1, V_1 are respectively imcoming flow, outcoming flow and the initial storage volume, and Q_2, q_2, V_2 are respectively imcoming flow, outcoming flow and the storage volume at the final moment then (6) can be written as:

$$\frac{Q_1 + Q_2}{2}\Delta t - \frac{q_1 + q_2}{2}\Delta t = V_2 - V_1 = \Delta V.$$

Above mentioned formulae is fundamental formulae for computing flood regulation of reservoir

$$\frac{Q_1 + Q_2}{2}\Delta t - \frac{q_1 + q_2}{2}\Delta t = V_2 - V_1 = \Delta V, \tag{9}$$

$$q = f(V). \tag{10}$$

Above mentioned formula for flood regulation are oftenly used for regulation computation. It is clear that these formula are deducted from thes basis that the water surface to be assumed flat $(I = 0)$. Hence, it is not adequate if compensating and expropriationg works based on this assumption. For illustration, we consider an example: (Picture 3)

Picture 3

- Natural reservoir bed i_1,
- Reservoir bed after deposition i_2,
- Deposition depth ΔH,
- Length from dam to deposition point (L)

Assume that water surface is flat, $I = 0$.

We will have

$$i_1 = \frac{\Delta H + A}{L},\ i_2 = \frac{A}{L} \rightarrow i_1 - i_2 = \frac{\Delta H}{L} \text{ and } L = \frac{\Delta H}{i_1 - i_2}. \tag{11}$$

From formula (11) we see that:

The rising length L is priliminary defined in the basis that the water surface is flat $(I = 0)$.

Picture 4

But in reality, water surface is a curve as in the picture 4. Hence, area and range for compensation and expropriation should be counted adequately, so that the affected person doesnt have overloss. Solve this problem properly, we can reduce the bad impact to social environement in water resources hydorelectric projects.

2 For the projects with big reservoirs, regulated in many years, the process of expropriating flood area should be carried out low to high elevation

There are many big reservoirs all over the world. The process of filling-up reservoirs should take many years. For example, reservoir Axuan on Nil river, Egypt, was contructed from 1960, finished in 1970 and started working since December 1970. The total storage volume is 162 billion cubic meters, in which useful volume is 131 million cubic meters, death volume 31 cubic meters. Storage area is 6540 square kilometers.

In 1970 the electrostation started working, but up to 1975, the reservoir was filled up to the half only. Due the lack of water, only 7/12 stations operated.

The Tam Mon Hiep reservoir in China was filled up just after 10 years.

In Vietnam, we have the same situation. The process of filling up water reservoir is not ended by the opening ceremony. By this reason, the emigration of residents of high ends should be organized carefully. Without carefull computation, be seeing that reservoir is not filled up, relocated residents may come back to the bound of reservoir. And the social-economical situation becomes more complicated, out of control.

References

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