Journal of Engineering and Applied Sciences 12 (5): 1288-1295, 2017
ISSN: 1816-949X

Basic Requirements of Investment Planning Calculation Efficiency in Hydraulic Engineering

F.K. Abdrazakov, A.V. Pomorova, S.V. Zatinatsky, A.V. Povarov and A.A. Halmetov
Federal State Budgetary Educational Institution of Higher Education,
"Saratov State Agrarian University Named after N.I. Vavilov", Teatralnaya Sq. 1, Saratov, Russia

Abstract: The study lists the main regulations that govern the implementation of hydraulic engineering design in Russian federation. The results of water outlet capacity research of a flood water collection structure relating the water flow to the value of a shutter opening, the flow levels in head water and tail water of the river big uzen in aleksandrov-gaisky district of saratov region. These calculations were carried out in the framework of the Russian federation government order number 219 "On the approval of water body state monitoring regulation" issued on 10.04 2007. A more detailed study of the investment and construction process reflects the algorithm of cost-effectiveness calculation concerning construction works, major repair and hydraulic structure reconstruction taking into account existing guidelines in Russian federation, based on the determination of a probable harm during a hydraulic structure accident.

Key words: Hydraulic engineering, operational reliability of hydraulic structures, blocking regulating structure, flow characteristics, reservoir, downstream, upstream, flat gate, prevented damage, property damage, social damage, budget efficiency ratio

INTRODUCTION

An integrated use of surface and ground waters for all sectors of the national economy implements water resource management or a water system of Russian federation. A sustainable socio-economic development of Russian Federation should be provided by an enhanced management of water resources. Hydraulic engineering was the basis of territorial-industrial facility development for many years. According to the Russian federation ministry of agriculture the reclamation-water complex of the federal property includes >60 thousand different hydrotechnical structures including 232 reservoirs; 2.2 thousands of regulating waterworks; 1.8 thousands of stationary pumping stations supplying and pumping out water, >50 thousand km of water conducting and discharge canals, 5.3 thousand km of pipes, 3.3 thousand km of protecting shafts and dams, the objects of production bases with the total carrying amount of 87.0 bln. rubles.

It is worth mentioning the fact that 24 hydraulic structures were built until 1970 forming large reservoirs (54% of available ones), 7 hudraulic structures-from 1970-1980 and 13 hydraulic structures after 1980. Therefore, the main task today is the operational reliability of hydraulic structures increase (including unclaimed ones) by bringing them to a safe technical condition. The solution of this task is implemented through the provisions of the federal target program "The development of Russian federation water complex in 2012-2020" (FTP, 2012), adopted by Russian federation government (GRF 2012). Let's provide the analytical data in 2015 according to key activities of FTP in hydraulic engineering:

- The creation of reservoirs and the reconstruction of hydro reservoirs on existing multi-purpose reservoirs 3 pcs
- The construction and the reconstruction of engineering protection structures and shore protection structures 90.8 km
- The reconstruction of 12 multi-purpose water facilities of the ministry of agriculture of Russia and the commissioning of 3 facilities

In 2015, the funding amounted to 12,978,080.7 thousand rubles (federal budget) including the "capital investment" 6,298,343.7 thousand rubles (budget investments 2,741,456.9 thousand rubles, the subsidies in Russian federation state property objects 1,743,188.9 thousand rubles, inter-budgetarys subsidies 1,813,697.9

Corresponding Author: F.K. Abdrazakov, Federal State Budgetary Educational Institution of Higher Education, "Saratov State Agrarian University Named after N.I. Vavilov", Teatralnaya Sq. 1, Saratov, Russia

thousand), research and development 255,499.7 development 255,499.7 thousand rubles, "other needs" 6,424,237.3 thousand rubles (The federal target program in 2012). The program commissioned 11 capital construction projects directly in Saratov region: "Bank protection of the Saratov reservoir at the village Vechny Hutor of Dukhovnitsky District, Saratov Region (area No. 2)". Commissioning permission No. 64-64511000-4-2015 issued on 04.12.2015 (GRF, 2012).

The increase of hydraulic structure operational reliability is also regulated by the action of the federal law "On the safety of hydraulic structures" number 117-FL issued on 21.07.97 and the Russian federation Government number 219 "On the regulation approval about the state monitoring of water bodies" issued on 10.04.2007.

MATERIALS AND METHODS

Research of hydraulic engineering construction operation: Let's consider a specific example of legal documents implementation in saratov region. FSBU "The management of land reclamation and agricultural water supply in saratov region" conducts the activities on water outlet structure capacity evaluation. A fencing regulating structure was commissioned near the village priuzensky of algaysky district of saratov region. The experts of the Saratov State Agrarian University Named after N.I. Vavilov performed the research of water outlet capacity in a flood water collecting structure relating the consuption of water with the value of a shutter opening, the flow levels in an upper and a lower pool of the river B. Uzen of Aleksandrov-Gaisky District, Saratov Region.

The purpose of the performed studies was the obtaining of flow characteristics, linking the water flow with a shutter opening value, the levels of a flow in head and tail water. The research results should be presented in the form of analytical functions, graphs and tables for operational monitoring, control and water transit flow accounting through a water outlet structure during the operation of one and 2 spans of a structure.

The main purpose of a regulatory fencing structure is the creation of an accumulating reservoir to provide a guaranteed water intake for drinking and household water supply of Priuzensky Village. The composition of a regulating structure fencing hydraulic block includes:

- A reservoir
- A non-overflow flood dam with a low upper slope
- A flood accumulating reservoir-an automatic spillway with a wide lip according to a chute type (Fig. 1)

A water outlet structure in an overflow dam body made of reinforced concrete. An input head wall with the rectangular section of 1.2×1.2. A water conducting part has 2 spans. The structure is equipped with flat vertical gates with lifts and dam beams. Water supply regulation by a water outlet structure is performed by a flat shutter lifting height. The nature of water outflow through a structure hole may be as follows:

- When upstream water levels make 7.50-8.69 m
- A free water discharge through with a broad threshold. The shutter is located above water level, the water depth in a drain tray is less than the depth of water above the threshold of a discharge hole
- б the flooded outflow through a spillway with a wide threshold, the gate is above the water level, the ratio of water depth in a tailrace to the water depth before a structure makes >0.75
- B free outflow from a shutter when the depth of water directly behind shutter ($h_{H\sigma}$) is less than a shutter opening height (α) and/or $\alpha/H<0.67$
- The r a flooded outflow from a shutter when the depth of water behind a shutter is more than a shutter opening (a)

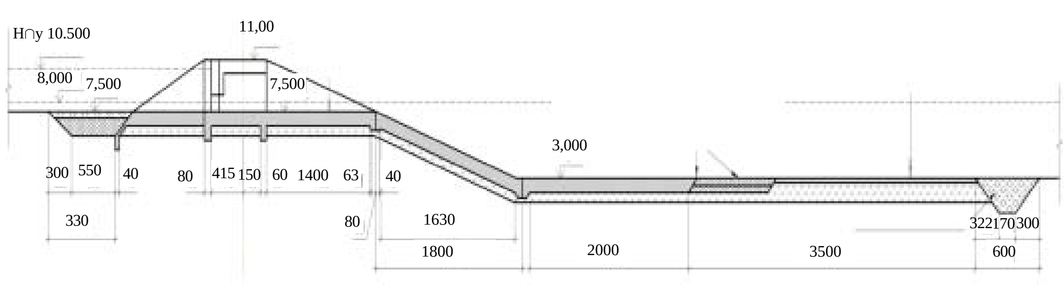

Fig. 1: Blocking regulatory structure along an overflow axis

- When the water levels in an upstream make 8.70...10.50 m
- A free outflow from beneath a shield a jump is moved away
- σ a flooded outflow from a shield a jump is flooded

The monitored parameters during HEI use to measure the water flow rate are the following ones:

- At a free outflow-a pressure over a threshold of a pipe Hole (H) or the water level in an up stream and a shutter opening height (a)
- At a flooded outflow-pressure (H) (the level) of upstream, the depth (h) (level) of water downstream, a shutter opening height (a)

Determine the calculated dependencies to specify an outflow bandwidth: A free outflow through a spillway with a wide threshold. Water consumption through an undrowned spillway with a wide threshhold and a rectangular inlet edge is determined by the total dependence for outlets (Hydraulic calculations of water supply and sanitation systems in 1986 (Bolshakov and Kiev, 1977; Kiselyov, 1972)) and it has the following form:

$$Q = mb\sqrt{2g} \cdot H_0^{3/2} \tag{1}$$

where, H_0 = water depth in front of a structure upstream, taking in to account an approach speed. The speed of an approach is neglected because an effective cross-section area of water in a supply channel makes:

$$S_{nx} >> 4bH,\ v_0 = 0 \text{ and water depth } H_0 = H$$

Where:

b = An outflow passage width (a shutter opening), b = 1.2 m

m = Consumption coefficient for input headwalls taking into account a flow compression is determined by Eq. 2 (Hydraulic calculations of water supply and sanitation systems):

$$m = 0.32 + 0.08 \cdot v_{Bx} \tag{2}$$

where, $v_{\beta x}$ = a stream compression value at the entrance to a spillway is determined according to the following dependence:

$$v_{\beta x} = b \cdot H / (b + 0.3) \cdot H \tag{3}$$

Flooding condition check: A water discharge is considered as flooded, if the inequality/3/ is performed:

$$z < H_0 - (h_{cr} + z'') \tag{4}$$

where, h_{cr} is critical flow depth at a water discharge threshold:

$$h_{cr} = \sqrt[3]{\frac{\alpha \cdot q^2}{g}} \tag{5}$$

where, q-relative water flow passing through a facility is equal to. During one span operation:

$$q_1 = \frac{Q}{b + 1.8} \tag{6}$$

During the operation of 2 spans:

$$q_{1+1} = \frac{2 \cdot Q}{b + 1.8} \tag{7}$$

The α-Coriolis coefficient showing the unevenness of velocity distribution in a living section of a flow, α≈1, ..., 1.1; g-free fall acceleration, g = 9.81 m/sec^2. z", the value of a restored pressure is determined by P.G. Kiselev's (Eq. 8):

$$z'' = \left(\frac{v_{cr} - v_p}{g}\right) \cdot v_p \tag{8}$$

where, v_{cr} , v_p-critical velocity, respectively (i.e., the flow rate at a critical depth) and the speed in a watercourse after a water discharge threshold, m/sec; the critical speed during the operation of one span:

$$v_{cr1} = \frac{Q}{h_{cr1}(b + 1.8)} \tag{9}$$

The critical speed during the operation of two spans:

$$v_{cr1+1} = \frac{2 \cdot Q}{h_{cr1+1}(b + 1.8)} \tag{10}$$

A watercourse speed after the spillway of an overflow threshold during the operation of one span:

$$v_{p1} = \frac{Q}{h_{б1}(b + 1.8)} \tag{11}$$

A watercourse speed after the spillway of an overflow threshold during the operation of two spans:

$$v_{p1+1} = \frac{2 \cdot Q}{h_{б1}(b + 1.8)} \tag{12}$$

The z is the difference in water levels between head-water and gtail-water, z = 3.0-0.75 m. B flooded water outflow through a spillway with a wide threshold. Water discharge with a wide threshold becomes a flooded one if $h_n/H>0.8$. The capacity is determined by the following dependence (Kiselyov, 1972):

$$Q = \sigma_{\text{П}} \cdot m \cdot b\sqrt{2g} \cdot H_0^{3/2} \tag{13}$$

where, $\sigma_{\text{П}}$ is flooding factor depending on the ratio of $h_{\text{П}}/H_0$ and calculated without taking into account the restoration differential according to Eq. 14:

$$\sigma_n = \frac{\varphi_n}{m} \cdot \frac{h_n}{H_0} \cdot \sqrt{1 - \frac{h_n}{H_0}} \tag{14}$$

where, $\sigma_{\text{П}}$ is the speed factor which is taken according to D.I. Cumin's data or according to Smyslov's dependence taking into account the following parameter ($v_{\beta x}$, (3)):

$$\varphi_n = 0.9 + 0.1 \cdot v_{\beta x} \tag{15}$$

Flooding condition check (according to Eq. 3)

Free outflow from a shutter: During a free outflow from a gate the horizontal tray of water discharge develops a moved away jump and a structure bandwidth is determined according to the dependence (Hydraulic calculations of water supply and sanitation systems in 1986):

$$Q = \phi \cdot \varepsilon \cdot a \cdot b\sqrt{2g(H_0 - \varepsilon \cdot a)} \tag{18}$$

Where:

α = A shutter opening (m)

φ = Speed ratio, according to N.N. Pawlowsky's advice for a panel opening without a threshold /1/, φ = 0.95-1.0

The ϵ is the coefficient of a stream vertical compression taken according to N.E. Zhukovsky depending on the ratio (α/H). In order to make the numerical experiment determining the flow rate characteristics of a structure a more convenient one we obtained the following dependence:

$$\begin{aligned} \varepsilon = {} & 5.992 \cdot (\alpha/H)^6 - 14.209 \cdot (\alpha/H)^5 + \\ & 12.853 \cdot (\alpha/H)^4 - 5.160 \cdot (\alpha/H)^3 + \\ & 0.927 \cdot (\alpha/H)^2 - 0.015 \cdot (\alpha/H) - 0.611 \end{aligned} \tag{17}$$

The establishment of outflow type from a shutter. An outflow type is a free one, if the following Eq. 18 is performed:

$$\left(1 + \frac{h_{\text{б}}}{\varepsilon_a}\right) \cdot \frac{h_{\text{б}}}{\varepsilon_a} < 4 \cdot \varphi^2 \cdot \left(\frac{H_0}{\varepsilon_a} - 1\right) \tag{18}$$

The Г flooded outflow from a shutter; if the inequality 18 is not satisfied then the form of pools will be characterized as a flooded outflow. In this case, the water flow rate through a water outlet is determined according to the following dependencies (Kiselyov, 1972):

$$Q = \mu \cdot a \cdot b \sqrt{2g(H - h_{\text{б}})} \tag{19}$$

Where:

h_σ = The depth of water in a tail water (the excess of tailrace level over a bottom mark of a horizontal water discharge tray) (m)

μ = Flow coefficient is determined by the following dependence/5/

$$\mu = \varepsilon / \sqrt{2 \cdot \varepsilon^2 \cdot m^2 - \varepsilon^{2\cdot} \cdot n^2 + \xi_0 + 1 - 2 \cdot \varepsilon \cdot m} \tag{20}$$

Where:

ξ_0 = Drag coefficient is determined by an input form for smoothly outlined steers ξ_0 = 0.4 /5/

m, n = The degree of a stream expansion and contraction, respectively

The expansion ratio is determined as follows for the overflow running by one span:

$$m_1 = b \cdot a / ((b + 1.8)h_{\text{б}}) \tag{21}$$

During the operation of 2 spans:

$$m_2 = b \cdot a / ((b + 0.3)h_{\text{б}}) \tag{22}$$

A flow compression rate is determined by the following relationship at the outflow from a shutter:

$$n = b \cdot a / ((b + 0.3) \cdot H) \tag{23}$$

RESULTS AND DISCUSSION

A numerical experiment for consumption characteristics determination is performed using MS Excel PP in order to determine the results of research. Some results of our research are presented on Fig. 2 and 3. The result of water discharge calculations are

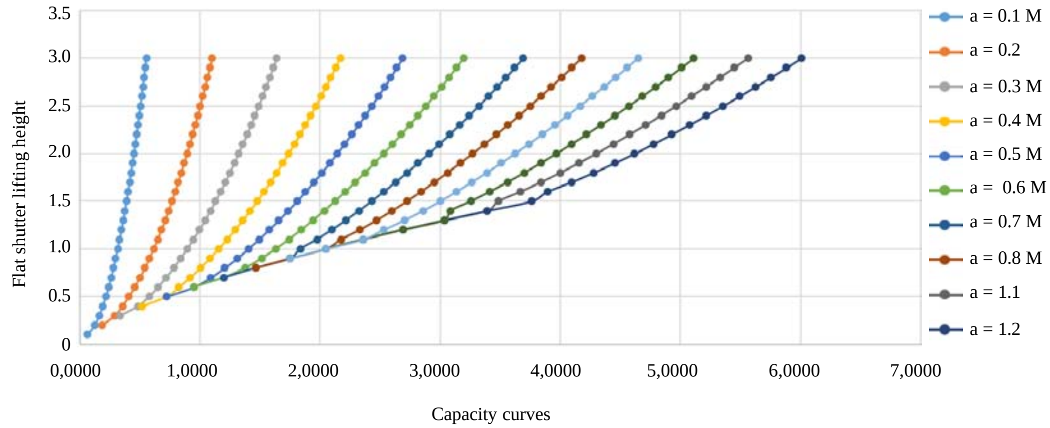

Fig. 2: Capacity curves of a water discharge first span (Q = f (H; h (3)) at a a flat shutter lifting height 0.1...1.2 m and a downstream water level at around 7.50

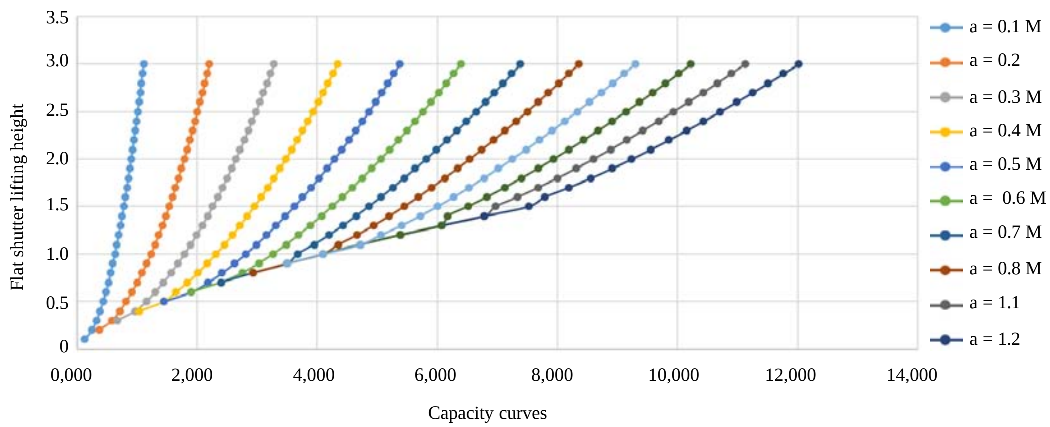

Fig. 3: Capacity curves during the operation of water discharge 2 spans (Q = f (H; h (3)) at a flat shutter lifting height 0.1-1.2 m and a water level in a downstream at around 7.50

the characteristics that relate a water flow with the value of shutter opening, the flow levels in head and tail waters within the form of analytical functions, graphs and tables for a water transit flow operational monitoring, regulation and accounting through an outlet structure.

The controlled parameters for a water flow rate measuring at HS use are the following ones: at a free outflow the pressure above the threshold of an outlet (H) and the head water level upstream and a shutter opening height (a); during a flooded outflow the water pressure (H) (the level) in head water, the depth (h) (level) in tail-water a shutter opening height (a).

Let's note a few problematic moments returning to the general issues of investment planning. The investment planning, performed both by FTP provisions and for independent investors of Russian federation water supply facility is reflected by the specifics of constructed facilities and is regulated by the list of documents:

- RF government decree No. 87 "On the composition of design documentation sections and the requirements to their content" dated on February 16, 2008
- Russian federation city planning code dated on December 29, 2004, FL No. 190 with amendments dated on 03.07 2016
- CP 58.13330.2012 "Waterworks. Basic provisions" an updated edition of SNiP 33-01-2003
- ED 31.3.05-97 "Technological design standards for seaports"

- DD 31.3.01-93 “The guide for the technological design of seaports”
- SNIP 3.07.02-87 “Engineering sea and river transport facilities”
- CP 41.13330.2012 “Concrete and reinforced concrete structures of hydraulic structures” an updated edition of SNiP 2.06.08-87
- Other valid RF normative documents in the field of hydraulic engineering

Hydrotechnical structures (water retaining structures) are not related to linear objects as an overall length for linear objects exceeds the width many times (in tens and hundreds of times). Consequently, HS should be attributed to the objects or non-production purpose (buildings, structures, the constructions of household purpose) or to other objects of capital non-production construction as the production of final products is not the result of project implementation. If for example, a small hydroelectric station is built on a river for energy production a reservoir channel is used in the composition of HTS for fish and HTS aquaculture production. It can be attributed to the production facilities (Abdrazakov *et al*., 2016a, b; Abdrazakov, 2015; Abdrazakov *et al*., 2015).

The composition of the project documentation sections includes industrial and non-industrial capital construction objects in the case of a water retaining structure, it will include a list of sections: Section 1 “explanatory note”: Section 2 “A plot planning organization scheme”: Section 3 “architectural solutions”. This study is included in the design documentation sections, if a pump station building is included in a hydraulic structure for example: Section 4 “design and space-planning decisions”: Section 5 “information about engineering equipment, about engineering and technical maintenance networks, the list of engineering activities, the content of technological solutions”. This section is included in the project documentation if a pumping station is available, for example as a part of a hydraulic structure: Section 6 “construction organization project”: Section 7 “work organization project concerning the demolition or the dismantling of capital construction projects”. This study is performed, if an object or a part of a capital construction object demolition (dismantling) is necessary: Section 8 “The list of environmental protection measures”: Section 9 “fire safety measures”: Section 11 “The estimate for capital construction object development”: Section 12 “other documentation in the cases stipulated by federal laws”. Such a documentation may be represented by the declaration of a hydraulic structure safety developed during a design stage. All relationships between a contractor and a customer are governed by the system of letters, the maximum responding period of which makes one calendar month 30 days (Model regulations of federal executive body internal organization, approved by the RF Government Decree No. 452 on 28-th of July, 2005; MNRR, 2009). After that all the letters are filed as a rule to the first or the fourth section of the design documentation before its provision to project public examination (Abdrazakov *et al*., 2016a, b; Abdrazakov, 2015; Abdrazakov *et al*., 2015).

The design in the field of hydraulic engineering (a hydraulic structure design) must ensure a safe operation and the delivery of products in a planned amount and with the specified technical and economic indicators. The following indicators may be regarded as technical and economic ones:

- The building manufacturability of construction
- The maximum industriality of designs (economy at reduced costs)
- The maximum use of local building materials
- The compliance with the necessary ecological requirements of a construction area

The set of technical and economic parameters characterizes capital investments, the economic efficiency of which is determined by the annual cost savings in its classic form or by the profits derived from a product sale (Schavelev, 1986). Now a days, the following formulae are used most of all in order to determine the economic efficiency of construction works, major repair and the reconstruction of a hydraulic structure (Abdrazakov *et al*., 2016 a, b; Abdrazakov, 2015; Abdrazakov *et al*., 2015):

$$E = Iobsch : K \quad (24)$$

where, K-capital investments for construction, repair or reconstruction performance of the hydraulic transportation system, determined by the cumulative cost estimates, rub.; Iobsch, the value of avoided damage in rubles which is explained by the construction nature and its flood control function. The calculation of the likely damage (Iobsch) is regulated by the collection of documents: the position of the federal law No. 225-FL “About compulsory insurance of a hazardous facility owner civil liability concerning an injury as an accident at the hazardous facility” issued on

Table 1: Main indicators of Russian Federation socio-economic development until 2018 (15)

Years	Values
2006	111,2
2007	114.7
2008	119.4
2009	105.0
2010	107.9
2011	108.8
2012	106.8
2013	105.5
2014	103.3
2015	110.8 Evaluation
2016	107.0 Prediction
2017	105.8 Prediction

Deflator index (Investments into fixed assets due to all sources of financing)

July 27, 2010. The decree of RF Government No. 876 "About the approval of financial security provision rules concerning civil liability for the damage caused by a hydraulic structure accident" as amended on 18.12.2001. The federal law "About the safety of hydraulic structures" FL No 117 issued on 21.07.97 (Abdrazakov *et al*., 2016a, b; Abdrazakov, 2015; Abdrazakov *et al*., 2015).

A direct determination algorithm of a probable damage during a hydraulic structure accident was defined by the requirements of "Professional Activity Rules (PAR) among insurers. The order of harm determination that may be caused as the result of an accident at a hazardous facility, the maximum possible number of victims and a dangerous object safety level", developed and approved by the National Union of Liability Insurers (NULI) in 2011.

In accordance with the recommendations of Rostehnadzor letter No. 00-01-35/1337 issued on 25/10/2013, at the determination of a damage due an accident of hydraulic structures to the extent not inconsistent with PAR NULI, it is necessary to apply the provisions of "Harm determination methods that can be caused to a person's life and health and a private and a legal person entity as the result of navigable hydraulic structure accident", approved by the order of Russian ministry of emergency situations and the ministry of transport of Russia No. 528/143 issued on 02.10.2007.

The PAR of insurers "Harm determination procedure that may be caused as the result of an accident at a hazardous facility, the maximum possible number of victims and the safety level of a dangerous object" are focused mainly on a social damage assessment that is they set the methods for a possible victim number determination (NULI, 2011). These rules include the recommended amounts of insurance payments under the contract of compulsory maintenance.

In respect of material injury determination (the number of legal entities, the property of which could be harmed, except for a dangerous object owner and the legal persons whose property is located on a dangerous object territory with a policyholder's consent) (NULI, 2011) of PPD insurers they give more than a modest payment. Consequently, the components of the material damage are determined according to the "Harm determination methodology that can be caused to a peson's life and health and to a private or a legal person's property as the result of navigable hydraulic structures accident", approved by the order of Russian ministry of emergency situations and the ministry of transport of Russia No. 528/143 issued on 02.10.2007, calculated on the basis of a probable harm physical indicators (MTRF, 2007). In some cases it is necessary to use the Ministry of Russia order No. 87 "On the approval of damage calculation methodology caused to water bodies due to the violations of water laws" (as amended) dated on April 13, 2009 to calculate the amount of damage caused to water bodies due to the violation of water system, structures and facilities operation rules as well as during the accidents at enterprises, transport and other facilities related to the discharge of harmful (polluting) substances in a water body.

In accordance with the current order the formula of damage determination to water bodies includes the indexation coefficient which takes into account the inflationary component of economic development. This ratio is recommended to take at the level of an accumulated one for the period of deflator index damage calculation in relation to 2007 (Table 1) which is defined as the product of the corresponding index-deflators by years in the line "investments (capital investments) at the expense of all sources of funding".

The damage to agricultural production as the result of hydrodynamic accidents may be assessed at 50% of a land value according to current restoration regulations (an average standard cost in a Russian Federation subject concerning a new land development in lieu of confiscated agricultural lands). Often a standard cost of new land development in lieu of confiscated agricultural lands is determined by the RF Government decree No. 77 "On the approval of loss compensation procedures to land owners, land users, tenants and agricultural production losses" issued on January 28, 1993 (as amended on December 27 1994) which is wrong as this decree became null and void in accordance with the RF Government Decree No. 98 "About the repeal of certain Russian Federation government decisions concerning the compensation issues for lost agricultural production" issued on 19 February, 2008.

Since, the restoration standards are not available now a days there is a sense to use the cadastral value in the calculation of a land value which is determined on the basis of a land value (Abdrazakov *et al*., 2016 a, b; Abdrazakov, 2015; Abdrazakov *et al*., 2015).

CONCLUSION

During the budget financing the values of fiscal efficiency ratio E, characterizing the necessity and the feasibility of a hydraulic structure construction, repair and reconstruction should be in the range of 1.08-1.15 on the average and >1.15 according to some recommendations. The recommended values E are not applied in the case of a development by the means of extrabudgetary funds, however, in any case the value of cost-effectiveness ratio can be more than one (Abdrazakov, 2015; Abdrazakov *et al*., 2016 a, b; Abdrazakov). It is worth noting that the method of capital investment efficiency estimation for planned activities is focused on performance and does not consider the time factor. The use of a simplified method is based on the assumption of an unequal distribution of a cash flow over the entire period of a project functioning. In this case, a typical method is used to determine the economic efficiency of capital investments (Gosplan Decree No. 40, the USSR Gosstroy decree N 100, the Presidium of the USSR AS No. 33 issued on 08.09.69).

In the case of an investment project financing with the involvement of a private investor funds, it is recommended to use the "Guidelines to assess the effectiveness of investment projects", approved by RF ministry of economy, RF ministry of Finance, the RF State committee for construction, architecture and housing policy No. VK 477 issued on 21.06.1999.

According to the stated above we conclude that the competent use of presented legal documents during hydraulic design is a pledge not only to obtain a positive conclusion of a state examination according to the executed results of engineering surveys, design and estimate documentation, followed by the performance of works ensuring the operational reliability of hydraulic structures in the Saratov Region as well as in other regions of Russia and also an active participation in the implementation of federal target programs.

REFERENCES

Abdrazakov, F.K., 2015. Organizational partnership for bulding, reconstruction for capital overhaul of hydrotechnical structures. Intl. Bus. Manage., 6: 1163-1168.

Abdrazakov, F.K., A.A. Tkachev and A.V. Pomorova, 2015. Economic justification of investment projects for construction, reconstruction or major repairs of objects for nature use. Agric. Res. Mag., 2: 65-68.

Abdrazakov, F.K., A.A. Tkachev, A.V. Pomorova and V.T. Sirota, 2016 a. The analysis and the evaluation of investment project feasibility for agricultural nature use. Agric. Res. Mag., 2: 37-40.

Abdrazakov, F.K., A.V. Povarov, D.A. Solov'yov, Y.Y. Trushin and A.A. Khalmetov, 2016 b. The study of the process of face milling cutter work by performing service and repair works at irrigation canals. ARPN. J. Eng. Appl. Sci., 11: 9613-9621.

FTP., 2012. The development of Russian federation water complex in 2012-2020. The Federal Target Program, Russia.

GRF., 2012. [On the federal target program: Development of the water management complex of the Russian Federation in 2012-2020]. Government of the Russian Federation, Moscow, Russia. (In Russian)

Kiselyov, P.G., 1972. Manual on Hydraulic Calculations Revised and Supplemented. 4th Edn., Energy Publisher, Moscow, Russia, Pages: 312.

MNRR., 2009. [N 87 On approval of the methodology for calculating the amount of damage caused to water bodies as a result of violation of water legislation]. Ministry of Natural Resources of Russia, Russia. (In Russian) http:// base.garant.ru/ 12167365/#ixzz3pKqtPbG2.

MTRF., 2007. [Methodology for determining the amount of harm that can be caused to life, health of individuals, property of individuals and legal entities as a result of an accident of navigable hydraulic structures]. Ministry of Transport of the Russian Federation, Russia. (In Russian)

NULI., 2011. The rules of insurer professional activity the procedure of harm determination that may be caused as the result of an accident at a hazardous facility, the maximum possible number of victims and the safety level of a dangerous object. The National Union of Liability Insurers (NULI), Moscow, Russia.

Schavelev, D.S., 1986. Economy of Hydraulic and Water Management Construction: The Textbook. Stroyizdat Publisher, Moscow, Russia, Pages: 423.