Materials of Conferences

ECOLOGICAL MONITORING OF RESERVOIRS OF VOLGOGRAD AND ITS SUBERBS WITH DIFFERENT DEGREE OF ANTHROPOGENIC INFLUENCE

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Hydrosphere is a natural accumulator of the majority of polluting substances, entering the atmosphere and lithosphere.

Presence of polluting substances in the water influences vital functions of some living organisms, functioning the whole water system and people, whose residence is in the coastal zone.

The goal of our work is monitoring of ecological welfare in reservoirs of Volgograd with different level of anthropogenic pollution.

The following reservoirs were chosen to be researched: the Angarsky pond, the Sudomoika eric, a reservoir in the place called Lesobaza which are located in different topodemes of Volgograd and its suburb.

In the process of investigation it was made a repeated water sampling from these reservoirs and organoleptic properties and chemical water composition of them were examined according to 14 indices (pH, petrochemicals, Cl^-, NH_4+, O_2, permanganate oxidation, biochemical oxygen consumption, PO_4^-, NO_2, NO_3, hardness, Ca^{2+}, Mg^{2+}, HCO_3^-).

Organoleptical analysis, the results of the experiment to test sediment and smell of water showed that the water of all the reservoirs is of midrange of pollution, nonpotable, might adversely affect the population of Angarsky settlement and camp settlement on the bank of the eric Sudomoika, as this water is used by some part of the population for cooking.

The results of hydrochemical investigation show that the Angarsky pond, the Sudomoika eric are tipically sweet reservoirs, but the reservoir in the place called Lesobaza is saltish. Maximum allowable concentrarion of the analyzable substances in the Angarsky pond and Sudomoika are in the limits of the possible meanings. As for the reservoir in the place called Lesobaza, maximum allowable concentrarion of magnesium, calcium are increased, and high mineralization takes place here that can be connected the presence of bischofites.

Thus, the Angarsky pond can be considered as the cleanest reservoir, the most polluted is the reservoir in the place called Lesobaza.

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HYDRAULIC ENGINEERING PROTECTION OF COASTS OF WATER OBJECTS

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The problem of human adaptation to floods has universal importance. Floods are usually observed at the territories which are rich with water and fertile flood-lands. There is a constant conflict between the necessity of coastal territory reclamation and unavoidable losses from floods.

In Russia about 50 thousand km^2 are flooded annually. The area of the territories which have a risk to be flooded amounts from 400 to 800 km^2. 300 cities and more than 7 million ha of farmlands fall into the flooded area. In Russia the areas with frequent flood are the North Caucasus, the Primorsky Kray, Sakhalin and Amur regions, Transbaikalia, the Middle and South Ural, Nizhnaya Volga.

At studying of high seasonal floods at the Middle Ural the materials of supervision of Perm university scientists with 1902 for 2005 are used. Forwarding, statistical, design methods are used.

The reason of high seasonal floods at the Kama river basin is the spring snow melt with the extremely big snow bank or (and) a friendly spring character. Over the last 100 years 1902, 1914, 1926, 1957, 1965, 1969, 1900, 1991 got the notoriety, when within the whole Kama basin there were observed floods which caused the inundation of banks, settlements and enterprises. Great damage was caused by the extremely high spring flood in 1979. In Perm region 11 cities and 86 small settlements were damaged.

At some places water rose up to 5-11 m, 7200 dwelling houses were flooded, bridges were broken, 338 km of road, 11 km of embankments, 11 km of water pipe -lines, 16 km of sewerage networks, 11 km of LHV were washed out.

Ice gorges are more characteristic for rivers of the Middle Urals and lead to great water level rises. On the Upper Kama level rises measure up 2,0-2,5 m. On Pilva, Kutima,Yazva, Velva, Obva and on a number of other rivers – from 0,5 to 2,0-2,5 m. The highest level rises are registered on the Chusovaya river near the village Kyn (2,8 m), at the Iren river near the village Shubino (2,7 m), and on the Silva river near the village Podkamenoe (3,4 m). Often there occur ice blocks within the transient regions of the Kama water storages on the Kama river feeders.

Due to the heavy snow cover rivers usually are free from frazil or there is not much of it. However, at weather conditions in the beginning of winter (1928, 1937, 1947, 1949, 1966) frazils can sharply appear and present a danger for hydrotechnical constructions. These conditions are the following: rapid air temperature falls at insignificant snow cover that lead to small and medium rivers freezing in separate areas and to water discharge on ice. Thus, in winter 1966-1967 almost all small rivers of the Kama river basin got frozen. Citizens of Perm, Chusovoj, Lysva, Chernushka cities could see with their own eyes how crafty even the smallest rivers could be. The frazil width at some areas amounted up to 1,5-4 metres. Having filled in the channel ice demolished bridges.

High spring floods in the Kama river basin are observed most frequently within Kungur region. Kungur city appeared at the junction of the Sylva river and its three large feeders – Iren, Shakva and Babka. The origin of this river junction is connected with the long-term development of karst and tectonic movements of the Earth's crust.

The Sylva river – the left feeder of the Chusovaya river, the basin is located in the south-eastern part of Perm region. The river network of the area under study belongs to the Caspian Sea basin. The basin region belongs to the mountain area (The Urals, the Cis-Ural region) as well as to the plain steppe and forest-steppe area. It is located within the South Urals region and a part of the Middle Urals. The basin relief constitutes mainly even land, in the east there are offsets of the South and Middle Urals.

In the Sylva river basin there are more than 300 ponds, about 400 lakes with the total area about 20 km^2, 120 bogs with the total area about 66 km^2.

The territory climate has some peculiarities that manifested in distribution of the air temperature, atmospheric precipitates and some other meteorological elements, that is caused by the influence of the Urals.

Judging by the hydroregime one can refer the rivers of the territory under consideration to a type with distinct spring flood, summer-autumn freshets and long-lasting winter low water. Snow water is important for stream feeding. In the southern forest-steppe areas the part of meltwater amounts up to 85-90% in the total runoff. It is substantially less (60-65%) – within the highest parts of the Ural Mountains where river feeding mostly depends on rains (up to 40%) as well as solid precipitations. On average about 25-35% of the annual runoff appears underground.

The spring flood on the Sylva river begins in the 1st decade of April. Water flow in the Sylva river almost doubles at 5 km, the channel width increases from 100 to 150 metres.

The flood peak comes after ice drift, which lasts for 1-5 days, when the snowmelting on the Kungur lands has already been over. In spring before the water level goes up there is observed a short lowering of the level to its minimum when the river channel is clearing off the ice within the town.

In case of an early spring a flood begins at the end of March (1961, 1978, 1981, 1983, 1984 and 1986), and if the snow melting is delayed the flood level rise begins in the second part of April and actively continues in the first decade of May. Depending on a temperature regime the river water level reaches its maximum in different periods. According to 1934-1997 data peaks of spring floods appear in between 3.IV (1961) and 21.V (1940).

The ebbing after its maximum progresses much slower than its rising. It usually stretches for 1-1,5 months and ends in the first (1975, 1977), second (1976, 1980, 1982 and 1983 years) part of May, and in some years in the first part of June (1934, 1935, 1956, 1978, 1979, 1985, 1986) and even in July (1984) which depends on the moment of its maximum comes.

Cold snaps in the snowmelting period lead to the level diagram dissection into two-three peaks and more complicated forms. The flood type according to its level regime defines its maximum height. Thus, if one-peak floods in 1979, 1981 and 1987 were characterized by the level rise up to 7 and more metres, then two-peak ones in 1959, 1968 ad 1980 had only the rise up to 4,5-5,5, and three-peak floods in 1935, 1961 and 1984 – no more than 3,5 metres. The danger of catastrophic inundations is produced only by one-peak floods with the maximum grades at the end April or in the beginning of May.

Protecting dams must be high enough to prevent the flood going over the edge. As fortifications there are used reinforced concrete, pre- and solid-cast plates, rockfill blankets, soft mattress coating, stone flagging, gabions, asphalt plates, ramping, planting shrubbery, forest plantation and grass sowing and etc.. Bank protection structures are influenced by streaming water, waves, ice drift and atmospheric precipitates. The fortification type is chosen depending on the level streaming water influences on the slope.

The flooding is prevented by dams with the total length about 28 km, the height up to 10 m and the edge width up to 6 m, the slope base from 1:0,5 to 1:1,5. The dams were built in the mid 60ths of XX century, under conditions of the highly cramped urban development. The protecting dams were built with the method of "national development", which means that each enterprise and organization in the city has attached urban lots where they had to provide protection from the flooding, that's why the body of the built dams was so different by its structure. The dams were laid with enterprises' waste products and clay soil, pieces of concrete frames. The dam operation conduct had been unregulated till the mid 90ths, the dam work was conducted only in the spring flood period.

The main dam buildup, broadening, stabilization operations were carried out in 1998-1999. As a result the opportunity for vehicles to drive along the dams' edge appeared.

In spite of taken measures sliding and breaking down of the dams are observed annually, especially on the unstable segments. These can be caused by unsatisfied quality of dam body materials, their height, too steep slope's angle.

To eliminate mentioned processes the agreement was made to reinforce the dam slopes. So far, since year 2000 the dams in Kungur have became the experimental area for the application of different reinforcing technologies. For the first time in Permsky Kray the following dam reinforcement technologies were applied:

- gabions;
- geoinjection of slopes,
- different biotechnologies (as cocas mesh, boimates, etc.),
- wave energy diminishing copes.

The gabions were designed using the technology of the “Mackaferry Gabions” Company (Italy). Fixing of the sliding slopes were performed via geoinjection method , which was proposed by “Gabions” Company (Russia, Perm). This method was applied for the wet slope for the first time On the dams of our region the boimates of “Mackaferry Gabions” have being successfully applied. Currently they are one of the main technologies of low-crest dam slope fixation, especially for the dams exposed to active surface water influence. These biotechnologies are used all around the world.

The Iren river dam in Kungur built in 2005 can be regarded as an example of a protecting flood wall. Its length amounts to 330 m. It provides protection against the flood for 531 houses with the popularity 3000 people. The prevented damage amounts to 332 million rub.

In some cases especially having a new building development, the protection against floods is fulfilled with soil filling. But this method is economically sound only if the embankment is not very high. The cost of this work usually is two or three times higher than the cost of the protecting dams.

In practice a method of river channels clearing is used. Depositions of wood and sandy silt material affect the water-transmitting capability of the Sylva river and this has resulted in a bad river shallowing. The channel clearing decreases a flood level, reduces the stream bank erosion and overgrowing of shallows, increases the river water quality.

Conclusion

The most radical way of flood protection is to regulate the flow with water storages. Reducing the flood damages is achieved by the redistribution of the flow in time. The water storages specially built up for the flood preventing, are constructed with the help of the dams of different height and length. For their arrangement artificial and natural hollows are used. A routing channel between the river and a detention pond is build to route flood water to and from the detention pond during high and low (water) flow respectively. The channel has constructions for regulating its transmitting capacity.On rivers which have wide flood valleys anti-flood storages are constructed –of a river or lake-river type, or a range of storages on the main river and its feeders. When projected, the designing of variants of location, water marks and operating conditions, the effectiveness of water storage construction is required. Water storages can become a reason of numerous negative processes – karst, erosive, hydrochemical, hydrobiological that can change the naturally developing nature system. Therefore a thorough investigation of the whole complex of questions is required. Any attempt of an isolated solution is doomed to failure as it doesn’t lift the threat of a flood, but either intensifies it or leads to new negative consequences.

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RAISING THE EFFICIENCY OF ENGINEERING SURVEY AS ONE OF THE WAYS OF ENVIRONMENTAL PROTECTION

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Caring about nature is a motto of the modern world. The most significant events under such logo are meetings, protests, and attempts to recover from already done mistakes. At the same time, one should not forget about preventing the environmental degradation under human activity. Sometimes damage caused to the nature is not clearly seen or is not significant itself; however, accumulating, even small environmental damages may result in a huge problem.

Mankind regularly affects the environment by building houses, factories, roads, communications, etc. And before building, it carries out engineering surveys. During those surveys wells are drilled and rock samples are taken, which damages so-called geological environment. Thus, even if a piece of land appeared to be not appropriate for building, environment is already breached. For example, during the projecting of trans-Siberian oil pipeline the surveys, to be exact, deforesting was already started before the project was approved. Later, the project was changed under the society pressure, but what about deforested lands?

It is understandable, that we can’t refuse from building at all, but we can try to minimize damage that is caused to our planet. An alternative for standard methods of engineering survey are geophysical ones. Geophysics studies physical properties of rocks, such as elastic waves speed, specific electrical resistance, radioactivity, etc. In this case surveys may be carried out not only in wells, but on the surface. For those purposes the surface of the area is laid out with profiles and pickets, and then a recipient and a source of a certain kind of signal is set up. In such method as seismic prospecting a source lets out elastic waves (due to a shock or ultrasound), which go through rocks and reach a recipient in a certain time. Basing on the data from seismic recipient a time section of the area is plotted and then it is mathematically transformed