Influence of pre-dams on changes of quality of the retention waters in main reservoirs

Summary

The work relates to the possible application and use of pre-dams for protection and improvement of retention water quality in primary reservoirs. To achieve the target, field tests were conducted in the area of the Mściwojów reservoir constructed on the Wierzbiak River in 1999 (Lower Silesia province). The reservoir is fed by two watercourses: Wierzbiak and Zimnik. The reservoir is for agricultural use of retained water. It also serves as a flood control reservoir. Moreover, it is possible to breed fish there and use it as a power source. It is thought that also the recreational function will play a significant role in the usage of the facility as this is one of a few bodies of water near Legnica and Jawor.

To improve the quality of reservoir feeding water, a so-called pre-dam was separated from the primary reservoir; it consists of a three-chamber settling tank and three biological dams. These facilities are to improve the quality of water feeding the primary reservoir.

To determine the effectiveness of the pre-dam, there were conducted regular measurements of quantity and quality of water reaching the reservoir and on the outlet of the reservoir. To explain quality changes of water during its flow through the reservoir, nitrogen and phosphorus the biogenic compounds that are easily absorbed by phytoplankton and macrophytes were subject to examination. They have crucial impact on the process of water eutrophication.

When assessing the changes of water composition, the following were taken into account: nitrates, nitrites, ammonia, total nitrat, phosphates, total phosphorus, reaction (pH), water temperature, electrolytic conductivity, solutes, 5-day biochemical oxygen demand, dissolved oxygen, oxygen saturation. Moreover, the following metals were determined in the water inflow and outflow of the pre-dam and primary reservoir: Zn, Cd, Pb, Cu, Fe, Mn and Mg, and chlorophyll-a.

The conducted filed and laboratory tests enabled to determine the level of pollution of the water inflow to the reservoir, in the pre-dam and water outflow, and the primary reservoir, as well as examine the decrease of pollution between the inflow and outflow of the tested system.

Results of the research from the period between November 2000 and October 2002 show the positive role of the pre-dam in limitation of eutrophication process development in the primary reservoir. The pre-dam decreased the concentration of nitrates by 66.5% and phosphates by 52.8%.

On the basis of the tests conducted, it was determined that:

– The pre-dam significantly decreases the quantity of pollution in water feeding the primary reservoir, thus improving the water quality in the primary reservoir.

– Pre-dams should be constructed simultaneously with the primary reservoir in the case of disordered water and sewage management in a catchments area,

– The following are required for due operation of a pre-dam:

a) Provision of appropriate water depths and time of water presence,

b) Regular conduction of maintenance work consisting in periodical plant mowing and removal, and periodical removal of bottom sediments from the pre-dam.