



Structural and Physical Aspects of Construction Engineering

The Effects of Selected Types of Active Bank Stabilization

Miloslav Šlezinger^a, Marková Jana^b, Gernešová Lenka^{c,*}

^aMendel University of Brno, Zemědělská 1, 61300 Brno, Czech Republic and University of Technology Brno, Žitkova 17, 60200 Brno, Czech Republic

^{b,c}Mendel University of Brno, Zemědělská 1, 61300 Brno, Czech Republic

Abstract

A major issue related to the banks of reservoirs is their gradual erosion caused by waves - those incurred by the wind, the movement of vessels, or otherwise. A possible way of the bank protection is the implementation of an active bank stabilization. Offshore breakwaters are designed for the cases where the shore itself is protected for some reason (e.g., protection of nesting birds, etc.) and a direct intervention in the bank is not possible. This is the situation of heavily disturbed banks of Brno reservoir, where the experiment described has been conducted and the results are presented in this paper.

© 2017 Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Peer-review under responsibility of the organizing committee of SPACE 2016

Keywords: bank; protection; erosion; dam; stabilisation

1. Introduction

Bank erosion is the surface abrasion of the base (bed and banks) by the motion of the water (waves) associated with the movement and deposition of released material. This phenomenon is the issue in a vast majority of water reservoirs, on a global scale. The emergence and development of erosion is caused by many factors; however, the results are the same - significant damage to the banks of reservoirs, the emergence of erosion walls and many tens, or even hundreds, of cubic meters of soil washed away [1]. Subsequent landslides and threat to the buildings and roads constructed on the banks are no exception [2], [3].

* Corresponding author. Tel.: +420 545134520

E-mail address: slezinger@node.mendelu.cz

However, project preparations of water works still seldom include a design of a consistent stabilization of potentially endangered reservoir banks, i.e. a proposal of appropriate preventive measures. Endangered parts of banks can be relatively easy identified in advance [4] and appropriate preventive stabilization measures can be proposed. In many cases, appropriate vegetation or biotechnical modifications would be sufficient. Consequent remedial interventions are significantly more challenging, both technically and economically. But even in these situations, ecobiology can be used with success to design appropriate biotechnical stabilization measures in combination with appropriate species composition and layout of riparian stands, and to ensure sufficient protection of the banks and erosion control [5], [6].

The present paper emphasizes the possible use of biotechnical stabilization, in the form of active bank stabilization. The cases presented are selected, implemented and subsequently verified active stabilization structures.

2. Methodology

The basis of active stabilisation is the aim to stop (hinder) the motion of waves and negate, or significantly reduce their destructive effect even before they reach the bank. This principle is primarily known from the protection of the seashore and ports (often a natural system of islands, reefs, considerably eliminate the destructive effect of waves breaking on the coast). However, it is much less used in the protection of the banks of inland artificial lakes.

If an erosion wall has been already formed, the bank material falls down naturally (by the alternations of frost and melting, the influence of rain, wind, etc.). This material is continually washed away into the reservoir and a cavern arises at the bottom of the erosion wall. Therefore, another desired effect of the active stabilization is a significant reduction or complete elimination of the material washing away. If successful, the material that falls down remains on the erosion platform and the bank starts sloping, naturally and gradually. However, this process can take decades. It is important that no bank line retreat occurs [7], [8].

The cornerstones of the research are to monitor the material washing and to determine which of the active stabilization elements can reduce the washing away best.

In the case of the result presentation of projects (project IGA 2016002 and project ÚČ LDF 2016), we draw on a long-term study based on the monitoring of biological stabilization measures at Brno Reservoir. The reservoir is located on the Svratka river, the Czech Republic. The total volume of the reservoir is 21 million m³ and the area of the section called "lake" is about 1 x 3 km (see Fig. 1).



Fig. 1.(a). Brno Reservoir – (b) bank damage.

Download English Version:

<https://daneshyari.com/en/article/5027260>

Download Persian Version:

<https://daneshyari.com/article/5027260>

[Daneshyari.com](https://daneshyari.com)