

MODELIRANJE VODOSTANA U SVRHU POBOLJŠANJA PERFORMANSI HIDROELEKTRANA

Sažetak:

U radu je predstavljen metod za analizu hidrauličkih procesa u vodostanima s bočnom komorom. Poseban doprinos rada je u a) kombinovanoj primjeni numeričkog rješavanja matematskog modela dovodnog sistema datog diferencijalnim jednačinama s analitičkom metodom i metodom računarske mehanike fluida za određivanje koeficijenata lokalnog otpora na spoju vodostana i dovodnog tunela, te b) modeliranju kretanja vode u bočnoj komori, a što je od bitnog uticaja na tačnost primjenjene metode. Validacija metode je izvedena na rezultatima eksperimentalnih ispitivanja izvršenih na vodostanu 2 HE Jablanica. Metoda daje rezultate u vrlo kratkom vremenu uz prihvatljivu tačnost, uporedivu ili nekada i bolju nego kod drugih raspoloživih metoda. Izvedena je i praktična primjena metode u analizi uticaja konstruktivnih i radnih parametara HE na hidrauličke procese u vodostanu, te su dati odgovarajući zaključci. Predložena je i vrijednost prečnika dijafragme na dnu vodostana s ciljem povećanja dozvoljenog protoka kroz dovodni tunel. Prezentovani su i potencijalni finansijski efekti rekonstrukcije vodostana.

Ključne riječi: hidraulika, hidroelektrane, vodostan, tranzijentni tokovi, simulacija

SURGE TANK MODELING FOR HYDRO POWER PLANT PERFORMACE IMPROVEMENT

Abstract

A method for an analyse of hydraulic processes in surge tanks with a chamber is presented in this work. The especial contribution of work is in a) combined application of numerical solving of the intake system mathematical model given by differential equations with analytical methods and computational fluid mechanics method for minor loss coefficient of connection between the headrace tunnel and surge tank estimation, and b) modelling of water movement in surge chamber what is crucial for applied method accuracy. Validation of the method has done on experimental testing results done on Surge tank 2 on HPP Jablanica. This method gives results in very short time with acceptable accuracy, comparable or even better than other available methods. Practical application of method was done on analysis of the influence of design and operating parameters of HPP on hydraulic processes in a surge tank and adequate conclusions. Diameter of surge tank diaphragm necessary for the headrace tunnel discharge increasing is recommended. Potential financial benefits of surge tank reconstruction are presented.

Key words : hydraulics, hydro-power plants, surge tank, Transient flows, simulation