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THE INFLUENCE OF THE HYDROPOWER PLANT PENSTOCK PROFILE UPON THE PENSTOCK MASS

UDK: 621.643

In hydropower plants with long penstocks that transport the water from distant storages to turbines, it is very important to determine a proper penstock profile and dimensions. For the available gross head and water discharge, penstock profile and dimensions are optimized with regard to investment cost and head losses in its exploitation. In the first design stage, the optimum diameter constant along the penstock, so called "the economic penstock diameter" is determined. The diameter obtained by this method is used as a basis for division of the penstock into sections with variable diameters. The principal condition for this division is that total head losses in the penstock should remain constant, while the mass of the penstock as a whole is reduced. In the present paper the influence of the penstock profile upon the penstock mass is also analyzed; that influence is demonstrated for five penstock profiles.

Penstock parameters obtained by the methods described in the paper are presented in the graphical form. The values of the section diameters, wall thicknesses and masses are given normalized to the diameter, wall thickness and mass of the economic diameter penstock, respectively.

Key words: transport, energy, optimization.

UTICAJ OBLIKA TRASE CEVOVODA HIDROPOSTROJENJA NA MASU CEVOVODA

U hidroelektranama sa dugačkim cevovodima kojima se voda transportuje od udaljenih akumulacija do turbina, veoma je značajan pravilan izbor oblika trase i dimenzija cevovoda. Za raspoloživi bruto pad i protok vode oblik trase cevovoda i njegove dimenzije optimizuju se s obzirom na cenu izgradnje i gubitke energije u njegovoj eksploataciji. U prvoj fazi projektovanja cevovoda odredi se optimalan prečnik konstantan po celoj dužini cevovoda, tzv "ekonomski" prečnik. Prečnik dobijen na ovaj način koristi se kao osnova za podelu cevovoda na deonice promenljivog prečnika. Osnovni uslov za ovu podelu je da ukupan gubitak energije u cevovodu ostane isti, a da se masa cevovoda kao celine smanji. U radu se takodje analizira i uticaj oblika trase cevovoda na njegovu masu; taj uticaj je prikazan za pet oblika trase.

Parametri cevovoda dobijeni postupcima opisanim u radu dati su grafički. Vrednosti prečnika, debljina zidova i masa deonica svedene su redom na prečnik, debljinu zida i masu cevovoda ekonomskog prečnika.

Ključne reči: transport, energija, optimizacija.