

NEW RESULTS ON WATER HAMMER STABILITY*

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Dedicated to Dr. Vasile Drăgan on the occasion of his 70th anniversary

Abstract

The present paper starts from a model with distributed parameters (i.e. described by hyperbolic partial differential equations with non-standard (derivative) boundary conditions) of a hydroelectric power plant with tunnel, surge tank and penstock. The association of a system of functional differential equations of neutral type and the one-to-one correspondence between the solutions of the two mathematical objects is given. Further, it is given the deduction - *via* singular perturbations - of the nonlinear ordinary differential equations for modeling the surge tank in order to discuss its stability under constant power delivery of the hydraulic turbine. Some other unsolved problems are pointed out.

MSC: 35L50, 35Q35, 34K40, 34K20

keywords: Saint Venant equations, neutral functional differential equations, stability

1 Introduction. State of the art

In the analysis of hydroelectric plant dynamics two basic phenomena are observable: water hammer and frequency/megawatt control [1, 2]. From

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