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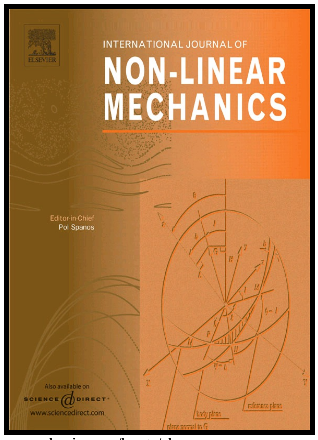

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Nonlinear dynamics of extensible viscoelastic cantilevered pipes conveying pulsatile flow with an end nozzle

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Abstract

Nonlinear dynamics of an extensible cantilevered pipe conveying pulsating flow is considered in this paper. The fluid flow fluctuates harmonically and exhausts via a nozzle attached to the end of the pipe. Taking to account the extensibility assumption, the coupled nonlinear lateral-longitudinal equations of motion are derived using the Hamilton's principle and discretized via the Galerkin's method. The adaptive time step Adams algorithm is applied to extract the time response, and then the bifurcation, power spectral density and phase plane maps are plotted for some case studies. Effects of some geometrical parameters such as flow mass, pulsating flow frequency, gravity, nozzle mass and nozzle aspect ratio parameters are studied on the dynamics of such system and the validity of extensibility assumption is investigated and some conclusions are drawn.

Keywords: Extensible pipe, Nonlinear vibration, Bifurcation, Pulsating flow.

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1. Introduction

Pipes conveying fluid are one of the basic elements which are extensively used in many structures and industrial systems such as pipelines, thermal and hydroelectric power plants and heat exchangers. Due to complex nature of the interaction between the fluid flow and the pipe structure, they are studied by many researchers as an interesting subject. Therefore, vibration of flexible pipes conveying fluid has been the subject of many studies

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