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Besançon



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Appliquées
CENTRE VAL DE LOIRE
ABOURGES-BLOIS



Influence of Electromagnetic Actuators on Near-Critical Behaviour of a Pipe Conveying Fluid

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Application of electromagnetic actuators to stabilize a pipe conveying fluid is investigated. When the flow velocity becomes sufficiently high the pipe loses stability. The energy supplied in a non-periodic form is transformed by the system into its oscillatory motion. Electromagnetic actuators of transformer type are investigated in the study. The non-linear ordinary differential equations governing the state of the actuators are presented. The continuous problem of dynamic stability of the pipe is discretized with the multimodal Galerkin procedure. It is shown that the actuators enable one to increase the critical flow velocity. Afterwards, a non-linear analysis of the Hopf bifurcation that occurs in the system is performed. Although the analysis is confined to purely numerical simulations, the physical parameters of the system are selected in a way that will allow conducting experimental verification, which is the next stage of this research project.