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THEORETICAL MODEL FOR THE FLUIDELASTIC INSTABILITY OF TUBE BUNDLES

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In this paper, a phase lag model is proposed in order to predict the fluid velocity threshold for a fluidelastic dynamic instability of square cylinder arrangement under cross flow [1, 2]. A theoretical formulation of a total damping, including the added damping in still fluid, the damping due to fluid flow and the damping derived from the phase shift between the fluid force and tube displacement, is given. A function of fluid and structure parameters, such as reduced velocity, pitch ratio, Scruton number, is thus obtained. It is shown that this function, taken as function of the reduced velocity variable, vanishes at the critical reduced velocity from which the fluidelastic dynamic instability of the tube occurs. Obviously, the value of the critical velocity is depending on other fluid-structure parameters. The obtained results are compared to experimental ones and those obtained from other theoretical models [3, 4].

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