Calculation of small vibrations of elastic systems with friction

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The paper considers an analytical approximate method for calculating small free and forced vibrations of elastic one-dimensional systems with dry friction. The method is based on the reduction of systems to mechanical analogues. The mechanical analogue is presented for each type of vibration in the endless system of linear oscillators. The authors propose an equality of frequency tone of free oscillations for each system to the i-tone of vibrations of the mechanical analogue. To consider dry friction the energy method was used, which was first applied by S.P. Tymoshenko to study the forced vibrations of a system with one degree of freedom. When designing a calculation method of vibrations the authors used the method of equivalent parameters. Particular solutions were found for the forced vibrations of mechanical analogues and equations of the transition process were considered. The results of the study can be used to examine dynamics of pipelines, for example, of oil pipelines.

Keywords: *cantilever beam, dry friction, free and forced vibrations, reduced viscous resistance.*

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