

Energy loss in a moving viscoelastic functionally graded component with a lengthwise crack in it

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One of the main characteristics of functionally graded composite materials is the continuous change of their material properties in certain directions in the structural component. The very concept of functionally graded materials offers excellent opportunities for designing the distribution of material properties in order to satisfy certain requirements in terms of strength, stiffness, temperature resistance, wear resistance and others in certain parts of the structural component. All this makes functionally graded materials indispensable in engineering applications, where structural components are subjected to dynamic loads, temperature fields and chemical effects. The phenomenon of energy loss is characteristic of materials with viscoelastic behavior. In this article, the energy loss in a viscoelastic functionally graded component with a lengthwise crack in it is studied. The component performs mechanical movement according to a known law. The resulting solution for the energy loss is based on an analysis of the behavior of the moving structural component under the action of the inertial load, taking into account the viscoelastic properties of the functionally graded material. The total energy loss is obtained by summing the energy loss in both arms of the lengthwise crack and in the intact part of the structural component. An approach known from the literature is applied to verify the solution. The effect of various parameters of the moving structural component, the lengthwise crack and the material gradient on the energy loss is evaluated.