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Optimum Method to Reduce the Natural Frequency for Steel Cantilever Beam

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Abstract : Passive damping, once properly characterized and incorporated into the structure design is an autonomous mechanism. Passive damping can be achieved by applying layers of a polymeric material, called viscoelastic layers (VEM), to the base structure. This type of configuration is known as free or unconstrained layer damping treatment. A shear or constrained damping treatment uses the idea of adding a constraining layer, typically a metal, on top of the polymeric layer. Constrained treatment is a more efficient form of damping than the unconstrained damping treatment. In constrained damping treatment a sandwich is formed with the viscoelastic layer as the core. When the two outer layers experience bending, as they would if the structure was oscillating, they shear the viscoelastic layer and energy is dissipated in the form of heat. This form of energy dissipation allows the structural oscillations to attenuate much faster. The purpose behind this study is to predict damping effects by using two methods of passive viscoelastic constrained layer damping. First method is Euler-Bernoulli beam theory; it is commonly used for predicting the vibratory response of beams. Second method is Finite Element software packages provided in this research were obtained by using two-dimensional solid structural elements in ANSYS14 specifically eight nodded (SOLID183) and the output results from ANSYS 14 (SOLID183) its damped natural frequency values and mode shape for first five modes. This method of passive damping treatment is widely used for structural application in many industries like aerospace, automobile, etc. In this paper, take a steel cantilever sandwich beam with viscoelastic core type 3M-468 by using methods of passive viscoelastic constrained layer damping. Also can proved that, the percentage reduction of modal frequency between undamped and damped steel sandwich cantilever beam 8mm thickness for each mode is very high, this is due to the effect of viscoelastic layer on damped beams. Finally this types of damped sandwich steel cantilever beam with viscoelastic materials core type (3M468) is very appropriate to use in automotive industry and in many mechanical application, because has very high capability to reduce the modal vibration of structures.

Keywords : steel cantilever, sandwich beam, viscoelastic materials core type (3M468), ANSYS14, Euler-Bernoulli beam theory
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