World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:13, No:01, 2019

Estimation of Damping Force of Double Ended Shear Mode Magnetorheological Damper Using Computational Analysis

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Abstract : The magnetorheological (MR) damper could provide variable damping force with respect to the different input magnetic field. The damping force could be estimated through computational analysis using finite element and computational fluid dynamics analysis. The double-ended damper operates without changing the total volume of fluid. In this paper, damping force of double ended damper under different magnetic field is computed. Initially, the magneto-statics analysis carried out to evaluate the magnetic flux density across the fluid flow gap. The respective change in the rheology of the MR fluid is computed by using the experimentally fitted polynomial equation of shear stress versus magnetic field plot of MR fluid. The obtained values are substituted in the Herschel Buckley model to express the non-Newtonian behavior of MR fluid. Later, using computational fluid dynamic (CFD) analysis damping characteristics in terms of force versus velocity and force versus displacement for the respective magnetic field is estimated. The purpose of the present approach is to characterize the preliminary designed MR damper before fabricating.

Keywords : MR fluid, double ended MR damper, CFD, FEA
Conference Title : ICMM 2019 : International Conference on Magnetorheological Materials
Conference Location : Rome, Italy
Conference Dates : January 17-18, 2019