World Academy of Science, Engineering and Technology
International Journal of Mechanical and Industrial Engineering
Vol:9, No:08, 2015

Improving the Exploitation of Fluid in Elastomeric Polymeric Isolator

Authors : Haithem Elderrat, Huw Davies, Emmanuel Brousseau

Abstract : Elastomeric polymer foam has been used widely in the automotive industry, especially for isolating unwanted vibrations. Such material is able to absorb unwanted vibration due to its combination of elastic and viscous properties. However, the 'creep effect', poor stress distribution and susceptibility to high temperatures are the main disadvantages of such a system. In this study, improvements in the performance of elastomeric foam as a vibration isolator were investigated using the concept of Foam Filled Fluid (FFFluid). In FFFluid devices, the foam takes the form of capsule shapes, and is mixed with viscous fluid, while the mixture is contained in a closed vessel. When the FFFluid isolator is affected by vibrations, energy is absorbed, due to the elastic strain of the foam. As the foam is compressed, there is also movement of the fluid, which contributes to further energy absorption as the fluid shears. Also, and dependent on the design adopted, the packaging could also attenuate vibration through energy absorption via friction and/or elastic strain. The present study focuses on the advantages of the FFFluid concept over the dry polymeric foam in the role of vibration isolation. This comparative study between the performance of dry foam and the FFFluid was made according to experimental procedures. The paper concludes by evaluating the performance of the FFFluid isolator in the suspension system of a light vehicle. One outcome of this research is that the FFFluid may preferable over elastomer isolators in certain applications, as it enables a reduction in the effects of high temperatures and of 'creep effects', thereby increasing the reliability and load distribution. The stiffness coefficient of the system has increased about 60% by using an FFFluid sample. The technology represented by the FFFluid is therefore considered by this research suitable for application in the suspension system of a light vehicle.

Keywords : FFFluid, dry foam, anti-vibration devices, elastomeric polymer foam
Conference Title : ICAME 2015 : International Conference on Automotive and Mechanical Engineering
Conference Location : London, United Kingdom
Conference Dates : August 20-21, 2015