

ABSTRACT

The utilizations of Internal Combustion (IC) engines are increasing in the field of automobiles and power plants due to population. Vibration in any machine causes wear and tear, reduction in life of its components and also produces the irritating noise. Any motion that repeats itself after certain time period is called vibration. Vibration behaviour of the machines is caused by the moving components of the machines like rotating and reciprocating components. Vibration is concerned with the cyclical motion of dynamic systems that can produce relative motion. All bodies with mass and flexibility have the ability to vibrate. In recent days, the design and development of engine mounts for vibration isolation is promising vibration control techniques due to unbalanced forces developed from the engine. The conventional mounts such as elastomeric, hydraulic, and pneumatic mounts are the most widely used in the engines to isolate vibrations. However, these mounts show some limitations on the isolation of different kind of vibrations. The recent research and development efforts focuses on improving the engine mount technology to achieve good vibration isolation. In this research work, honeycomb mount was developed and tested on the single cylinder Variable Compression Ratio (VCR) engine to observe the vibration characteristics for compression ratios such as 18, 19, 20, 21 and 22 to isolate vibration. The experimental results were compared with the elastomeric mounts for vibration parameters such as Natural frequency, damping ratio, mount displacement for particular time, magnitude for the acceleration, and Root Mean Square (RMS). The values have been observed under different fuel injection pressure with varying load conditions, blower various closing conditions. Further, the results of the vibration testing from the various mounts were analyzed with respect to time domain and frequency domains. As a result, the current study suggests a hybrid honeycomb mount loaded with silica gel to separate engine vibration. Analysis of various domains is done during experiments on the VCR engine installed on the hybrid honeycomb framework. The outcomes of the tests revealed that the engine's efficiency with a

hybrid mount was superior to that with a regular elastomeric mount. A hybrid sandwich panel is used to reduce engine vibrations. It has a honeycomb design and is stuffed with fibrous silica gel. Comparing honeycomb mounts to conventional (elastomeric) mounting, the damping ratio for the former is 0.17, making them excellent damper. Under various load circumstances, a mount with a honeycomb construction decreased vibration by over 40% when compared to a standard elastomeric mount. The damping factor developed for honeycomb mount provides better damping even at High frequencies. Through Time Domain Analysis, Frequency Domain Analysis and Analytical Approach through ANSYS, it is found that Honeycomb mount acquires less vibration than Elastomeric mount. In Honeycomb Mount, 35% to 45% of vibration is absorbed more than Elastomeric Mount. Therefore, when compared to a rubber mount, a honeycomb mount has superior damping properties and heat dissipation properties. In the vibration-free study, the honeycomb mount achieves a greater damping ratio (0.17) than the traditional mount. The investigation shows that engines with a chosen compression ratio of 18 have lower displacement and acceleration amplitudes when using the honeycomb mount. As a result, the honeycomb mount with silicone gel is extremely effective with respect to dampening and vibration isolation. As a result, this hybrid mount (honeycomb) would be suggested for engines with improved vibration signature characteristics, such as VCRs.