A Multi-Disciplinary Approach for Design Improvement of an Air-Cooled Two-Wheeler Engine Cylinder Head

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The air-cooled engine surfaces are generally provided with extended surfaces of high conducting materials called fins for enhanced heat transfer. One way to increase the rate of heat transfer is by increasing the fins surface area. However, increase in fin length introduces undesirable vibrations of the fins, which in turn radiate annoying high frequency noise. With the demand of quieter engines increasing, the vehicle manufacturers follow counter measures to minimize the fin vibrations. One trend in the two-wheeler industry is to put rubber dampers between the fins. These rubber dampers damps out the level of vibrations and the level of noise radiated is reduced. However, these rubber dampers have many disadvantages. Apart from the adding extra cost and a parallel manufacture process, these rubbers act as an insulating material, which impede the free flow of cooling air. The engine may get overheated and purpose of providing extended surface would not be satisfied. In this paper, effect of these rubber dampers on engine radiated noise and thermal performance is investigated. We discuss a systematic methodology on how to remove these rubbers by keeping the noise level same along with higher heat transfer from the engine surfaces. Results from experiments and numerical simulations for noise & vibration and computation fluid dynamics (CFD) with conjugate heat transfer are discussed. This paper describes a classic example of multi-disciplinary approach to solve real-world design problems.

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