NUMERICAL STUDY OF A THERMO-ACOUSTICALLY ENCAPSULATION

Fabian Duvigneau¹, Ulrich Gabbert¹

¹ Institute of Mechanics, Otto-von-Guericke-University Magdeburg
Universitätsplatz 2, 39106 Magdeburg, Germany
E-Mail: fabian.duvigneau@ovgu.de, ulrich.gabbert@ovgu.de

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In recent years comfort has become an important factor when evaluating the performance of modern automobiles. One important aspect that has negative ramifications on the perception of quality is the generated noise. Therefore, an important goal in current research activities is to minimize the acoustic noise that is radiated by a combustion engine. To achieve this goal, the paper at hand investigates the performance of a thermo-acoustic encapsulation. Using this passive approach it is hope to improve not only the acoustic but also the thermic behavior. From a tribological point of view the heat storage of the motor oil is of utmost importance. By encapsulating the motor the oil temperature can be increased. Since the oil temperature is directly related to the fuel efficiency the consumption can be decreased and therefore the pollution is reduced as well. We avoid, moreover, a so called cold start-up of the engine resulting in a reduced abrasion. Consequently, a thermo-acoustic encapsulation has several positive effects increasing the environmental friendliness.

In a first step acoustic and thermic phenomena are considered separately. The finite element method (FEM) is deployed to simulate a stripped engine block. Detailed analyses are conducted with and without thermo-acoustic encapsulation. The numerical results clearly indicate the potential of such an encapsulation (cf. fig. 1). Both a significant reduction in sound pressure and an improved thermic insulation can be proofed. In a last step several parameter of the encapsulation are varied illustrating the vast potential for an optimized design.

![Figure 1: Radiated sound pressure of an engine with and without a thermo-acoustically encapsulation](image-url)