**Vibration and Noise Attenuation of Car Engines with Active and Passive Methods**

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ABSTRACT

In recent years comfort has become an important factor when evaluating the performance of modern automobiles. One important aspect is the disturbing noise level of cars which is mainly caused by the engine. In the presentation active and passive approaches to reduce the noise radiation of combustion engines are discussed. In the first part a smart structures concept is presented and applied to reduce the noise radiation of the oil sump of engines. For the design a finite element based overall modeling approach has been developed. This concept is briefly presented and then applied to an oil sump of a diesel engine, which is the most noise radiating part of an engine. Piezoelectric patch actuators and sensors are attached to the oil sump, and with help of an appropriate controller the noise radiation is reduced significantly. Besides the numerical results also measurements are presented, which are received on an acoustic engine test bench. Alternatively, in the second part of the presentation passive approaches are discussed. The focus is on engine encapsulations consisting of damping materials, which are also designed with help of finite element models. The numerical results are also compared with measurements performed with help of an engine test bench. It is shown that the active approach works well in the lower frequency range, whereas acoustic encapsulations reduce the radiated noise considerably in the higher frequency range. A combination of both approaches seems to be an efficient concept to reduce the noise radiation over a broad frequency spectrum of excitations.

Brief CV

Ulrich Gabbert graduated at the Technische Hochschule Magdeburg as Mechanical Engineer (Dipl.-Ing.) with a specialization in steel construction and applied mechanics. The doctoral degree (Dr.-Ing.) he received in 1974. Then he was working as an engineer in a pump and compressor company in Halle, where he was responsible for the strength of materials, safety design and the development of simulation software. In 1979 he went back to the Technische Universität Magdeburg as head of a Finite Element Development Group, responsible for finite element software developments and industrial applications. In 1988 he received the title doctor habilitatus (Dr.-Ing. habil.). Since 1992 he is Full University Professor at the University of Magdeburg. His research interests are finite elements, smart structures, active vibration and noise control, structural health monitoring and medical engineering. He is an active member of several national and international scientific organizations. In 2000 he received the Otto von Guericke Research Award*.*

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