

CONDITION HEALTH MONITORING OF A SUSPENSION STRUT CAP/ UPPER STRUT MOUNT USING PIEZOELECTRIC SENSOR FOR ELECTRO-MECHANICAL IMPEDANCE TECHNIQUE

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ABSTRACT

The suspension strut cap is the major component of automobile, which attaches the suspension strut to the vehicle body. In addition, it insulates the tire noise & vibrations from the vehicle for generated due to rough road profile and speed breakers. The suspension cap is mounted at the top of suspension strut, where one side bolts to the vehicle (i.e. cap is directly attached to the body) and the other side to attached to the steering pivots of wheel. So as the vehicle moves and goes over bumps, the up & down impact pushes and pulls at the mount. The caused vibration can be transmitted into the vehicle if routine inspection has not been done and can cause wear and tear in bearing part of the mount (loosening of bolts). The damaged suspension cap can lead to clunking noises, noisy steering, excessive movement, tire alignment etc. Hence, conditional health monitoring of a suspension strut cap is vital in vehicles. For this study, the utilizations of dual sensing mechanism of piezo sensor has made for Structural health monitoring (SHM) technique i.e. Electro-Mechanical Impedance Technique. Different state of damage has been induced by loosening the bolts to different torque range and compared with pristine stage (when bolts are tightened to highest force). The admittance signature are plotted to verify the damage condition raised due self-loosening. The RMSD plots were drawn to quantify the level of damage. Finally the FE coupled simulation has done for the suspension strut mound with surface bonded PZT patch for different damage levels and results are compared with experimental results. The promising results for this study sets a new paradigm for SHM technologies.

Keywords: Condition Health Monitoring, Structural Health Monitoring, Damage Detection, Suspension strut mount, EMI Technique, FE coupled simulation.

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