Optimisation of Stiffener Layout On Shell-like Structure

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ABSTRACT

This work is concerned with defining a methodology for adjusting the design of gearbox casings so that the radiated noise for constant speed operation is minimised. A baffled rectangular plate having a dimension similar to that of radiating surface of the gearbox casing was used in the study to develop the technique. Structural changes such as the number and arrangement of stiffening ribs were simulated on the plate and the differences in the radiated sound studied. A valid modal model of the plate was developed by correlating experimental data with numerical results. The same updating technique can later be used on the gearbox model with internals. Pseudo-inverse method was used to determine the excitation force from the measurement of the surface vibration and the updated FE model. The same forcing function was used in the subsequent optimisation studies for which an optimal stiffener layout was sought for minimising the weighted vibration energy. The optimisation was performed over a band of frequencies centred on the dominant excitation frequencies in order to make it less sensitive to the accuracy of the model as well as the variations from one unit to another. A procedure for determining an optimal configuration using genetic algorithm was proposed.