

Identification of Anisotropic Plate Rigidities using Free Vibration Data

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ABSTRACT:

In this thesis, a method is presented which determines anisotropic plate rigidities using measured resonant frequencies of a rectangular test plate with four free edges.

The measured data are compared with the calculated results of a numerical RITZ-model of the same test plate. The parameters in the numerical model are the unknown plate rigidities. For a given set of these parameters, an eigenvalue problem can be solved, yielding calculated resonant frequencies.

The basic idea of the method is to tune the plate rigidities in such a way that the calculated resonant frequencies match the measured resonant frequencies.

The tuning of the plate rigidities is performed using computed sensitivities of the resonant frequencies for plate rigidity variations. With these sensitivities and with the discrepancies between measured and calculated resonant frequencies, an iterative Bayesian parameter estimation technique updates the plate rigidities.

The engineering constants of the material can be calculated from the updated set of plate rigidities.