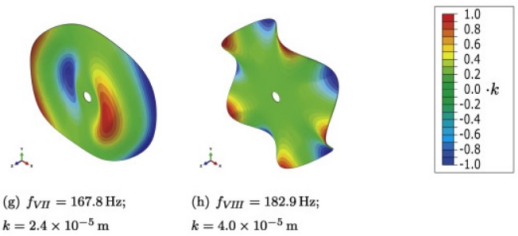
Chair of Vibroacoustics of Machines and Vehicles
TUM School of Engineering and Design
Technische Universität München

Semester-, Masterarbeit

Experimental Investigation of Dynamics of Rotating Discs

Topic

In terms of stability, sound radiation and safety, the dynamics of rotating discs should be further investigated, particularly as lightweight designs become increasingly important. Rotating structures, such as rotors and discs, experience various harmonic forces during operation, which lead to distinct responses across the frequency domain. In addition to these harmonic forces, gyroscopic effects caused by rotation alter the system's dynamic response. If not properly analyzed, these effects can result in reduced performance or even mechanical failure. Boundary conditions have a significant impact on the forces acting on a rotating disc, as well as on its overall dynamics and response. A measurement campaign will be carried out to gain a better understanding of these effects. In this study, the motor that excites the disc will be mounted on a flexible connection, such as rubber, to introduce flexible boundary conditions. The disc will be excited by the motor, and a laser vibrometer will be used to measure the resulting output velocity. Various post-processing techniques will be applied, including output-based approaches such as operational modal analysis, as well as input-output-based methods. In addition to different post-processing techniques, several excitation conditions will be investigated to assess their influence on the dynamic response of the rotating disc.



(g) $f_{VII} = 167.8\,\mathrm{Hz}$; $k = 2.4 \times 10^{-5}\,\mathrm{m}$ (h) $f_{VIII} = 182.9\,\mathrm{Hz}$; $k = 4.0 \times 10^{-5}\,\mathrm{m}$

Maeder et al. "Numerical analysis of sound radiation from rotating discs", Journal of Sound and Vibration (2020)

Tasks

- Design of the measurement setup
- Carry out measurements
- Post-processing and evaluation of the measurement data

Requirements

- High interest in experimental methods
- High interest in structural dynamics and vibrocaoustic
- Basic MATLAB knowledge is preferred

Contact Person

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