Abstract:

The dynamic E-module – the great unknown in the practical procedure to determine the natural frequency target value of brake discs

1 Motivation

This article deals with the definition of the natural frequencies of brake discs during the development process. This is usually done on the basis of finished prototypes in accordance with VDA 301, Nov. 2009

However, it is increasingly evident that the definition of the natural frequencies of a brake disc should occur before the production of prototypes in a purely virtual sense, contrary to the recommendations of the VDA guidelines.

The design of the meshes required for the calculation (choice of elements and mesh fineness) as well as the drafts and radii to be taken into account in the area of the vents lead to the initial inaccuracies here, but are not considered further in this presentation.

Further substantial difficulties arise due to the fact that the material data required for a precise calculation, in particular the correct dynamic E-module, is not usually available.

The dynamic E-module plays a prominent role in the calculation of natural frequencies. It forms the link as it were between the geometry and the material. The fact that the dynamic E-module of a cast part is not only dependent on the selected material but also on the thermal module of the respective brake disc is often forgotten or not widely appreciated.

The correlations between the dynamic E-module, chemical analysis and thermal module of a cast part as well as the problems involved and a possible solution will be demonstrated in this presentation.