PREDICTION OF THERMAL LOSSES AND THERMAL CONTACT RESISTANCE FOR MACHINE-TOOL COMPONENTS

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Abstract

Inhomogeneous temperature distribution leads to diverging thermal expansions in the machine tools. For improving production accuracy, these uncertainties need to be accounted for. Therefor, a thermo-elastic model of the machine tool and its components, which calculates the temperature field and thermal expansions resulting from heat fluxes, is of great interest.

Next, varying heat fluxes due to thermal contact resistances (TCR) at contact areas between the component's parts can differ strongly. The TCR needs to be quantified in order to improve the accuracy and reliability of the thermal model for the machine's components as well as for the whole machine tool.

The scope of the presented work is a presentation of valid results for the governing parameters (heat sources, thermal losses, thermal contact resistances) by means of experimental and numerical investigations and an approach to use these results within a thermo-elastic model of a machine tool component, which then is compared to experimental results of the actual machine tool component.

By combining the numerical calculation of the TCR and a predefined FEM model the thermo-elastic behavior of an exemplary structural component could be predicted with high accuracy.

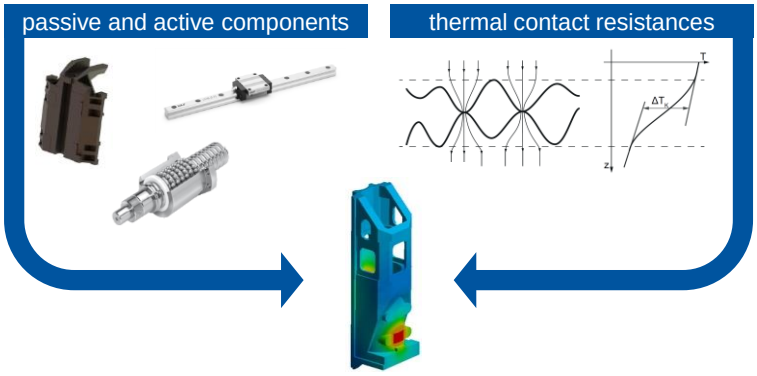

Figure 1: influences on the thermo-elastic machine tool behavior