Axisymmetric analysis of bolted disc brake assembly to evaluate thermal stresses

Prashant Chavan, Amol Apte

TATA motors ltd.

Pimpri, Pune-411018. India

91-20-5613 3159

chavan.prashant@incat.com , amol.apte@incat.com

Abstract:

Typically thermo-mechanical analysis including complexities such as contacts and bolt preloads are carried out using three dimensional models. These analyses require significant time and effort in FE model building, analysis setup, solution, and results processing. It also requires special effort to ensure it is error free.

In order to get stable and accurate results element size and time step selection is very important in transient analysis. These aspects are discussed in this paper.

This paper also talks about simplified yet almost equally accurate modeling and analysis method for thermo-mechanical analysis using brake fade test simulation as an example. This methodology is based on use of Abaqus/Standard Axisymmetric analysis technique modified to represent effect of discrete bolting, bolt preloads, and contacts within various components of the assembly.

Analysis results as well as analysis turnaround times are compared between this new method and the conventional method. Up to 80% time can be saved with significant improvement in the accuracy of the results.

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