Boundary Condition Influences on Shank Stress in 3D Solid Bolt Simulation

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Abstract: *When simulating bolts, the amount of detail to include is often raised. The analyst is left with using judgment in deciding to include or not include details, such as threads. For system models, where the primary bolt function is to transfer load from the cover to the base, thread details are sometimes perceived as not needed. It is believed that a reasonable result can be achieved without this detail.*

Should the bolt head contact interface be bonded or full, and how does this affect the shank stress, is another concern. This again is a judgment left to the analyst.

This paper evaluates boundary conditions and software settings used in simulating bolts. A simulated threaded bolt with full contact is the baseline model. A model with interaction, smear, at the threaded region and one with tied contact at the threaded region is compared against the baseline model.

A summary table is generated to compare the results of the approaches used.

Keywords: *Bolting, Bolt Simulation, Boundary Condition, Influence, Shank Stress, Bolt Body, Contact, Smear, Thread Smear, Smearing, Thread Contact, Solid Bolt, Bolt Modeling, Abaqus/CAE, Abaqus, CAE, FEA, Finite Element, Finite Element Modeling, Thread Interaction, Preload, Pro/ENGINEER, and Pretension.*

1. Introduction

A number of general purpose finite element software programs include the capability to simulate a three-dimensional (3D) solid bolt (Figure 1) with pretension and contact behavior.