

Adams MaxFlex

Complete Nonlinear Flexibility in Multibody Dynamics Simulations

SOLUTION BRIEF

Why MaxFlex?

The Need for Higher Fidelity Simulations

Greater emphasis has been placed in recent years on high-speed, lightweight, precise mechanical systems. Often, these systems will contain one or more structural components for which deformation effects are paramount for design analysis. In those cases, including the flexibility for those key components results in a more precise loading prediction and improved system performance prediction.

Traditional Approaches to Flexible Bodies in Adams:

Adams/Flex has been used by Adams users for many years to include linear flexibility into multibody dynamics systems, and allows one to capture relatively small deformation of flexible components (up to roughly 10% of the characteristic length) during a simulation.

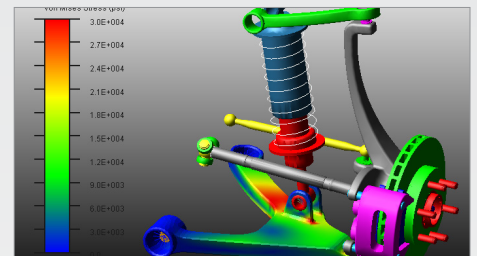
However, when it comes to components with geometric or material nonlinearity, like the twist beam in a suspension system or engine mounts, Adams/Flex does not provide the capability to cope with nonlinearity in the simulation.

Hence, to incorporate the nonlinear flexibility into multibody dynamics systems, we have introduced a new methodology/tool for our users.

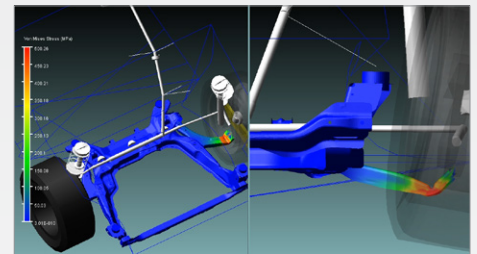
What is MaxFlex?

Based on the implicit nonlinear finite element analysis, Adams MaxFlex allows for the representation of geometric nonlinearity (i.e., large deformations), material nonlinearity, and boundary condition nonlinearity in Adams models. While FEA technology is used to represent and solve the nonlinear flexible body, it is embedded wholly within Adams, so no additional FEA software is required to solve the model.

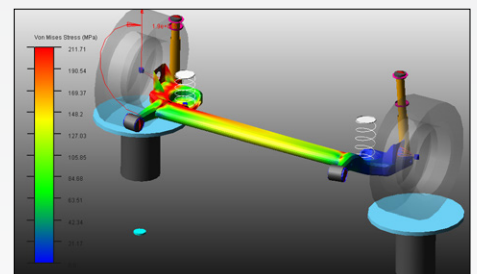
It is not the intention to provide broad finite element pre- or post-processing capabilities within the Adams environment. Rather, the focus is on providing a solution for those problems where the nonlinear behavior of some parts and the motions and loads of the rest of the multibody dynamics (MBD) model influence each other, making accurate results impossible or impractical through separate MBD and FEA analyses. While FEA technology is used to represent and solve the nonlinear flexible body, it is embedded wholly within Adams. No additional FEA software is required to solve the model. This is not a co-simulation.



Traditional linear flexible lower control arm



MaxFlex nonlinear flexible part simulating plastic deformation (Model provided by Volvo Cars)



Nonlinear twist beam in an Adams model

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“We see potential use of MaxFlex in durability events, where permanent deformation of suspension components alters the load path and loads which we were not capturing using mnf bodies. Having this capability in MBD environment would help us in generating more realistic loads earlier in the program.”

Chandra Tangella, Loads Analysis Engineer at FCA

About Adams

Adams improves engineering efficiency and reduces product development costs by enabling early system-level design validation. Engineers can evaluate and manage the complex interactions between disciplines including motion, structures, actuation, and controls to better optimize product designs for performance, safety, and comfort. Along with extensive analysis capabilities, Adams is optimized for large-scale problems, taking advantage of high performance computing environments.

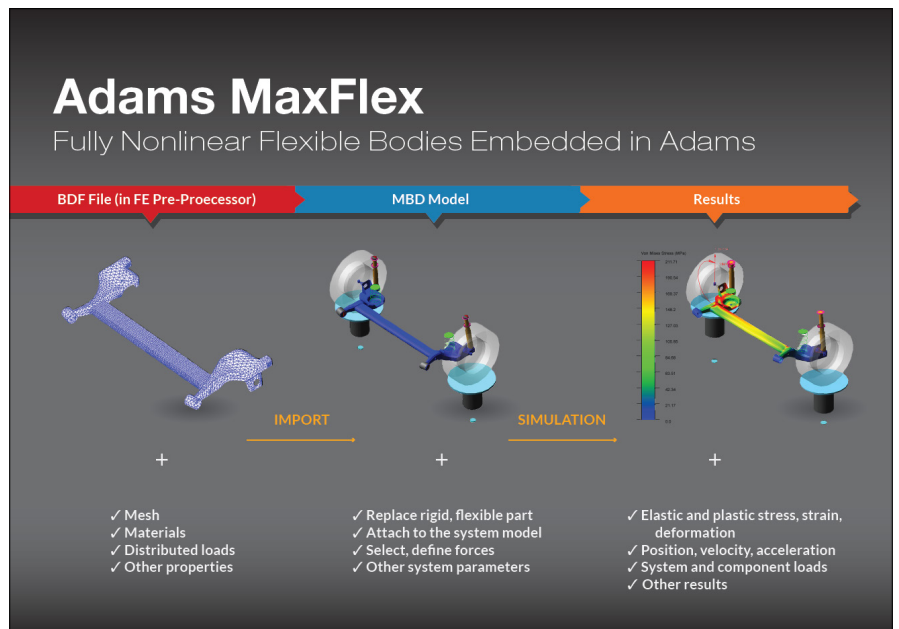
Who is it for?

Adams users who want to incorporate material nonlinearity, geometric nonlinearity or contact nonlinearity into their system model.

MaxFlex can be used in any scenario where the engineer wants to capture nonlinearity in their Multibody Dynamics model. For example, in the auto industry, it can be used to simulate the twist beam suspensions, stabilizer bars, coil springs, suspension bushings, rubber mounts, lower control arm buckling, and so on.

What are the Benefits?

- Using Adams MaxFlex, an MBD analyst can increase model accuracy by including nonlinear structural behavior
- It's a streamlined workflow, similar to Adams/Flex
- Simulation is conducted entirely in Adams, saving time and cost
- There is shared memory parallel (SMP) support to increase simulation efficiency
- It's easy to set up models and run simulations
- No third-party tool is needed to generate animations with both rigid and nonlinear flexible parts, since it can be done in Adams/Postprocessor



Adams MaxFlex Workflow

For more information, please visit www.mscsoftware.com/maxflex