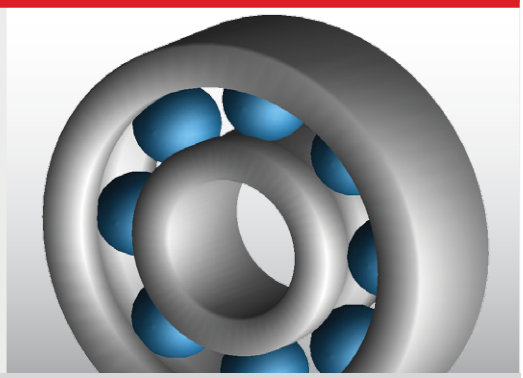
TOOLKIT

Adams/Bearing Advanced Technology



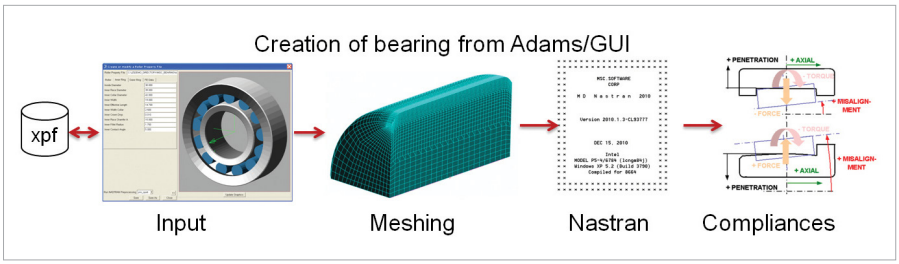
Rolling Bearing Modeling & Simulation

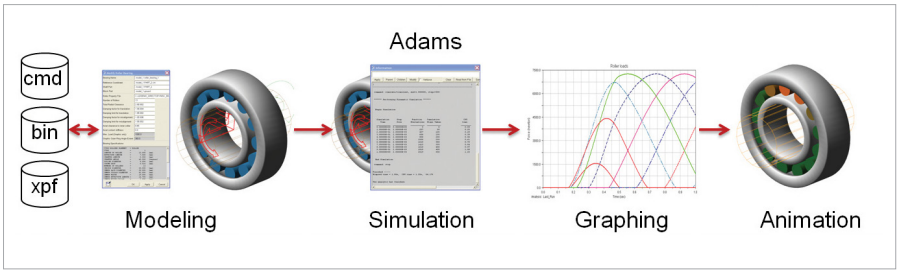
Rolling bearings are used in all industries, where they transfer radial and/or axial loads of rotating components from mechanical systems. It is logical, that the compliance of the rolling bearings influences the dynamic response of the system. In consequence, the dynamic stresses of the components will be influenced by the level of accurate modeling of rolling bearings. The combination of both effects underlines the need for the technology of Adams/Bearing AT. So one can expect, that the high fidelity modeling of Bearing AT offers a contribution to reduced development time and cost.

Traditional modeling in multi-body dynamics (MBD) is generally based on kinematic joints or simplified compliances. Evidently, a mechanical constraint is a strong abstraction of real bearing behavior. Compliances are derived by analytical solutions and/or by expensive physical testing. The transfer function of a rolling bearing is generally complex, what puts limits to the accuracy of this type of modeling.

Modeling Process

The design of Adams/Bearing AT meets the prerequisites for modern virtual prototyping: fast and user-friendly modeling and accurate and short simulations. All input is limited to the geometric parameters including the micro-geometry, what guarantees fast and user-friendly modeling-friendliness. Hence it takes only it takes only a few moments to create a high fidelity model of a rolling bearing by the Adams plug-in Bearing AT.





Supported Bearing Types

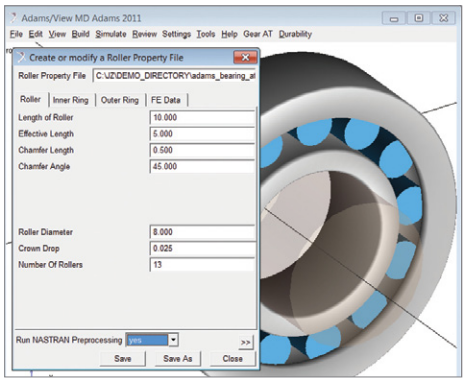
- Deep groove ball bearing
- Cylindrical roller bearing
- Needle bearing
- Tapered rolling bearing

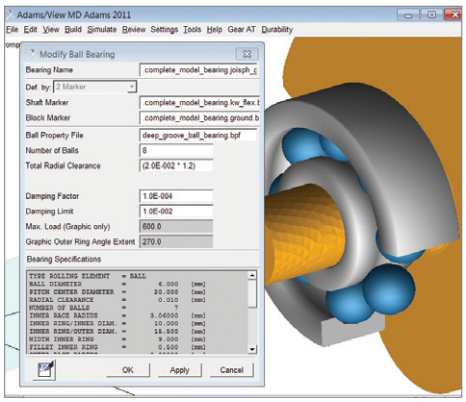
Common Modeling Options

- Kinematic joints - strong abstraction of reality
- Linear/nonlinear forces - insufficient representation of reality
- Solid contact - assumption of contact stiffness
- Analytical solutions - knowledge based engineering

Hardware

- 32- and 64-bit Windows XP, Windows 7, Windows Vista



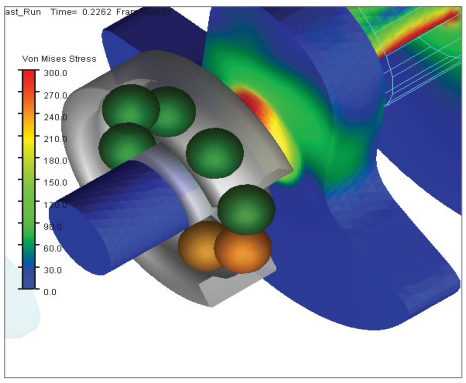


MSC Software

Adams/Bearing AT Bearing Generation

Upon completion of the input, Bearing AT creates Nastran finite element models for the rolling elements and the rings. These models are very fine for accurate contact compliances. Finite element modeling has been preferred over analytical solutions. It is widely accepted, that finite element analysis is a reliable design procedure. The process chain of meshing and of Nastran analyzes does not require any user interaction.

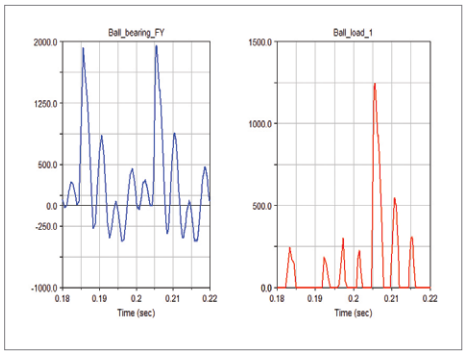
The compliances between rolling element and the ring are computed instantly for the workspace of the rolling element against the ring. These accurate results are stored for later usage in Adams.



Adams/Bearing AT Simulation

The creation of a rolling bearing in an Adams model is an easy task to any Adams user. The user has to reference the marker, the bearing property file, set damping and clearance and one is ready for simulations with high numerical performance.

The marker positions of the shaft and of the ring are used to compute the position and the orientation of the rolling elements against the ring. The force in each rolling element is determined from the pre-computed and accurate compliances of the preprocessing phase. Evidently, the sum of the forces of all rolling elements gives the resulting bearing forces.



Adams/Bearing AT Results

The results contain evidently the total bearing force and torque. Information about the loads and the operating conditions of the rolling elements releases information in design data, which is not easily available from simplified modeling.

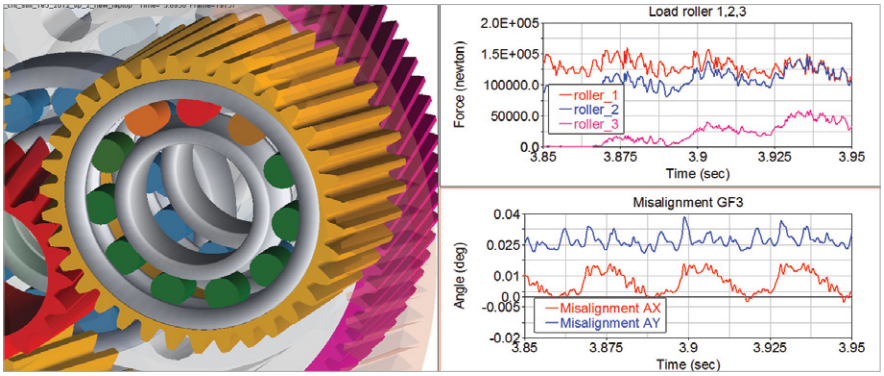
The load amplitude of each rolling element can be visualized during animations.

Summary Adams/Bearing AT

Bearing AT represents an accurate modeling of rolling bearings for system simulation. Despite the realistic modeling, high user-friendliness and fast modeling are offered through the automated modeling process. The usage of Bearing AT does not require expertise knowledge of Nastran or Adams.

As Bearing AT is based on finite element analysis, as one observes robust accuracy for all designs without need of time consuming tuning of input parameters or identitication by expensive physical testing.

Please contact toolkits@mscsoftware.com for more information.



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