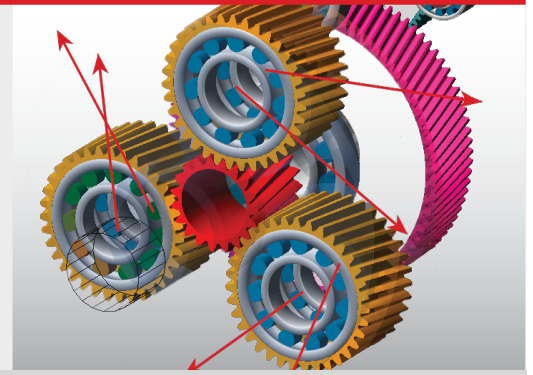


Adams/Gear Advanced Technology

Simulating the Dynamics of High Fidelity Gears



Field of Application

Adams Gear AT is a plug-in to the world leading multibody dynamics program Adams from MSC Software.

Gear AT enables design offices to use a single dynamic simulation tool for the complete design process of transmission systems. From very fast conceptual design over high fidelity system simulations including detailed gears and bearings up to optimizations can be performed.

The target applications are geared High Performance Transmissions. Lightweight, noiseless, vibration-free, transmission error-free, durable and strong against misuse – all goals shall be reached in shorter development time frames and with less experimental testing.

Traditional design procedures often rely on static design studies, although it is widely experienced, that these design procedures can't explain many of the failures seen in the field.

Decoupling or simplifying system dynamics from component dynamics always carries potential design risks, which often lead to unexpected high maintenance activities and/or down time.

Especially shock load or vibration conditions are insufficiently considered in traditional methods, but are nevertheless a common prerequisite for robust system engineering and reliable component dimensioning.

Capabilities of Gear AT

Simulation Solution

- Transient dynamics
- Design process oriented
- Adams based
- Detailed components
- Interacting components
- Complete system
- One model for various detail grades
- Flexible structures via Adams-MNF

Gear Components

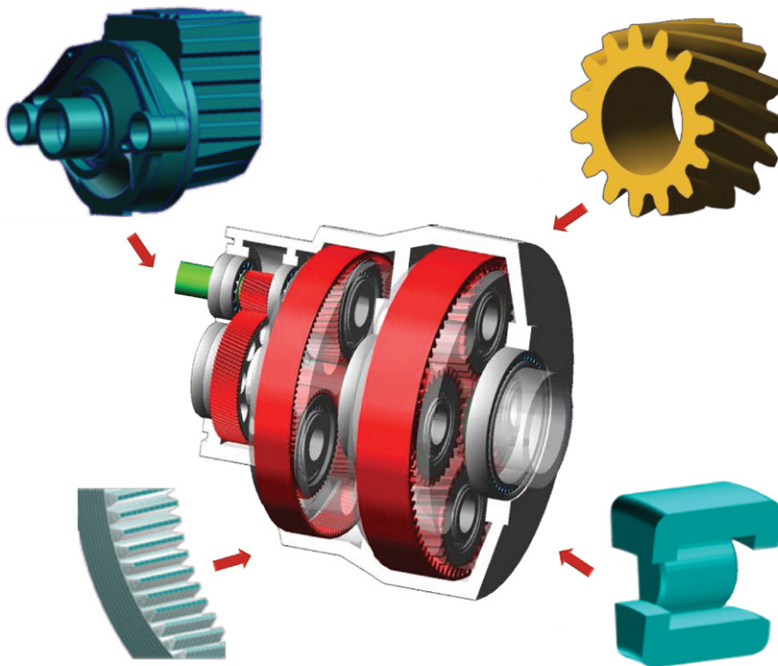
- Non-linear helical gears
- Backlash
- Profile modifications
- Gear rattle effects
- Transmission error
- Load distribution
- Contact Stresses
- Gear specific results

System Evaluation

- Application of controllers
- Concept phase
- Detail design phase
- Optimization

SW requirements

- Adams 2011



Adams Gear AT Approach

Gear AT is made for drivetrain designers by supporting the solution finding process efficiently. The numerical methods behind are covered by user-friendly and application specific user-interfaces.

Therefore the gear shapes are defined based on common design variables. In order to improve the accuracy, even topology modifications like lead flank corrections, crowning, etc. can be applied. Alternatively profiles can be imported via an ascii-interface.

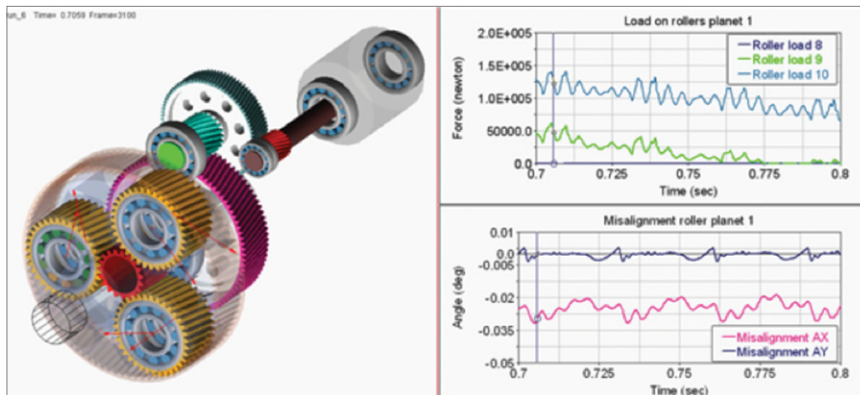
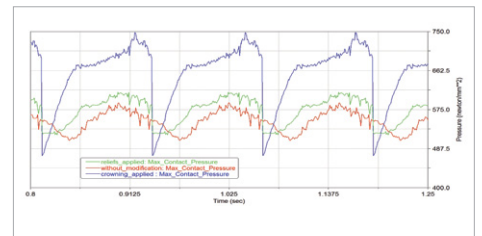
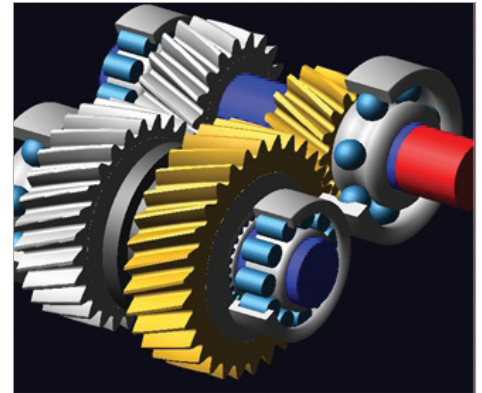
After this step, the designer positions the gear and defines active gear meshes.

Adams Gear AT simulates the full dynamic transient system as known from Adams, but considers non-linear 6 DOF gears (and bearings via the includable toolkit Bearing AT) down to their micro geometries. Misalignments/movements in the gear mesh are considered as well as the displacements of connected and flexible parts with their influence on the gear mesh behavior and interaction with the system. After the simulation the designer evaluates the system and components with gear typical result qualities (i.e. K_{Hh} , K).

As sometimes not the full accuracy with detailed evaluation of the teeth behaviour is needed, "Gear AT Fast" offers a parallel way to speed-up the simulation, as joints would be used. This is doable by performing fully automated FE-based parameter studies which deliver one package of gear pair stiffness results to Gear AT prior the start of the MBS-simulation. As consequence the time-consuming contact search can be skipped due to the use of boundary condition depending stiffnesses.

Adams Gear AT is made for transmission designers. It is highly tailored for the needs and approaches of this group of engineers. The expanded GUI reflects this intention by providing commonly established input for gears and bearings. Same is valid for the result output, where even static standard results are derived from the available dynamic transient data.

Adams Gear AT doesn't require a numerical specialist – it requires an engineer for mechanical systems and supports him in every design stage.



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