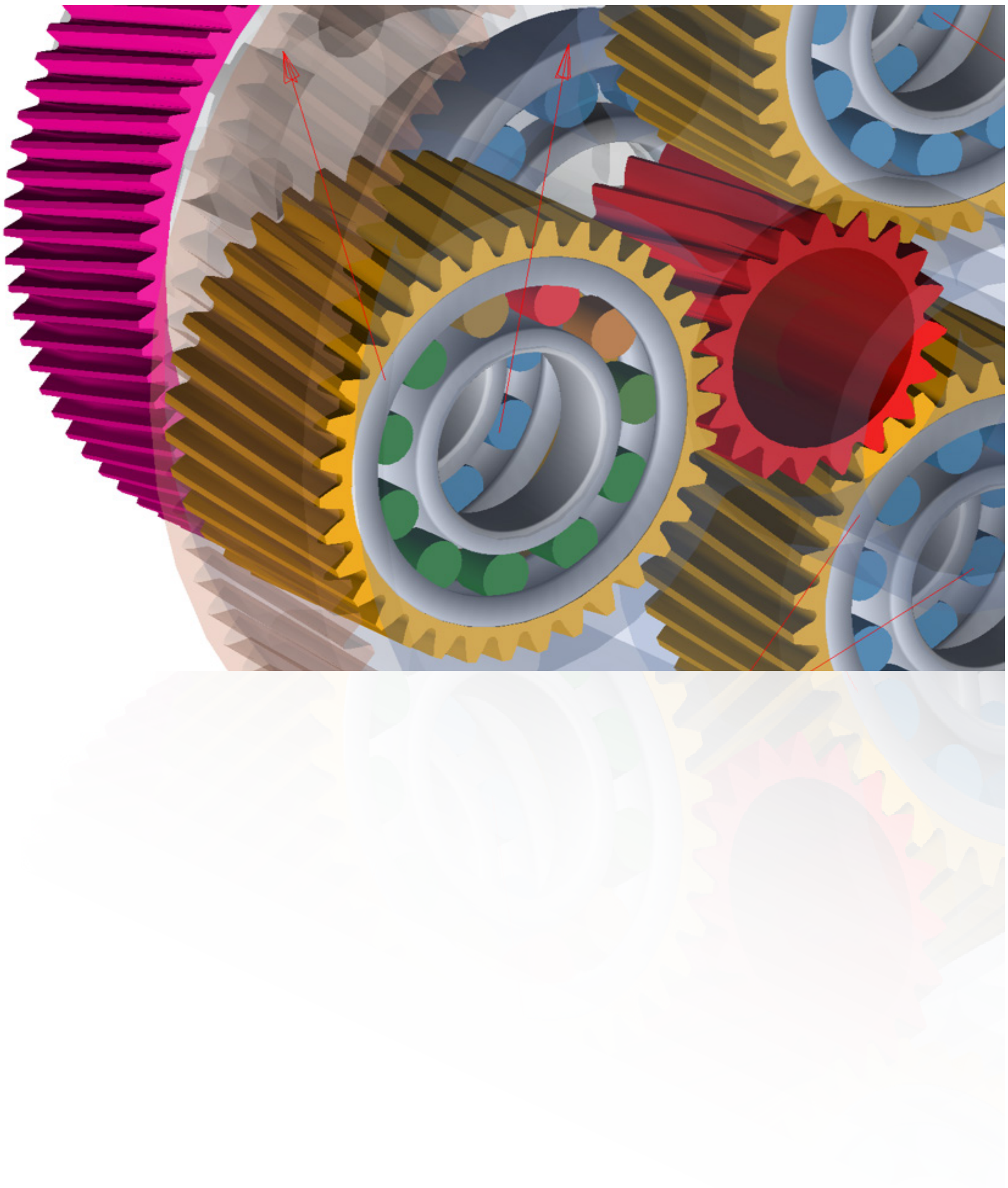
Adams 2017



We are Pleased to Announce the Release of Adams 2017!

This release delivers new functionalities and major enhancements in many areas.
Key highlights include:

- **Adams Machinery Gear Advanced 3D Contact**
  Simulating the dynamics of gear tooth flexibility
- **Python Scripting Phase 1: Modeling**
  Faster executing, more efficient scripting language
- **FE Part Improvements**
  Enhancing usability and performance of nonlinear beam elements
- **FMI Model Import**
  Incorporating sophisticated controls model into Adams

For more details on this release, please visit https://mscsoftware.subscribenet.com for the release guide. Several examples are also available to help you use these capabilities.

Thank you for your continued support of Adams.
Adams Product Team

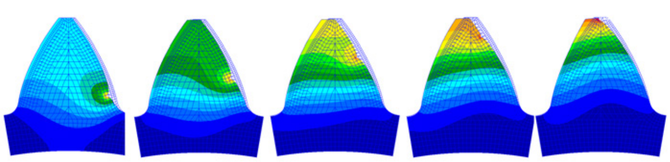
Advanced 3D Contact Method for Gears

In previous releases, Adams Machinery Gears have been modeled as rigid parts with a separately defined compliance between gear pairs. In Adams 2017, with the Advanced 3D Contact method, we've introduced much more realistic gear tooth flexibility. This feature allows you to define the gear part geometry and material properties from which a finite element model (FEM) is created and solved in the background to define tooth compliance. No knowledge or installation of a Finite Element Analysis (FEA) tool is required since the meshing and FE-analysis are fully automated.

From the basis of these FEMs there are three options to define the contact behavior of the gear pair during the Adams analysis all of which represent the contact between gears in the Adams model as a six-component force:

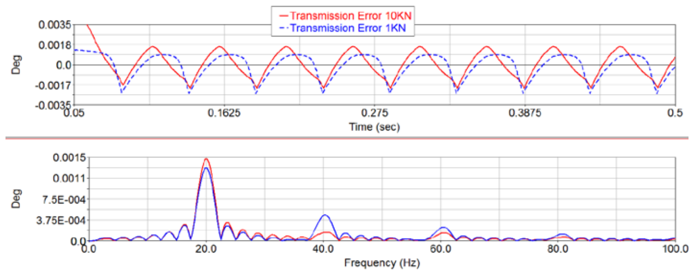
- The Run Time option computes the contact behavior of the gears during the analysis and is the most accurate
- The Pre Computed option runs a setup analysis to predict contact behavior which saves time during the actual system simulation often with little trade-off in result accuracy
- The Rigid option simplifies things further by treating the gear teeth rigidly. This, however, is distinct from the pre-existing rigid-body 3D Contact method. The Advanced 3D Contact method's "Rigid" contact option frequently results in smoother forces because the contact detection is not based on traditional tessellation techniques but rather the FEM-based fine meshes. Also, there are more tooth and gear modification options available through the Advanced 3D Contact method including commonly applied micro-geometry modifications.

The flexible tooth options here provide superior accuracy compared to using an Adams Flex representation of the gears. Adams Flex uses the modal superposition method, which assumes that the part's deformation can be captured by superimposing normal mode shapes. But in the case of gears, most of the deformation takes places in the teeth themselves, which is difficult to capture in the mode shapes.



Contact line moves upwards

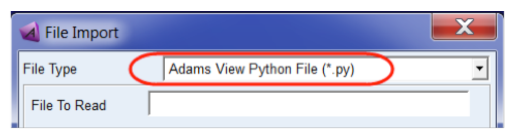
Advanced 3D Contact improves upon the preexisting Adams Machinery Gear methods in several ways ultimately allowing for the accurate calculation of dynamic gear meshing forces including microgeometry, tooth deformation and instantaneous misalignment. These capabilities allow users to evaluate meshing-order transmission error and system excitation, along with potential interactions of this behavior with case, shaft and bearing motions. Users may evaluate the tooth contact pressures in high-load conditions and identify if the microgeometry used is sufficient for addressing potential stress concentrations. In addition, the enhanced tooth accuracy will provide improved dynamic predictions for rattle, whine and other transient operating conditions.

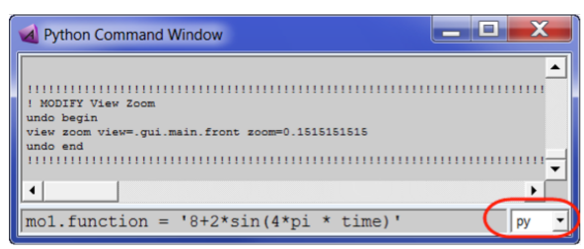


Python Scripting Phase 1: Modeling

This is the first of a multi-release initiative to provide a Python scripting alternative to the Adams View command language (cmd). While techniques have existed for some time to interact with Adams via Python they have always required that Adams View cmd commands ultimately be issued to make anything happen in Adams. So, for example, business logic could be coded in Python, but model construction actions had to be issued via cmd. This release represents the first where native Python can be used to issue commands to an Adams GUI.

This first phase will cover most modeling actions in Adams View. Subsequent phases in future releases will cover simulation, post-processing, Adams vertical products (for example, Adams Car and Adams Driveline) and customization actions. Note that there is no intention of eliminating the Adams View command language or not supporting new features in the future with it. The impetus behind this Python initiative is to provide users with a powerful alternative that many may find more appealing to use rather than learning an Adams-specific scripting language and which will generally perform faster than cmd.





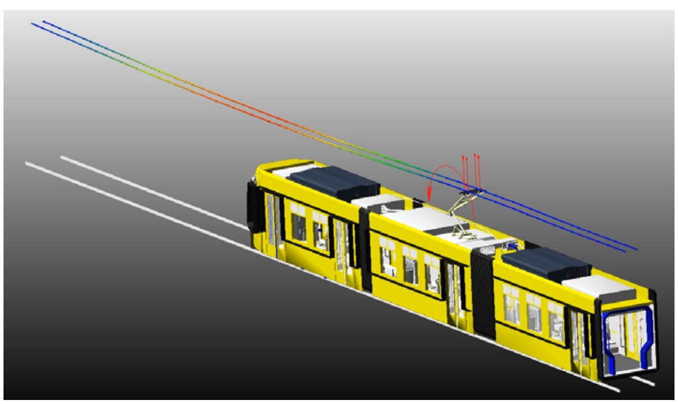
FE Part Improvements

A few enhancements have been made in 2017 to improve both the performance and the usability of the nonlinear beam element: FE Part.

Starting from pre-processing, the time required for Adams View to create an FE Part (either interactively or via import) has been drastically reduced thanks to an optimization of the tessellation and renderer algorithms. Users working with anything aside from very small FE Parts should notice an improvement. For large FE Parts and/or models with numerous FE Parts speed improvements in .cmd file import in the range 10-100x have been observed.

A new option is available for FE Parts whose centerline is defined by a curve (BSpline). One can now parameterize the location of such an FE Part's nodes (that is, the position along the centerline known as "S") to the curve's control points. So, when the curve control points are moved, the FE Part's nodes will move with them. Previously the FE Part would react to changes in the centerline shape due to modified control point locations but maintain the same "mesh" (that is, the nodes' S values). Now, there is an option to toggle between these two behaviors.

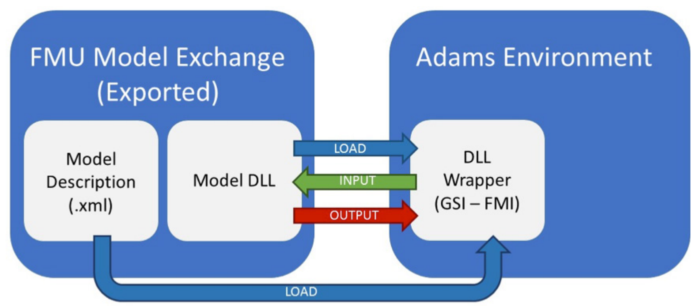
On the performance side, the FE Part now supports shared-memory parallel (SMP) multi-threading. So, models with multiple FE Parts (3D Beam or 2D Beam types) or single large FE Parts (3D Beam type), in terms of the number of nodes, should exhibit performance improvements when setting the number of threads greater than one on multiple CPU/core machines. Across a range of models dominated by large FE Part content, performance improvements of 1.2-3.5x have been observed when using 2-8 threads.



FMI Model Import

One can connect sophisticated models from other simulation tools to Adams models using Adams Controls. For quite some time the included models from either Easy5 or Matlab/Simulink. Since version 2013.1 Adams Controls has supported the co-simulation style of interaction with tools adhering to the Functional Mockup Interface (FMI) standard. Now with this release Adams Controls also supports the FMI Model Exchange Model Import style of interaction. This is analogous to the traditional external system library import style of interaction (also known as "ESL Import" and "GSE Import") that Adams Controls has supported for years for Easy5 and MATLAB®/Simulink®. In this style of interaction the solution is done by Adams Solver without the need for the other tool at runtime (Adams Solver just references the external library). Now, this capability is available for all tools which adhere to the FMI Model Exchange standard. For a list see: https://www.fmi-standard.org/tools. Those supporting Model Exchange Model Export now be imported into Adams.

The Adams Controls control system import dialog will automatically recognize a Model Exchange Functional Mockup Unit (FMU), as opposed to a Co-simulation FMU, and no special declaration is required by users. For FMU's that support both modes the dialog will display and extra entry for you to choose in which mode you want to use it.



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