MBD for ANSYS
Multi-Body Dynamics

MBD for ANSYS Provides a Seamless and Easy-to-Use

Multi-Body Dynamics Solution for ANSYS Users

FunctionBay

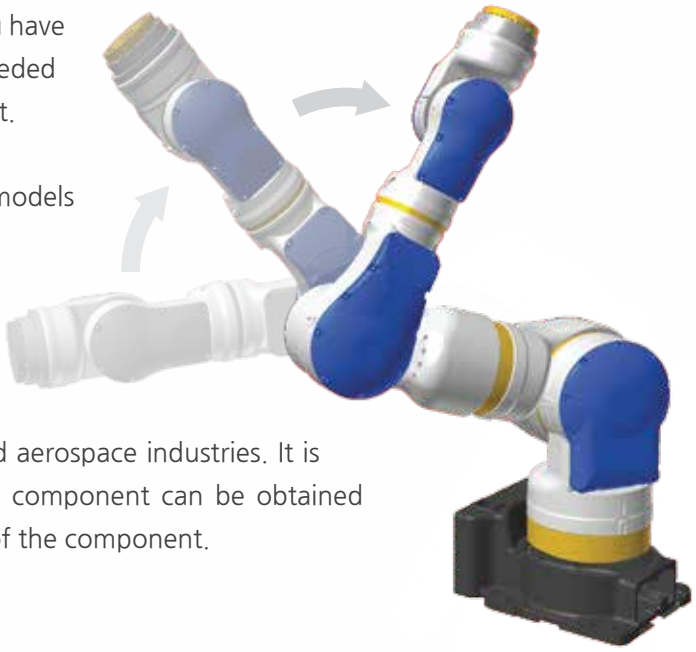
Multi-Body Dynamics (MBD)

Multi-Body Dynamics (MBD) is used to analyze the behavior of a wide variety of mechanical systems in motion and to determine the loading conditions that are needed for structural analysis.

The Concept of Multi-Body Dynamics

Multi-Body Dynamics predicts the dynamic behavior of an assembly in motion, where forces may be applied to one or more rigid bodies that are connected to each other through kinematic constraints or contacts. It uses rigid bodies to perform a transient analysis, which allows you to obtain results quickly.

The MBD analysis results include the position, velocity and acceleration of each body and the reaction forces or frictional forces at each constraint (joints, etc.) as well as forces at each contact. With these outputs, you can view and understand the dynamic behavior of the system. In addition you have the loads and boundary conditions that are needed to do the structural analysis of each component.



You can also create and simulate virtual models instead of building real mechanical systems, reducing the costs and time required to design and develop a product.

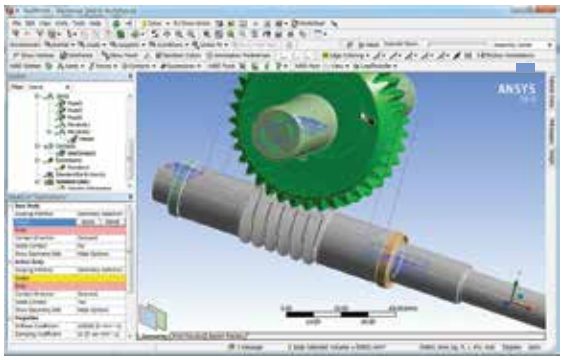
MBD is widely used in the construction, electrical/electronics, defense, automotive, and aerospace industries. It is very useful because the loads acting on each component can be obtained through MBD and used for structural analysis of the component.

MBD for ANSYS

MBD for ANSYS is an add-on module developed by FunctionBay, Inc. for ANSYS Workbench. It is used to simulate the dynamic behavior of mechanical systems in motion.

MBD for ANSYS is embedded in the ANSYS Workbench user environment and features the RecurDyn solver, which is recognized as the world's best technology in the field of Multi-Body Dynamics simulation. MBD for ANSYS simulates the dynamic behavior of a mechanical system in motion over time, providing fast and stable analysis results.

MBD for ANSYS Strengths



MBD for ANSYS is a Multi-Body Dynamics analysis module that runs in ANSYS Workbench and provides the optimal environment for users who are familiar with the ANSYS environment. Now, you can perform Multi-Body Dynamics analysis in the ANSYS environment using MBD for ANSYS.

MBD for ANSYS features a fast, reliable solver that provides a high-performance contact algorithm, a post-processing function optimized for Multi-Body Dynamics, and an automated Load Transfer function. The biggest advantage to using MBD for ANSYS is how easy it is to apply the analysis results of MBD for ANSYS as the load conditions for a structural analysis model using the automated Load Transfer.

Also, an MBD for ANSYS model can easily be converted to a RecurDyn/Professional model where you can use various toolkits and an improved analysis function.

4 Advantages

The powerful features of MBD for ANSYS provide fast and stable dynamic analysis results and allow you to use the results as the required load conditions for structural analysis.

1 User-friendly interface integrated with the ANSYS Workbench environment

- An add-on module for ANSYS Workbench that can be installed easily
- A convenient, innovative modeling environment optimized for Multi-Body Dynamics analysis
- Pre-processing, solving, and post-processing possible within the ANSYS Workbench environment

Movie clip
Contact Creation

Movie clip
Joint Creation

2 Fast and robust solver

- Developed by an experienced FunctionBay team.
- Fast simulations using rigid bodies (Transient analysis)
- High performance contact algorithms

Movie clip
Animation of Gear Contact Simulation

Modeling

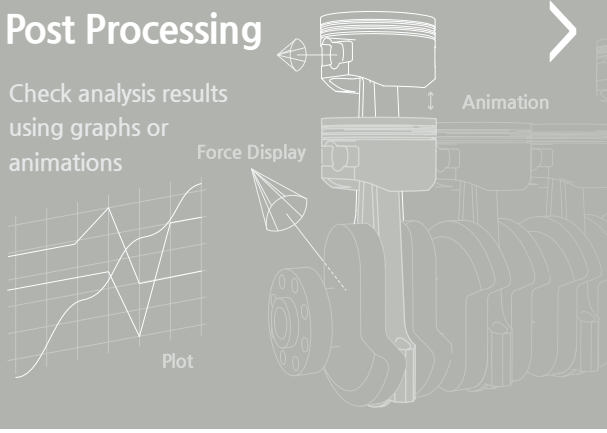
Provides A convenient, intuitive interface that can run on ANSYS Workbench

Simulation

Analyze complex multi-body systems or nonlinear contact problems quickly and accurately

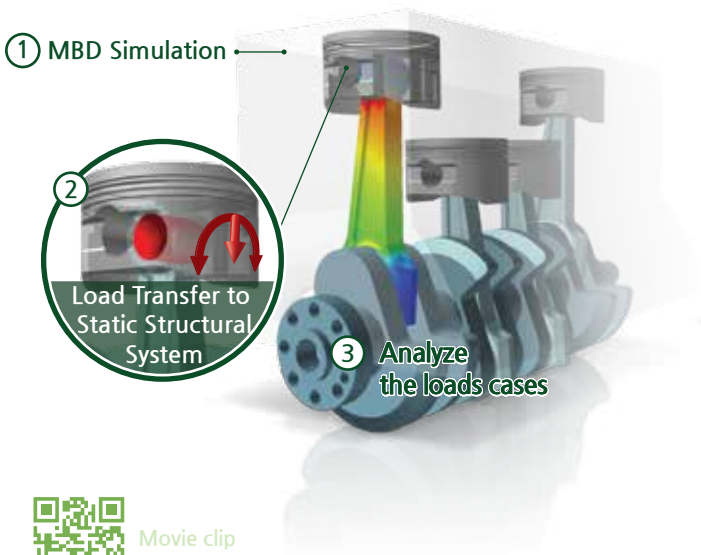
Post Processing

Check analysis results using graphs or animations



3 Convenient, Automated Load Transfer

- Apply the Multi-Body Dynamics analysis results as the load conditions for a structural analysis model.
- Easily convert the analysis results into the load conditions for a structural analysis model with Load Transfer.

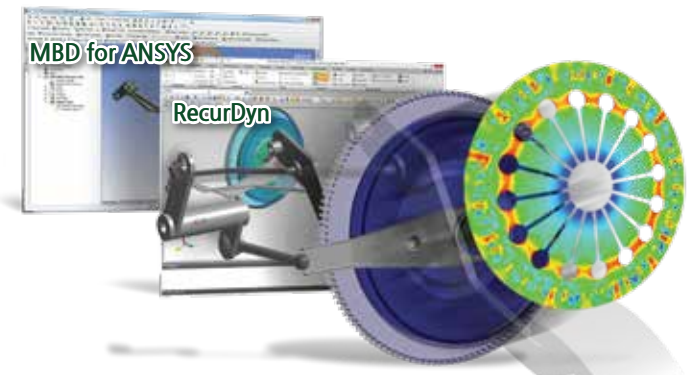


Movie clip
Load Transfer

4 Scalability to Multi-Body Dynamics applications

- Convert MBD for ANSYS models into RecurDyn models, to access additional functionality in RecurDyn/Professional.
- You can simulate a complex system with coupled vibrations or other complex applications such as mechatronics or coupled analysis with a fluid.

Expandable Areas	Multi Flexible Body Dynamics Controllers, sensors, belts, bearings, tracks/optimization Co-simulation with a computational fluid dynamics using particle dynamics (Particleworks)



Movie clip
Transient Analysis
Result of RecurDyn/FFlex

Movie clip
Plot and Animation
Using RecurDyn Viewer

Load Transfer

Convert results into load conditions for a structural analysis model, with automated Load Transfer

Export

Use models from MBD for ANSYS within RecurDyn/ Professional

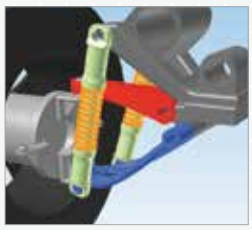
Provides various toolkits and improved analysis function

DesignXplorer

Support optimization using ANSYS DesignXplorer by designating various MBD for ANSYS parameters as design variables

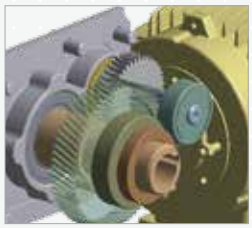
Application Examples

Multi-Body Dynamics analysis can be used to calculate the loads transferred to each component due to joints, external forces, contacts, body forces, etc. related to the motions of mechanical elements. The calculated results are converted into load conditions for structural analysis using the Load Transfer function.
In complex mechanical systems it is especially important to calculate contacts quickly and stably, and the analysis algorithm within the MBD for ANSYS solver calculates contacts efficiently and robustly.

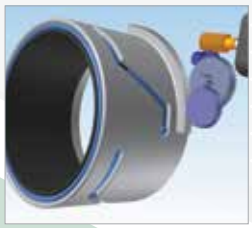
Automobiles

You can analyze the dynamic behavior or calculate the load applied to each component by performing dynamic analyses on the full vehicle, suspension, engine, and clutch based on various driving conditions and operating conditions.

Planetary gear

You can calculate the load changes due to transients in a high-speed planetary gear, and use the results for structural analysis.

Cameras

You can analyze the behavior of a camera lens barrel based on the operation of the camera gear train when you use the zoom feature.


Robots

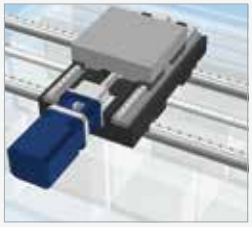
You can use dynamic analysis to calculate the dynamic load applied to each connection when the robot moves in various ways.


4D Driving Simulator

The forces acting on the components of these seats can be accurately predicted in a simulation of the dynamics of the motion seating system.

Machine Tools

You can calculate the changes in the load applied to each component when the machine tool moves in various ways.




Tools

You can calculate the load applied to each connection when a tool is used, and use the calculated results for an efficient product design.


Table Lifts

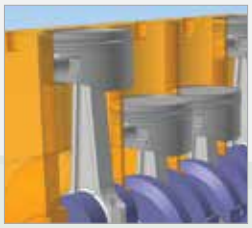
You can use dynamic analysis to calculate the load applied to the lift when the table lift moves up and down.


Landing Gear

You can analyze the retractable mechanism of the landing gear as well as the vibrations, sliding and the load applied to the landing gear when the airplane takes off or lands.


Engine

The complex nonlinear interactions caused by contact and joints between the crank shaft, connecting rods, pistons, bearings, engine casings, gears, valves, cams, chains, and various other parts of the engine system can be simulated, resulting in the calculation of the forces acting on any component of the engine.




Scalability of MBD for ANSYS

A MBD for ANSYS model can be converted into a RecurDyn model for a full-function Multi-Body Dynamics analysis. Once in RecurDyn the model can be augmented with various application toolkits for simulating chains, belts, gears, and media transport; Multi Flexible Body Dynamics (MFBD); a control system, and co-simulation with a particle-based fluid system.

RecurDyn is Multi-Body Dynamics analysis software that provides a fast and efficient solver, an intuitive interface, and various libraries. It can import models that are created in MBD for ANSYS so that you can apply additional modeling entities and analysis capabilities.

In addition, RecurDyn supports nonlinear flexible body analysis (large deformations), including contacts. It is also possible to define control systems that interact with the mechanical system. The system can be optimized and the mechanical components can interact with particle-based fluids (MPS) and the solid particles (DEM).

RECURDYN

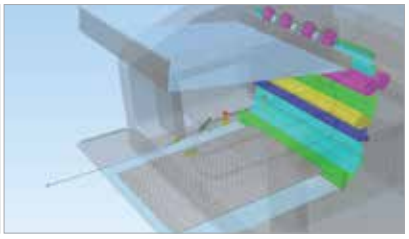
MFBD

Multi Flexible Body Dynamics (MFBD) combines both Multi-Body Dynamics, which analyzes the movement of an assembly of rigid bodies, and the nonlinear flexible bodies. The flexible bodies include a mesh with stiffness that is defined using standard shape functions and have nodes with local coordinate systems and mass. This combination of MBD, nonlinear flexible bodies, and advanced contact modeling provides a unique, fast, and robust capability to simulate moving assemblies in motion.

MBD Multi-Body Dynamics
Rigid body
Motion analysis

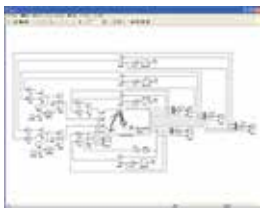
FEM Finite Element Method
Flexible body
Stress and deformation analysis

MFBD
Multi Flexible Body Dynamics
Rigid body + Flexible body
Dynamic behavior analysis of a system

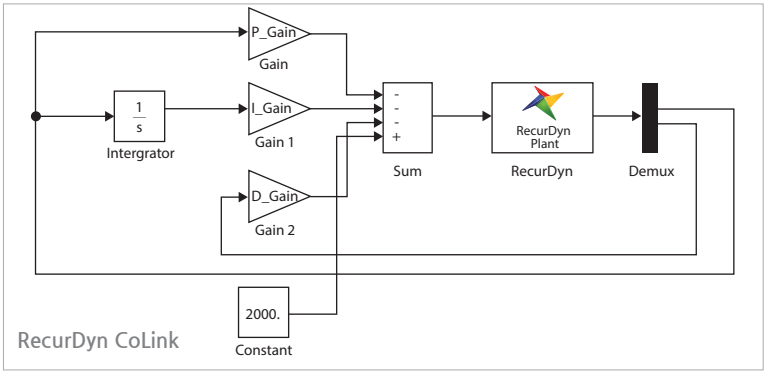


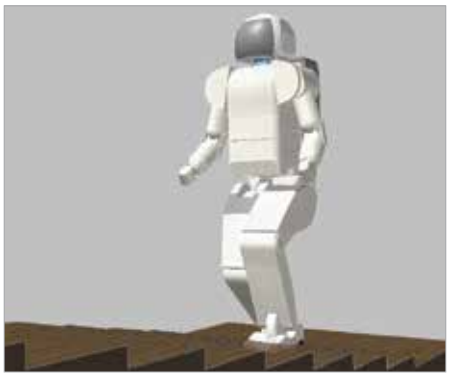
Control

The mechanical assembly can be combined with control system and/or hydraulics modeling in order to simulate a more complete system. RecurDyn provides an integrated control system modeling tool as well as an interface for co-simulation with the Matlab/Simulink and AMESim software.
In addition, the controls module supports FMI libraries to incorporate Modelica-based sub-models into the controller.



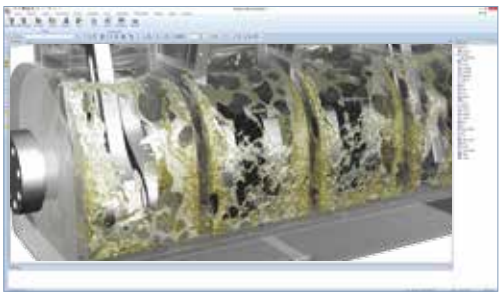
MATLAB SIMULINK





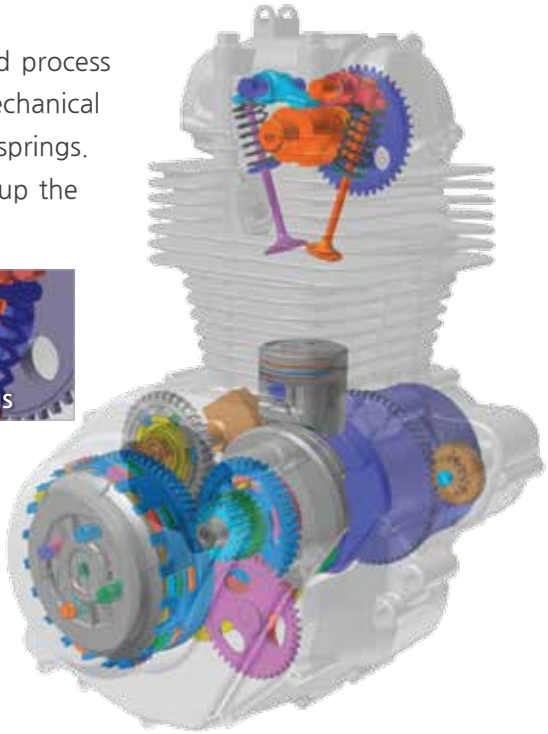
Fluid - Assembly Interaction

RecurDyn supports co-simulation with Particleworks to simulate the moving assembly with a fluid. The moving components can “push” the fluid and correctly simulate momentum effects. The fluids “pushes back” on the moving components so that drag forces can be assessed correctly. Particleworks uses the MPS (moving particle system) approach and does not require a mesh. High Performance Computing (HPC) is supported with both GPUs and compute clusters so that millions of particles may be used to simulate the fluid.



Toolkits

Machinery. The machinery toolkits contain customized UIs and process automation to facilitate the modeling of advanced mechanical subassemblies, such as gear sets, chains, belts, bearings, and springs. Each toolkit includes specialized solver functionality to speed up the simulation of these subassemblies.



Engine. The engine toolkits let you automatically create and analyze the elements associated with valves, pistons, crankshafts, and other major components of internal combustion engines. This allows you to create and analyze highly realistic engine models quickly and easily.

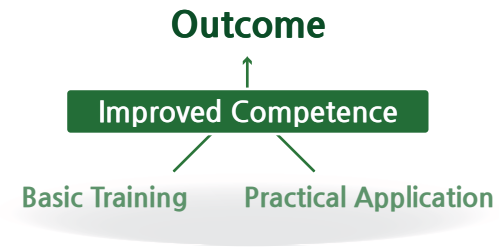
Track. The track toolkits provide efficient modeling and analysis of the track assemblies that are frequently used in construction equipment, military vehicles, and specialized robots. These toolkits significantly reduce the time needed for modeling and allow for fast and accurate analysis through specialized solver functionality.

Media Transport. The media transport toolkits help you model flexible media such as paper, films, and cards easily and create rollers and guides simply by entering parameters. Contact between the media and the rollers/guides is defined automatically. This toolkit provides world-class capability to simulate and improve the layout design of transfer systems. In addition, you can produce realistic simulations that include various sensors and simulate air resistance, suction, and static electricity.

Technical Support Site *support.functionbay.com*

The Technical Support website provides comprehensive information, from the basics of using MBD for ANSYS and RecurDyn to advanced tips for fully utilizing Multi-Body Dynamics and Multi Flexible Body Dynamics. The result is a faster learning rate and higher productivity.

The Technical Support website is designed for beginners / intermediate users of MBD software. It not only describes the basics of how to use the software but also provides useful tips and learning materials about computer-aided engineering (CAE), and tutorials to help users efficiently utilize MBD software.



FAQ. Instructions and practical tips

FAQ-style tips to help users understand MBD software easily. FAQs were created by analyzing questions frequently asked by users and content that was not included in the tutorial.

Knowledge Base.
Tutorials and advanced tips for using CAE software
Provides materials on actual tasks so users can improve their competence.

Blog.
Product information, success stories, and special reports
Provides news on our products and activities, customer success stories, and special articles.

Forum. Community forum

A community forum where users can receive technical support and freely communicate with other users.

e-Learning. Self-training program for CAE beginners

Provides simple examples to help beginners who want to learn about computer-aided engineering (CAE) perform Multi-Body Dynamics modeling, check dynamic analysis results, and compare CAE software with analytical solutions.

Microsoft Partner Gold Application Development

KBRAIN POWER

Digital Innovation Awards 2014

MBD for ANSYS Multi-Body Dynamics

Korean Headquarters R&D Center

FunctionBay, Inc.
5F, Pangyo Seven Venture Valley 1 danji 2 dong, 625, Sampyeong-dong, Bundang-gu, Seongnam-si, Gyeonggi-do, 13487, South Korea
82+31-622-3700 www.functionbay.co.kr inform@functionbay.co.kr

Overseas Subsidiaries

China. FunctionBay CHINA
350 Xianxia Rd., Kechuang Bldg. Suite #229 Shanghai 200336, China
86-21-5240-0270 www.recurdyn.cn che-wei.chang@pro-lambda.com

Europe. FunctionBay GmbH.
Central Tower Landsbergerstr. 110 80339 Munich Germany
49-89-322-098-27 www.functionbay.de Info@recurdyn.de

Americas. MotionPort LLC
3143 S. 840 East, St. George, UT 84790, USA
1-435-767-9645 www.motionport.com brant.ross@motionport.com