Pro/ENGINEER Mechanism Dynamics Option (MDO)

Analyze Dynamic Forces with a Powerful Virtual Prototyping Solution

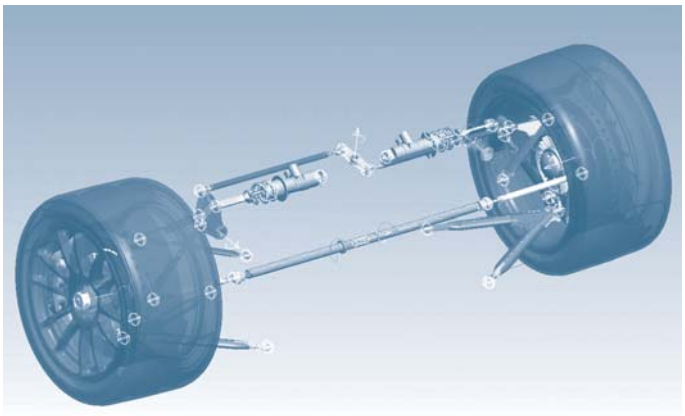
Pro/ENGINEER Mechanism Dynamics Option (MDO) allows you to virtually simulate real-world forces and analyze how your product will react to them, without building costly physical prototypes. Gaining insight into product behavior early in the design phase allows you to build better products, saving time and money.

Simulate Real-World Forces

Mechanism Dynamics allows you to determine how your design will react to dynamic forces, such as gravity and friction. Since you are able to conduct this analysis without a physical prototype, you are able to conduct testing very early in the design phase, when correcting problems is not costly. Having already been vigorously tested, physical prototypes are higher quality. Fewer physical prototypes, not only cuts costs, but also reduces time to market, giving you a better quality product, that is built right the first time.

Design and Analyze Concurrently

Pro/ENGINEER Mechanism Dynamics takes advantage of the integrated tool set of Pro/ENGINEER. This means there will be no errors in data translation from one application to another. Additionally, engineers are already familiar with the graphical user interface, as it is the same one used to design the product. Furthermore, since MDO already understands the model from Pro/ENGINEER, the engineer does not need to waste time preparing the model for analysis. After implementing engineering changes, the analysis is simply rerun, allowing the engineer to get a higher quality model faster.



Engineers at Maserati and Dallara use MDO to simulate real-world forces on this Maserati MC12 race car suspension, reducing the number of physical prototypes and shortening the design cycle.

Key Benefits

- Fully integrated with the Pro/ENGINEER family eliminates the need for data translation, saving time and making translation errors a thing of the past.
- Reduce development costs by creating virtual prototypes for desktop testing.
- Incorporate changes into the products faster and earlier with immediate results from desktop testing.
- Deliver higher quality products to market first by reducing development time.
- Reduce warranty costs with a better estimate of product life.
- Eliminate costly manufacturing errors with specific, animated production instructions for assembly.
- Create more innovative products by using the time savings gained from virtual testing to evaluate more design ideas.
- Easy to learn, intuitive user interface.

Features and Specifications

Explore Real-World Behavior

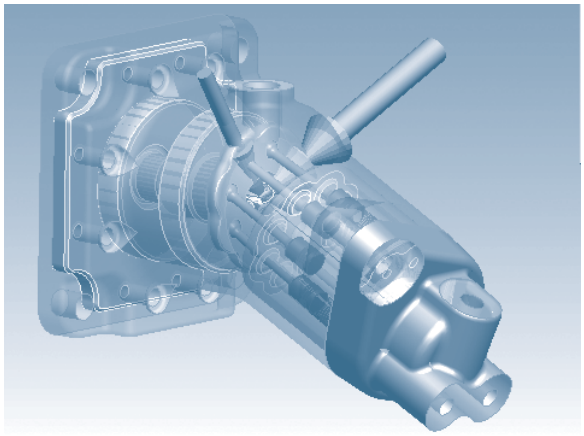
- Simulate gravity, springs, and friction without creating a physical prototype.
- Perform kinematic analysis (position, velocity, and acceleration analysis) as well as dynamic motion analysis (friction, gravity, and forces)
- Detect problems with clearances and interferences early in the design cycle.
- Import behavioral data from applications such as Microsoft Excel, and apply to existing models to determine their performance under this behavior.

Easily Share Results Through Intuitive Graphs

- Measure and graph custom measurements, such as velocity at a specific joint.
- Graph critical reactionary forces such as loads and torques to better communicate how the product will respond in a specific environment.
- Share results with others using graphs, animations, and output tabular data to spreadsheets for additional analysis.
- Compare real-time motion with the graphical results.

Advanced Motion Analysis Gives You Greater Flexibility to Explore Complex Real-World Situations

- Use static analysis to determine loading at a static point.
- Determine forces necessary to put a mechanism into motion with inverse static loading (force balance)
- Load mechanisms with tension and compression forces using spring and damper connections.
- Easily create complex motion envelope parts of select components in your mechanism for use in space claim studies, or as placeholders in any assembly.
- Use Pro/TOOLKIT to program a variety of complex behaviors such as force based gear systems, belts driven by flexible pulleys, linear beam and truss elements, and tire models.
- Create user defined forces and motor profiles as custom functions of position or velocity.
- Model intelligent piping and instrumentation diagrams (PID) controllers as well as non-linear springs and dampers.



Simulate real world dynamic forces to optimize product quality.

Integrated Design and Simulation

- Transfer reaction, gravity, and inertial loads directly to Pro/ENGINEER Structural and Thermal Simulation.
- Set design feasibility and optimization study goals for kinematic and dynamic performance.
- Fully integrated with other Pro/ENGINEER solutions such as Pro/ENGINEER Structural and Thermal Simulation and Behavioral Modeling for optimization for complete virtual product analysis.
- Leverage design information from other applications, such as Microsoft Excel.
- Bullet-proof associativity ensures changes are propagated to all other downstream deliverables of the product design.

The Pro/ENGINEER Advantage

With Pro/ENGINEER you know that no matter where you make a change in your design, these changes will be propagated throughout all downstream deliverables. With Pro/ENGINEER Mechanism Dynamics you will be able to perform motion analysis without wasting time preparing the model for analysis. Pro/ENGINEER already understands the joints and connections. You do not have to worry about working with outdated information or recreating it to be used for motion analysis. Pro/ENGINEER's applications are seamlessly integrated allowing you to focus on design and analysis of your product–not wasting your time and energy recreating the model to be used for different applications. The integration of Pro/ENGINEER eliminates errors that result from translating or recreating models for another program.