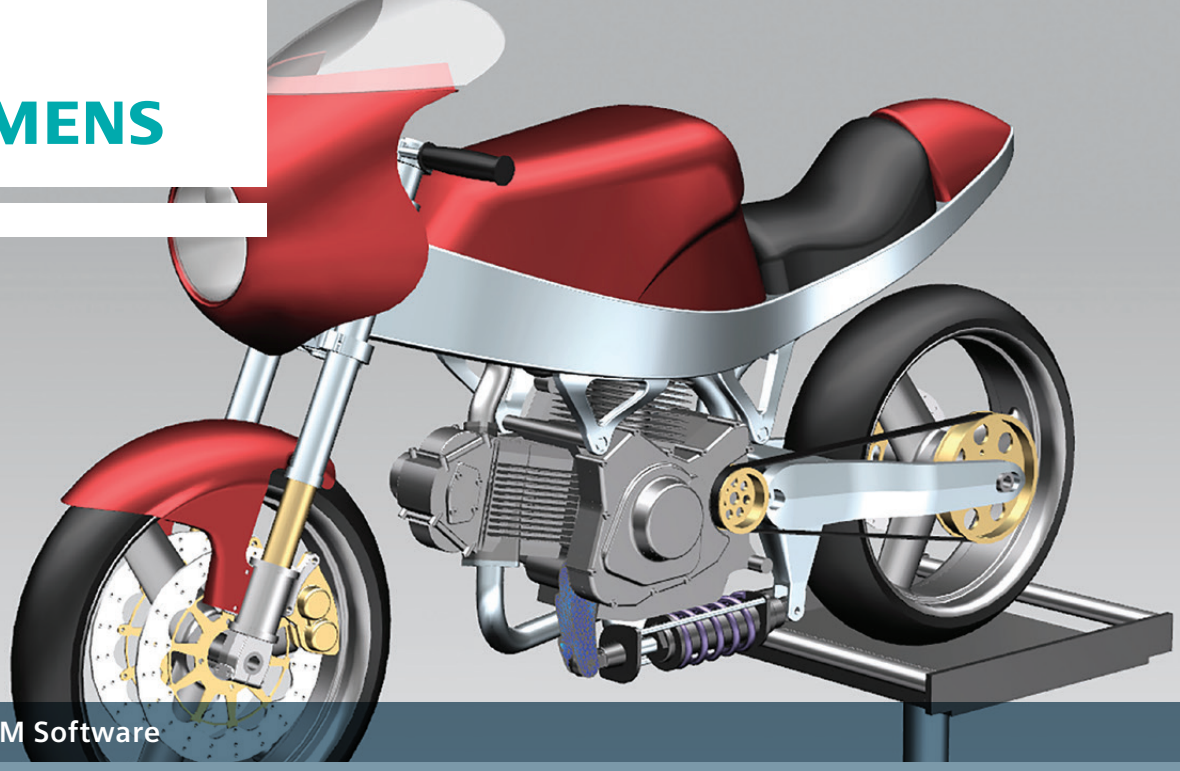
SIEMENS



Siemens PLM Software

NX Motion Flexible Body

Simulating multi-body dynamics in higher fidelity

Benefits

- Extends NX Motion to study problems that cannot be solved by using rigid-body motion analysis alone (including the effect of sharp impacts, sudden changes in motion, or the effect of component flexibility on mechanism performance and durability)
- Determines if a flexible part will interfere with other parts in the assembly while in motion, as well as by how much and in what position
- Accelerates product development by facilitating rapid evaluation and optimization of product alternatives
- Reduces physical testing costs by allowing you to analyze mechanism and part performance in a virtual environment

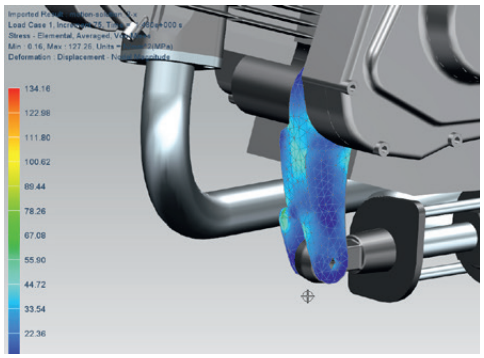
Summary

NX™ Motion Flexible Body solution enables designers and engineers to investigate design performance using higher fidelity models that combine elastic deformation and rigid body motion. Part flexibility is important because it changes the geometry of the mechanism and can lead to serious design issues that involve mechanism interference or performance. NX Motion Flexible Body is an add-on module to NX Motion Simulation-RecurDyn; it requires NX Advanced Simulation to model, simulate and post-process flexible bodies.

Evaluate part compliance effects on mechanism performance

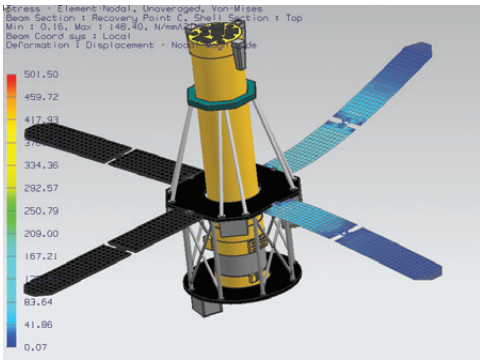
Typical motion simulations represent mechanisms using rigid bodies. While this approach is acceptable for general design, in many cases, rigid bodies do not accurately represent all the parts and assemblies involved. As a result, rigid bodies may not be able to correctly predict performance. For example, rigid-body motion simulation alone cannot represent certain dynamic characteristics. However, by combining both flexible and rigid body motion, you can analyze elastic deformation and rigid body motion together. This facilitates a more accurate understanding of part and mechanism performance.

Including part flexibility in your model can help if your analysis conditions include sharp impacts and/or sudden changes in motion, or if the component is flexible enough to affect the motion of the mechanism. In addition, flexible body dynamics can have different benefits for designers or for expert CAE analysts.



Use flexible bodies to understand how part flexibility impacts performance.

NX Motion Flexible Body



Animate mechanism with flexible bodies to understand how they deform.

Typically, flexible body analysis helps designers and design engineers in the instances where:

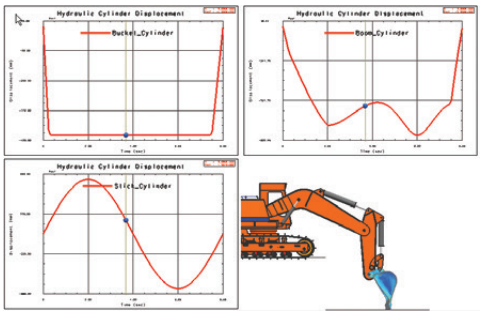
- You need to understand if, when and where a component will fail when in movement.
- Your assembly articulates and doesn't lock in reality because some components are flexible; in this case, you need to determine the force or torque requirements to make it complete the movement.
- You need to optimize packaging, but the tolerances are within the part's deformation order of magnitude.
- You know a mechanism component is very flexible, and you need to know if it will interfere with other parts, by how much and in what position.
- You've optimized a component using loads determined from rigid links, but since the part stiffness has decreased significantly, you need to determine the new loads along with the behavior of the new assembly.

Similarly, flexibly body analysis can help expert CAE analysts when:

- You need to perform durability studies to understand fatigue behavior of a part.
- You need to optimize a part in a mechanism to eliminate interference, minimize weight and maximize strength and fatigue life.
- You want to make sure a part can withstand the forces it experiences while in operation by analyzing the coupling between flexible body and motion reactions.
- You want to study a worst-case scenario and need to understand the transient dynamic effects in motion in instances where there is a sharp impact to the mechanism.
- You need to determine the variation in the mechanism behavior to ensure that your design meets quality or six sigma targets.

The NX workflow used to perform a flexible body analysis is very straight forward. Working in NX Motion, you define one or more components in your mechanism as flexible. NX will replace the rigid components with equivalent FE models that enable part stiffness to be taken into account. Behind the scenes, NX Nastran® performs a component mode synthesis analysis. This analysis enables NX to represent the dynamic behavior of the flexible component with an equivalent set of mode shapes.

After solving this modal solution, NX associates the flexible body output file with the link on which the component is defined in the motion simulation. When you solve the motion simulation, the RecurDyn solver communicates with NX Nastran and recovers the FE results. When you animate the mechanism, the selected result contour plot for the flexible component animates along with the rigid body animation.



Plot results from flexibly body analyses.

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