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Siemens PLM Software

# LMS Samtech Samcef Mecano

## Increasing structural efficiency and reliability while minimizing weight

**Benefits**

- Profit from our vast experience in nonlinear finite element analysis, multi-body simulation and the ability to include both in the same model
- Build models including details where needed
- Compute more precise dynamic loads (improved accuracy)
- Obtain better fatigue prediction thanks to more accurate load inputs
- Reduce the need for physical tests by increasing the quality of virtual ones
- Reduce time-to-market and design costs
- Increase product reliability and customer satisfaction
- Decrease costs linked to warranty and product maintenance

Reducing weight, increasing efficiency and reliability, saving time, energy and budget in your design process are challenges that require a new approach.

LMS Samtech Samcef™ Mecano software from Siemens PLM Software provides answers to a major part of these challenges. Its development has always been driven by the idea of extending the boundaries of classical nonlinear implicit finite element analysis (FEA) method to multi-body simulation (MBS). Classically, this type of solver had always been limited to structural analysis.

Our experience makes it very easy for users to accurately predict global and local phenomena, including vibrations and other dynamic effects. All this leads to a higher level of accuracy in dynamic loads assessment. It induces better fatigue prediction, as well as improved computation of large flexible deformations.

Building better models by including MBS features in the FEA analysis produces results that have never been closer to reality. These cutting edge technologies decrease design costs and duration, decrease potential failures and breakdowns and increase both product reliability and customer satisfaction.

# LMS Samtech Samcef Mecano

**Features**

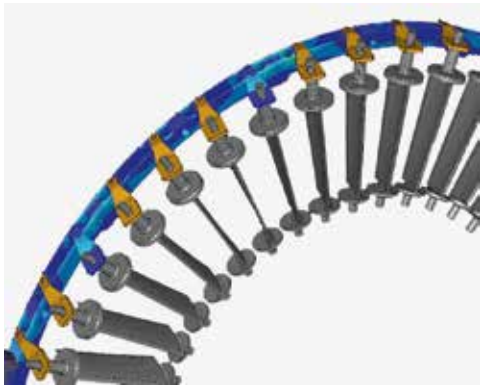
- Library of elements: volume and shell (including composites), membrane, beam, rod, lumped mass, superelements, etc.
- Library of material laws: elastic, piezoelectric, Smith-Ferrante, damage ply, damage interface, elastoplastic, hyperelastic, viscoelastic, viscoplastic, creep, hardening laws, isotropy and anisotropy
- Composites: dedicated composite definition interface, failure criteria, ply-by-ply results visualization
- List of boundary conditions: clamp, connection between mesh nodes, locking, node on surface, plane of symmetry, prescribed acceleration, displacement and velocity, etc.
- Loads: acceleration, line force, pressure, resultant force, rotation speed, surface force, temperature, torque
- Assemblies: bearing, bushing, flexible-rigid and flexible-flexible contact, distance sensor, rigid body, glue, mean (RBE3 type element), spring, etc.
- Kinematic joints: 3D sensor, cylindric, distance sensor, gear, hinge, linear motor, prismatic, screw, rigid and flexible slider, spherical, twist, universal joint, wheel, constant velocity joints
- Time integration schemes: Newmark, Hilbert-Hugues-Taylor, generalized midpoint, Chung-Hulbert

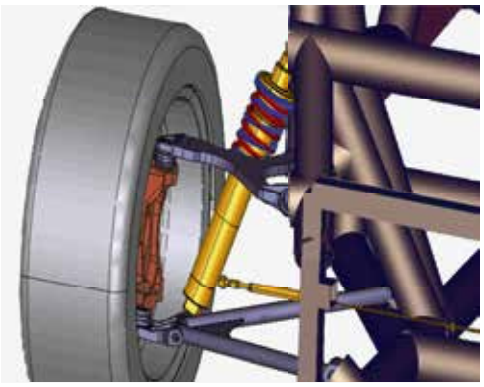
**Flexible dynamics**

LMS Samtech Samcef Mecano Motion solution has the unique ability to allow using MBS features (kinematic joints like hinges, sliders, wheels, etc.) inside real finite element models. This enables you to properly model flexible dynamics phenomena.

LMS Samtech Samcef Mecano Motion is used to compute more accurate dynamic loads as input for detailed structural analysis. Classical MBS tools are usually used to assess loads acting on the different parts of a mechanism (car suspension, wind turbine, robot, etc.).

These parts are then modeled in a detailed way with an FEA module to compute the effects of these loads on the parts. The flexibility of these parts is accounted for at the MBS level. Local nonlinearities that have a major impact on the loads computation are included in the model. That is why LMS Samtech Samcef Mecano Motion is progressively used as a complement of classical MBS tools in various industries for nonlinear flexible multi-body simulations, such as wind energy and automotive.





This unique technology can also be used to assess and control the vibration level acting on structures that can induce fatigue phenomena that must be avoided or at least delayed at all cost.

Vibrations prediction cannot be accurate unless the real flexible behavior of the parts and of the transmissions between the parts is properly modeled.

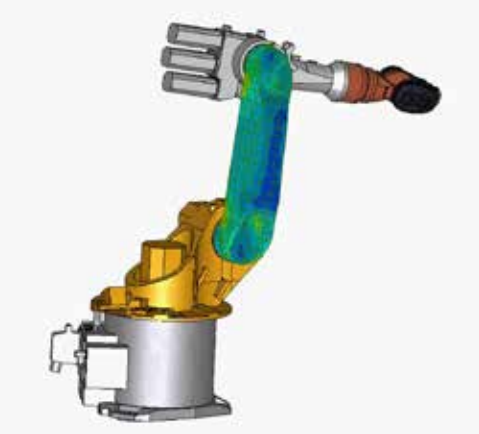
LMS Samtech Samcef Mecano Motion offers the ability to build your model according to your requirements. Keep it simple (rigid, super elements, basic representation of transmissions) when possible (predesign, parts of the structure on which you do not focus, etc.) and add details to increase accuracy when needed. Just make your model evolve along with your design process.

**Nonlinear structural analysis**
LMS Samtech Samcef Mecano Structure solution provides you a tool for static and dynamic analysis and allows you to model large displacements and deformations of structures that are assembled with different components.

Many material laws are available to define the structural properties including linear, elastoplastic, viscoplastic, viscoelastic, hyperelastic, composite (including delamination and damage), specific laws and user-defined laws. All material parameters can be temperature dependent. The assembly between components is defined through gluing or contact friction conditions (such as fasteners).

When coupled with the definition of kinematical joints in a finite element (FE) formulation (included LMS Samtech Samcef Mecano Motion), you can analyze nonlinear flexible mechanisms. This nonlinear structural analysis solution:

- Improves the level of vibrations taken into account
- Allows for stress computation inside components without the need to use local FE analysis
- Does not require iterations between a multibody analysis tool and an FE tool



By creating static and dynamic analysis models that closely reflect reality, you can decrease design time and costs, reduce potential failures and breakdowns and increase product reliability and customer satisfaction.

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