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Kinematics and compliance analysis

Simcenter Engineering services optimize vehicle dynamics and ride comfort based on target setting for the suspension

Benefits

- Cascade targets for the full vehicle down to the subsystems
- Relate K and C analysis for suspension to the full-vehicle targets
- Increase suspension handling and ride comfort performance and improve feedback to design
- Model key components with high accuracy
- Test K and C CAE model validation

Summary

Simcenter™ Engineering services analyze kinematics and compliance (K and C) for clients. By combining Simcenter testing solutions for benchmarking of existing systems with Simcenter™ 3D software for performance analysis and optimization, Simcenter Engineering is able to optimize suspension handling and ride comfort.

Engineers need complete information on suspension-system behavior to accurately evaluate the effects of its performance on ride and handling. During K and C measurements, they apply known displacements or force inputs to the suspension and measure the position and angle changes in the wheel center or tire patch. Kinematic tests measure wheel behavior changes that occur due to position changes, such as roll-and-ride height, while lateral, longitudinal and aligning forces are zero. Compliance tests are used to measure wheel behavior changes due to lateral, longitudinal and aligning force inputs.

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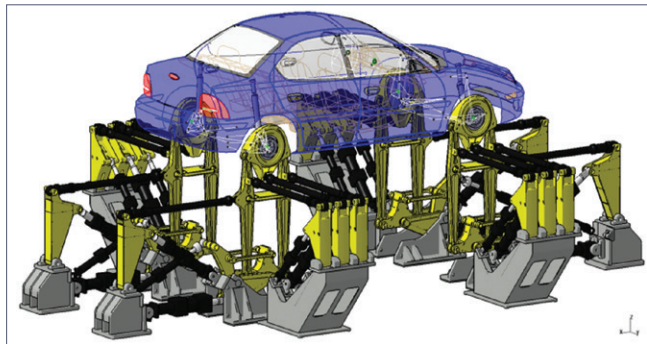
In a structured vehicle development process, the K and C targets result from cascading the full-vehicle ride and handling targets. As a result, the suspension subsystems can be optimized and validated through final integration in the full vehicle. K and C analysis begins with a virtual or physical measurement phase. This enables the vehicle designer to analyze an existing suspension and set up the targets for a new one. Using advanced simulation, engineers design a new suspension and later test it in the full vehicle for handling and ride comfort. A typical K and C optimization project is comprised of the following phases:

Measurement phase

Simcenter Engineering partners with external testing facilities to accurately measure the kinematic characteristics of the vehicle suspension. Standard analysis consists of tire and spindle tests to obtain K and C curves. These are used in the next phase to support the modeling and validation of the computer-aided engineering (CAE) suspension model, which is created in Simcenter 3D.

Detailed suspension analysis

Simcenter Engineering experts model the front and rear suspension, as well as the steering system in Simcenter 3D Motion. Several load cases are simulated, validated and optimized against the design target. An

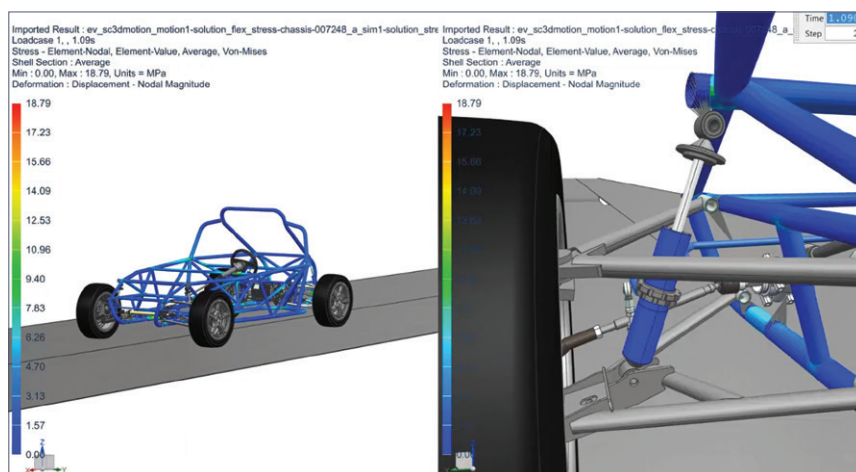


Simulating, validating and optimizing against targets.

internal optimization loop is performed to design the new suspension, taking into account the K and C targets. Using this combined test and simulation approach, Simcenter Engineering creates highly accurate models that can be used to evaluate modifications without the need to physically implement them, saving time and costs.

Full-vehicle performance validation

Once the K and C targets are met, Simcenter Engineering does a full-vehicle handling and ride comfort performance verification. The optimized suspension setup is checked at full-vehicle level during actual maneuvers without a physical prototype. The Simcenter Engineering experts can then provide feedback to the design team so that the suspension solution behaves optimally in terms of handling and ride-comfort performance.



Verification of optimized suspensions.

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