

Highlights:

Model ANY type of transmission: AT, MT, AMT, DCT, CVT, IVT, and new, innovative concepts

Fuel economy, emissions and vehicle performance

Powerflow layout and transmission design

Shift quality and driveability

Loss prediction, lubrication, and thermal management

NVH studies and torsional analysis

Physical synchronizer and wet clutch models

Formal Multibody Dynamics (MBD) mechanical solution methodology

Models can be built from higher-level or primitive elements

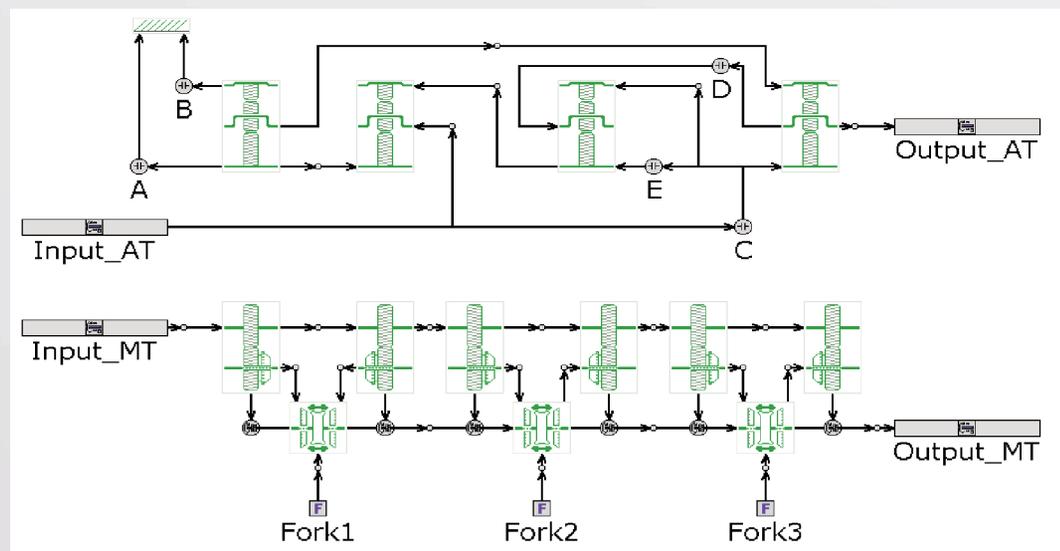
Fully integrated with other GT-SUITE libraries

Transmission Modeling

Transmission Mechanics, Hydraulics, and Control

GT-SUITE offers a versatile set of tools for the modeling of transmissions in various levels of detail suited for all phases of the development process:

- **Fuel Economy, Emissions, and Performance** calculations for closed-loop driving cycles, or open loop maneuvers based on transmission type, optimum gear ratio selection, and shift strategy optimization
- **Powerflow Layouts** can be quickly prototyped and analyzed with higher-level gaset options or simple primitives in a representative view, similar to schematics
- **Shift Quality and Control** can be simulated by combining mechanics and hydraulics together to model wet and dry clutches and synchronizers and their actuation systems, consisting of solenoids, shift valves, and mechanical shift and pedal mechanisms
- **Losses and Thermal Warmup** can be evaluated by integrating the transmission model with a lubrication circuit and thermal models of components, such as wet clutches and brakes
- **Higher Fidelity NVH Studies** can be made both in the time and frequency domains by evaluating overall system design including torsional vibrations, dynamic transmission error and lash, and specification of detailed gear tooth design.



System-level models for automatic and manual transmissions

Any and all of the above applications can be easily coupled to a **GT-POWER** detailed engine model or one of the GT-POWER Fast Running Models (FRM) from the **FRM Engine Database** to account for the combustion-related engine torque pulsations

Advanced Features and Applications:

GEM3D and SpaceClaim CAD preprocessing tools for discretizing hydraulic flow paths and volumes

Seamless integration of hydraulics and mechanics for actuation system modeling

Modeling of electrics and magnetics for predictive solenoids

Internal component thermal models

Thermal hydraulics with aeration and species transport

Frequency-domain analysis for mechanical systems

Output visualization of detailed gear and synchronizer systems

Torsional or fully rigid systems

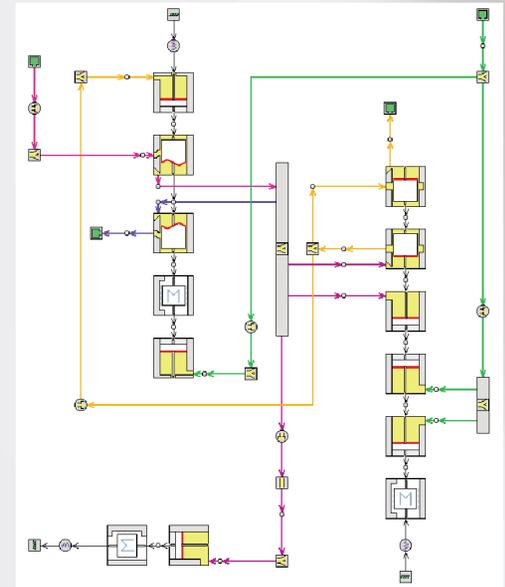
Extension of 1D mechanics to 2D and 3D

These capabilities are included in every GT-SUITE license

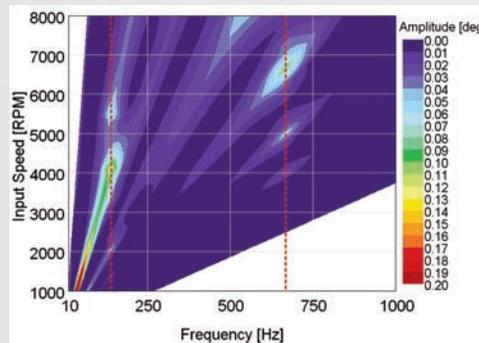
GT-SUITE has a number of usability features that aid the user in building models. **GEM3D** and **SpaceClaim** can be used to generate 1D GT-SUITE hydraulic models from the native 3D CAD file format. Spool dimensions, volume calculation, orifice diameters, and more, can be easily determined and semi-automatically populated in the GT-SUITE model.



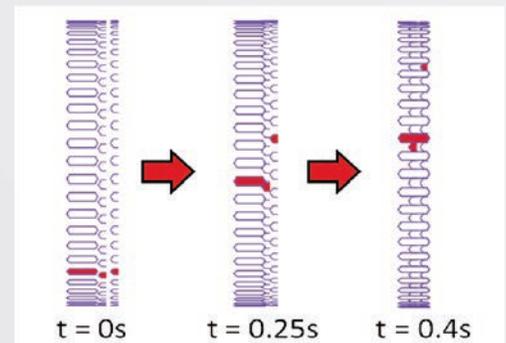
Discretization of a 3D CAD model into a GT-SUITE model



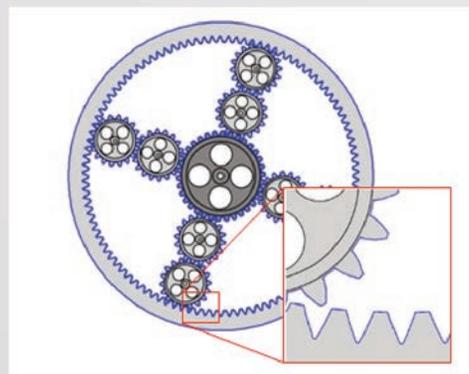
GT-SUITE is capable of building models in various levels of fidelity, to satisfy the various needs at the particular phase of development, from concept evaluation to production and post-production, including **SiL** and **HiL** capabilities. The level of fidelity of models can be easily reduced or increased to include aspects such as torsional dynamics, fluid dynamics, thermal effects, and detailed engine and vehicle systems. The result is a tool designed for **component design** and **system-level optimization**, which allows the user to improve vehicle performance and fuel economy while reducing emissions and driveability concerns.



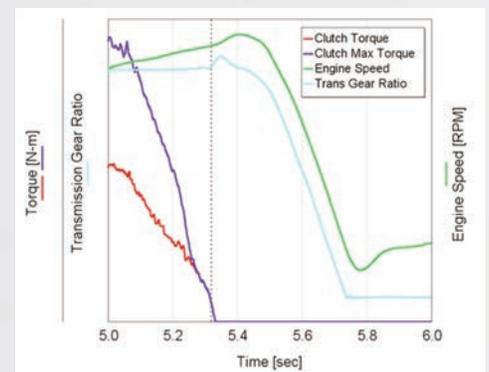
Frequency domain analysis



Synchronizer engagement animation



2-D model of epicyclic geartrain



Gear shift quality results: engine flare

GT-SUITE can be used to diagnose hardware or calibration issues in transmissions