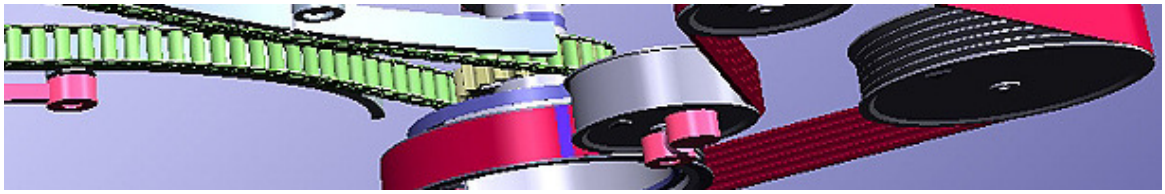
KADKRAFT SYSTEMS
Innovate Simply

SIMDRIVE 3D

SIMDRIVE 3D for Dynamic Analysis



Key Users

- General Motors
- Chrysler
- Schaeffler Group
- Cummins
- Suzuki Motor
- Fenner
- Gates Unitta
- NOK
- Audi
- BMW Group
- ContiTech
- Daimler
- Dayco
- Ford
- Jaguar Cars
- Skoda
- Optibelt
- Porsche
- Volvo
- Volkswagen
- Valeo
- MAN Trucks
- SKF
- Vibraucoustic
- Bando

Key Features

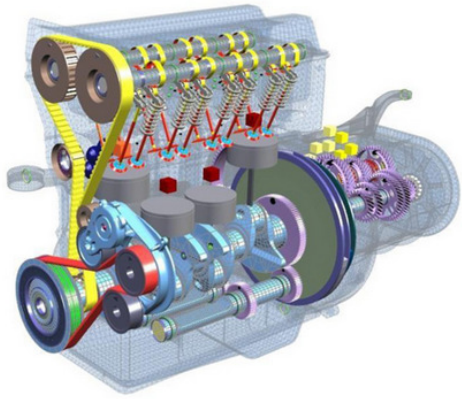
- Fast and proven prediction models
- Fast model set up through an unique graphical 3D-modelling and simulation environment for all modules
- Common database for modelling, simulation and evaluation to get around co-simulation
- Convenient model/data exchange with all major automotive suppliers
- All results v/s time, speed and as order analysis

Benefits

- Reliable, robust and very fast simulation models and -methods for concept studies, pre development, project support and design optimisation
- Scalable depth in the modelling and flexible integration of subsystems into a complete-engine-simulation
- Unmatched high accuracy of the simulation results

Available Modules

- **Poly V Belts**
  - ✓ Flat belts, Poly-V belts
- **Timing Drives**
  - ✓ Chain drive, Tooth belt, Valve train
- **Engine**
  - ✓ Crank train Basic and Advanced, Dual Mass Flywheel, 3D Bearings
- **Gear Drive**
  - ✓ Gear Drive, Transmission, Planetary Gear
- **DOE and Post Processing**
  - ✓ Case Studies, Parameter Studies & Optimizer, Reportgenerator
- **Enhancements**
  - ✓ 3D Elements, Animation, Controller / Mechatronics



SIMDRIVE 3D is a worldwide unique simulation platform from Germany, merging the most important methods for the predictive dynamic analysis of power transmission systems in time and frequency domain.

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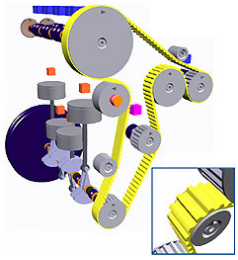
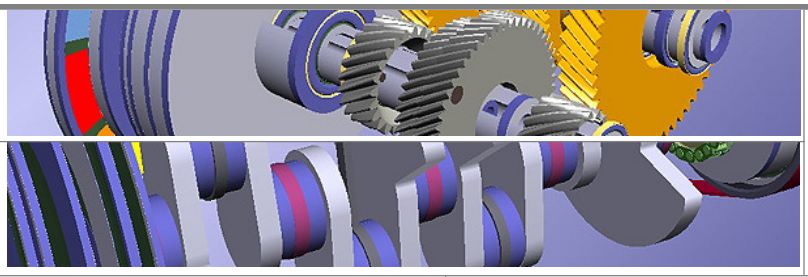
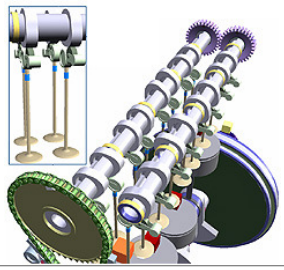






The **Tooth Belt module** provides the simulation and study of timing belt drives with automatic tensioning systems for durability analysis, system load and power loss.

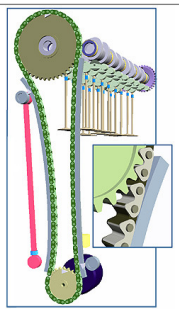
- Dynamic model with a detailed description of the belt-pulley contact
- Study of belt and tooth forces with detailed geometry definitions for each pulley
- Incorporation in a complete 3D Engine Simulation
- Complex analysis of timing drive dynamics, e.g. oscillation angle transversal deflection

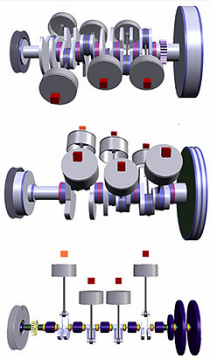
The **Valve train Module** is designed to make a complex analysis possible, starting with single valve elements as well as increasing the complexity up complete Powertrain analysis.

- Simple component modeling with single elements, such as cam, valves, valve springs and rocker arms
- Contour definition possible as XY-coordinates, hub curve or with the 2nd derivative
- Consideration of the combustion pressure

The **Advanced Chain Drive module** covers the analysis and optimization of entire chain dynamics NVH studies of timing drives with bushings, rollers and silent chains.

- Detailed sprocket geometry: ISO, involute as well as a variable outline for silent chains
- Link-to-Link connection with nonlinear chain stiffness including friction and damping to analyse power loss
- Physical chain tensioner model covering gap flow and dissolved air
- Incorporation in a complete engine simulation with 3D sprocket movement
- Unround sprockets and irregular pitch for resonance cancellation



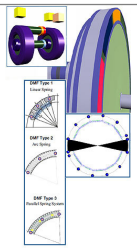


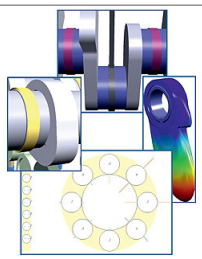
The **Advanced Crank Train module** allows the simulation of coupled flexural and torsional vibrations of crank trains as well as the entire power train with elastic or hydrodynamic journal bearings. The Crank Train Basic version enables a reduced torsional vibration analysis of the crank shaft.

- Automated reduction from a fully flexural simulation model to a torsional vibration model
- Engine characteristic definition by gas pressure input
- Study of the hub load influence of FEAD or timing drives on the crank train through a coupled simulation

The **Dual Mass Flywheel** Advanced module offers complex multibody modeling for the dynamic simulation of Dual Mass Flywheels, as well as a reduced rheologic approach. The system includes all three common designs of the inner spring setup in one element

- Detailed dynamic model as a series of spring and mass elements with nonlinear and rpm dependent friction and geometry influence
- Advanced approach of a full 3D geometry modeling including bearings and flexplate flexural bending
- Implementation of the Valeo CDMF as a SIMDRIVE3D customer element





Simulation of **journal bearings** using the complex solution of the reynolds equation incorporating an EHD approach or of simple elastic bearings with damping proportional to velocity for linear elastic mount of shafts.

- Simulation of ISO ball-bearings through calculation and evaluation of pressure condition and dynamic behaviour in dependency on geometry and load.
- Direct solution of the equation in time domain considering oil drillings and tilting under dynamic load
- A significant less time consuming approach available using a precalculated data map

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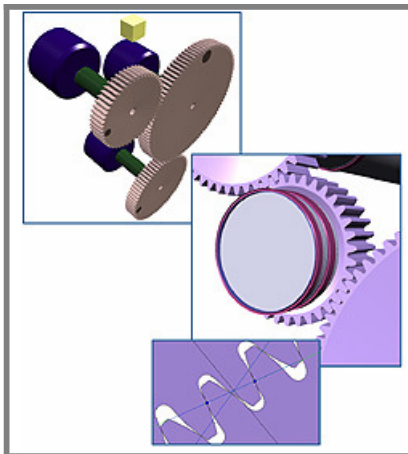
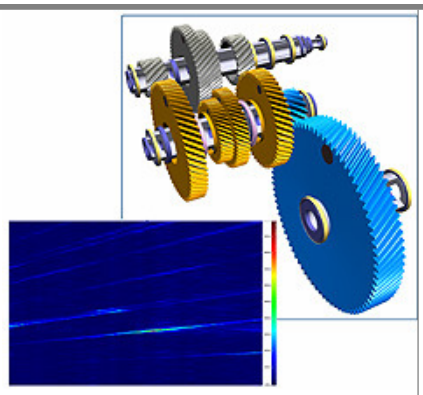




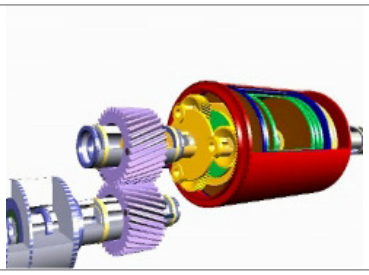
Analyzing the driveline and transmission for **rattle and dynamic transmission errors** in combination with the crankshaft, dual-mass flywheel and clutch in full 6DOF

Tool Contour Geometry design for Standard Tools and Protuberance Tools

- Interactive design tool for setting up parametric gear shafts
- Study of engaging and disengaging gear pairs with clutches
- **NVH Study** of gears in a complete power train and driveline simulation

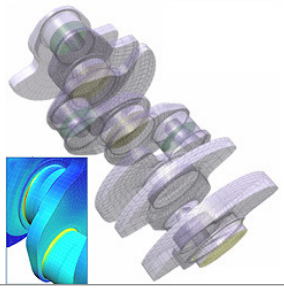
Simulation of **dynamics and vibrations of rotating multiple spur gear pairs** in gear trains.

- Detailed analysis of contact dynamics
- Study of pretensioned or isolated gears
- Modeling of either spur or helical gears
- Advanced modeling of flexible gears including full 3D contact



Simulation of **dynamics and vibrations of planetary gearbox** arrangement with serveral stages.

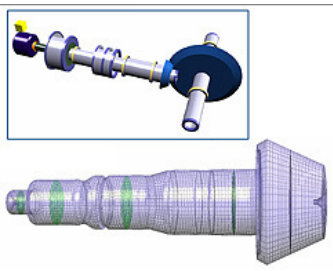
- Modeling of any combination of planetary gear stages is possible
- Automatic calculation of gear ratios and angular velocities (sun, carrier, ring) for all gear sets in a complete gearbox arrangement
- Study of dynamic gear loads and bearing loads
- Advanced modeling with flexible planet carrier and flexible ring gear



Parametric Crankshaft

Structured approach in crankshaft web design, enabling a simple variation of a specific design element, such as fillets, base or pin diameters, shoulder or counterweight specifications

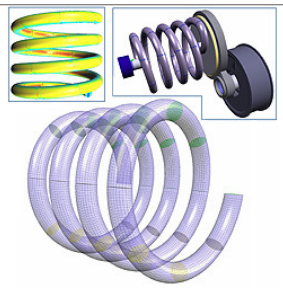
- Effective way to create a complete crank shaft with high detail
- Fatigue limit assistant with material data base and consideration of construction and gradient influence
- Modern and revolutionary analysis algorithms for the cycle stress tensor
- Simple parameter variation and system optimisation



BEM Rotary Connector

Analyse a setup of shafts used in transmission or drive line and torsional vibration damper

- Detailed depiction of rotary elements such as shafts through sectional calculation
- Comprehensive import function from point-to-point description or the ISO STEP format file



BEM Spring

Highly accurate approach to create a structural model of a spring

- Geometry definition of the surface mesh using precise design parameters
- Illustration of the displacement and stress on the spring surface

Functional Engineering **Virtual Prototyping** **Collaborative Engineering**

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