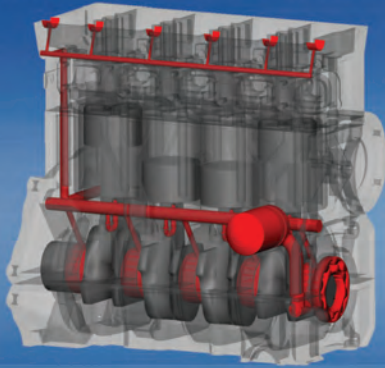




Highlights:

Steady state analysis

Transient analysis

Pressure, flow and temperature distribution

Cold start priming

Driving cycle analysis

Thermal warm-up

Easy integration with crank and valvetrain models

Automated pump and lube system model building from 3D CAD file

Two Bearing levels (Mobility & FE HD)

Accurate wave dynamics based on Navier-Stokes (conservation of mass, momentum, energy, and species)

Gerotor, gear, vane and other pumps

Lubrication, Bearings & Detailed Pumps

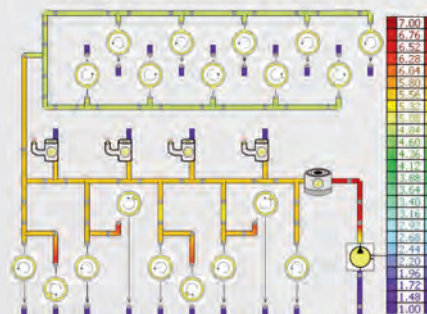
Cutting Edge Lubrication System Modeling

GT-SUITE can be used to quickly and efficiently design, analyze, and optimize lubrication systems and components. Using the state of the art software for lubrication can shed light on many issues. Listed below are a few common types of analysis:

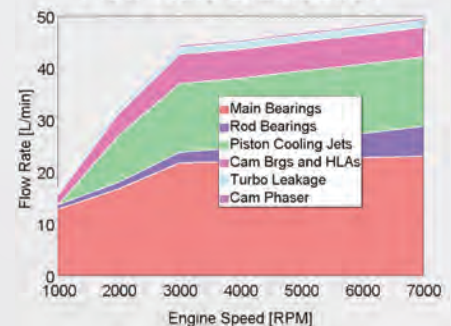
Steady state analysis

Pressure, flow rate and temperature distribution throughout the oil circuit

Oil System Pressure [bar]



Flow Rate Distribution

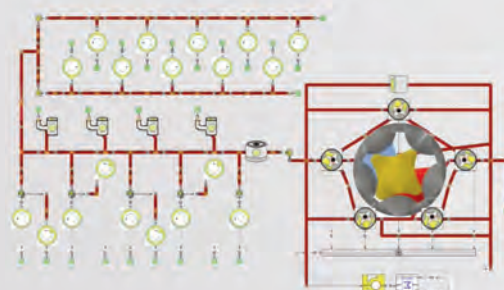


Transient analysis

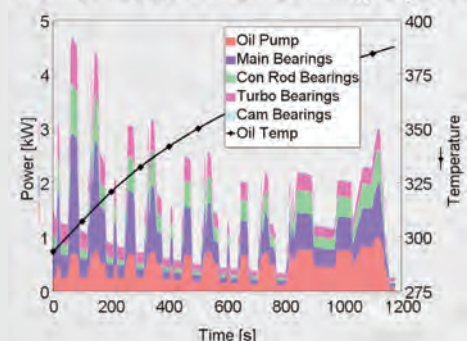
System priming at cold start (filling)
Resonance and wave dynamics in the system
Energy loss in the system over a driving cycle
Thermal warm-up and integration with cooling system models

Priming Animation

Air = Red, Oil = Blue



Power Loss Over Driving Cycle



Advanced Features and Applications:

Lubrication

Cavitation

Transient aeration (free and dissolved gas.)

Transport of gas

All oil consumers included

Bearing Predictions

Orbit and film thickness

Flow rate

Friction torque/power

Peak film pressure

Thermal balance

Multiple pressurized grooves and holes

Multiple flow rate options for different bearing types

Detailed Pumps

Flow pulsations predicted from geometry

Many types supported

Flow behavior when experimental data not available

Predicts resonance

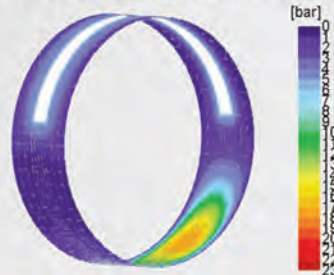
Force predictions acting on bearings

These capabilities are included in every GT-SUITE license

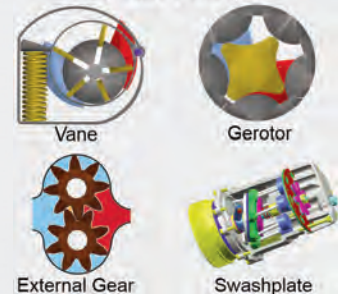
Components of the lubrication system can be studied in detail as a standalone model or included in the full system:

Bearings (fast running Mobility method or Finite-Element HD method)
Detailed pumps (gerotor, vane, crescent, external gear, screw, others)
Hydraulic lash adjusters and chain tensioners
Cam phasers
Valve dynamics

FE HD Bearing Film Pressure

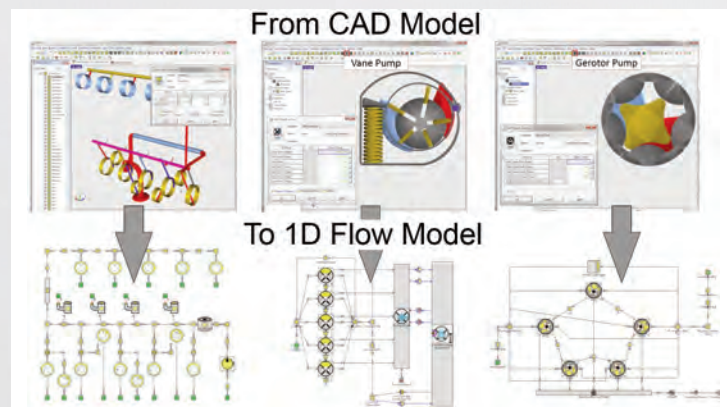


Detailed Pumps



Fast Model Building

Building a lubrication model or detailed vane or gerotor pump is easy thanks to the GEM3D pre-processor, where a CAD model of the pump or flow network can be imported and discretized into a 1D model.



System Integration - Lubrication and Cranktrain

Lubrication models can easily be integrated with other systems such as cooling, cranktrain, valvetrain and engine performance. Shown below is an example integrating a cranktrain model with the lubrication system to predict the bearing loads acting on each of the bearings in the lubrication system. The loads can be predicted for a rigid, torsional or bending crankshaft or camshaft.

