

Highlights:

Based on Navier-Stokes equations

Always solves energy equation (thermo-hydraulics)

Fundamental cavitation model

Transient aeration model (free and dissolved)

Tracks and transports vapor and gases

Leakage with pressure dependent clearance

Frequency dependent friction

Pipe wall compliance

High-level templates for component design

Automated creation of flow network from 3D CAD data

Gerotor, gear, vane and other pumps

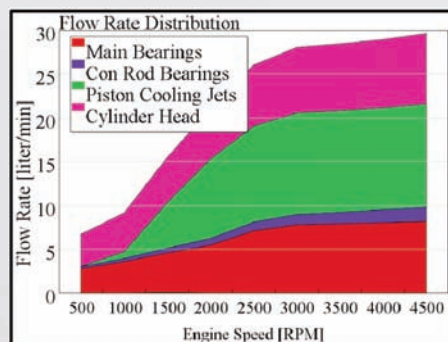
Lubrication Analysis

Breakthrough Advances in Lubrication Modeling

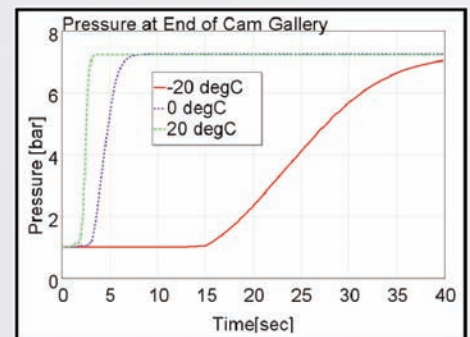
GT-SUITE can be used to quickly and efficiently design, analyze, and optimize all variants of lubrication components and systems. Typical lubrication models in GT-SUITE involve:

- Steady state pressure and flow rate distribution throughout oil circuit
- Priming
- Thermal warmup and integration with cooling system models
- Pump analysis for energy consumption over driving cycle
- Detailed component analysis for:
 - o pump
 - o cam phaser
 - o hydraulic lash adjuster and chain tensioner
 - o bearings based on mobility method
 - o valve dynamics

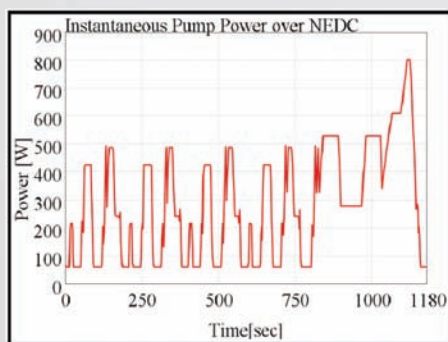
Results can easily be analyzed with the GT-POST post-processor, as shown in several application results below, ranging from **steady-state to priming and pump analysis**.



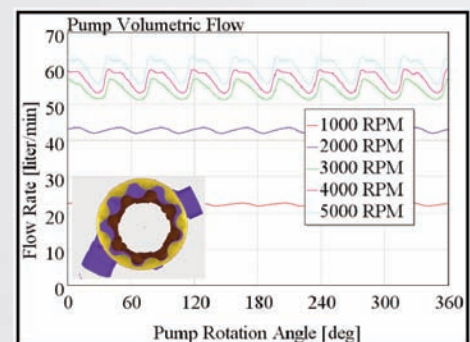
Steady State Flow Rate Distribution



Priming Analysis (pressure delay)



Pump Power over Driving Cycle



Predictive Pump Analysis

Advanced Features and Applications:

Fundamental pump models with predictive flow rate and pressure ripple modeling

Priming of dry circuits

All oil consumers such as jets, lash adjusters, cam-phasers

Thermal warm-up of structure

Transients and driving cycle simulation

Integration with mechanics for bearing load predictions

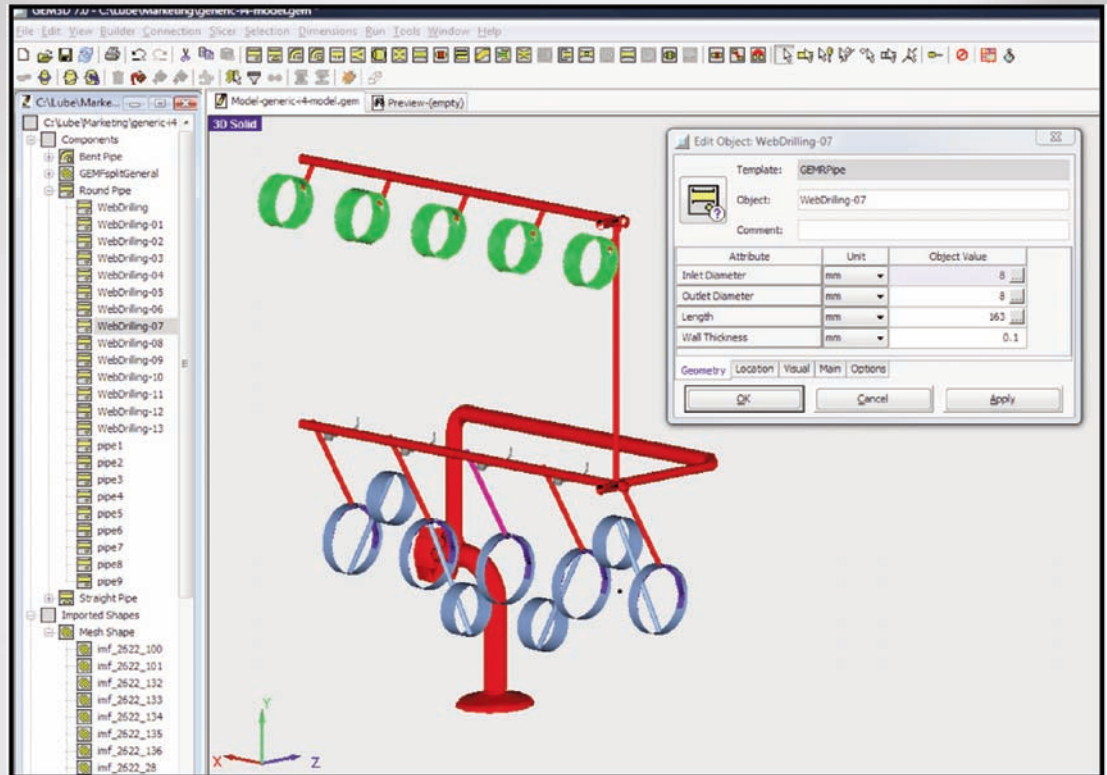
Advanced Bearing Modeling

Predictions of:

- orbit and film thickness
- flow rate
- friction torque and power
- film extent
- peak oil film pressure
- thermal balance
- multiple pressurized or passive grooves and holes
- multiple flow rate options for specific bearing types
- separation into two races when load coincident with groove or hole
- hydrostatic force
- transient species (air purged by oil)

Fast Model Building

Building a model is easy thanks to the **GEM3D pre-processor** of GT-SUITE, where a standard oil circuit flow network can be built very quickly by discretizing (semi-automatically) the entire oil network into pipes and flowsplits, starting from an existing CAD file.



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.

