MODELING & SIMULATION PLATFORM FOR SYSTEMS ENGINEERING

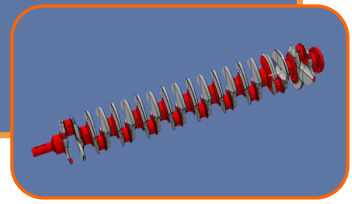
AMESim

APPLICATIONS – LARGE DIESEL ENGINES

MECHANICAL ANALYSIS

KEY POINTS

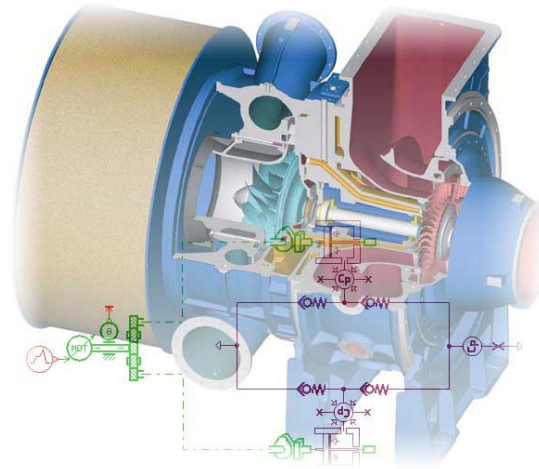
- Steady state and transient simulation.
- State-of-the art for large engines modeling.
- Time domain and frequency analysis tool:
  - Vibration modes characterization
  - Eigenvalues and Bode response
  - Activity index for energy/efficiency
- Fluid properties database for a large range of pressures and temperatures.
- Built-in database of parameters for handy modeling.
- Fluid cavitation with void content, air release and entrained air everywhere in the system.
- Advanced hydraulic line models (wall compliance, frequency dependent friction…).
- Laminar /turbulent transition and cavitation in orifices.
- Electronic control unit for cyclic command, Matlab®/Simulink® interface for control design.
- Complete injection, lubrication and vibratory systems design.
- Crankshaft and Camshaft influence
- Generator set for setup configurations of power generation



Overview

AMESim® allows you to design and optimize large engines early in the development process. It offers an open architecture for various configurations (2 & 4 strokes, low, medium & high speeds, …)

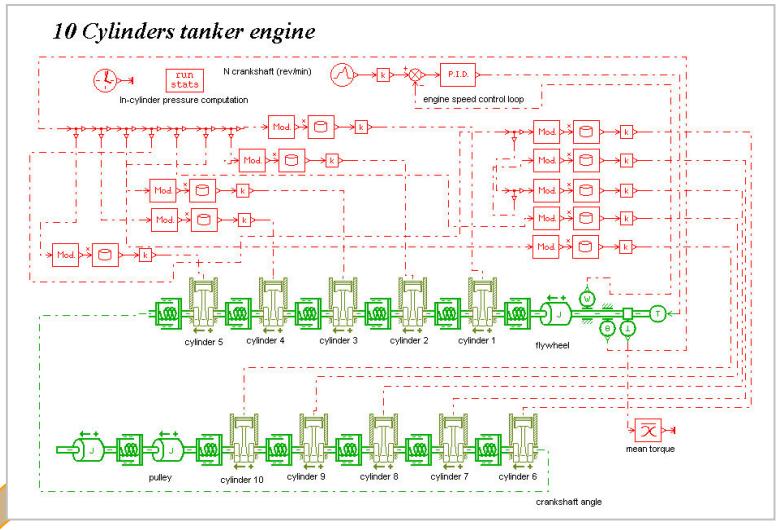
The dynamic behaviors of such systems are hard to predict since every sub-system needs to be taken into account. For early prototyping, it is efficient to use one simulation environment in which coupling different modules is possible: enhanced compatibility, reduced implementation time, easy handling of the interface, no programming effort, adapted numerical convergence…



A new step in large diesel engines design has been achieved by using AMESim, the most efficient tool to answer typical concerns such as sizing of your system, optimization of your network architecture, development of control strategies, increasing component performance, reduction of flow ripples, damping of pressure fluctuations, reduction of energy consumption, increase of efficiency, study of air release or behaviour at cold start, analysis of oscillations due to rope effects, understanding of wear and stress, test of different load case situations and working processes… With this combination of **Vibration analysis, torsion, cam less** and **turbo compressors** in one physical modelling environment, AMESim provides a speedy, easy, secure & optimal way for the design of large diesel engines.

Benefits

System development time is reduced significantly (from months to weeks). The maintainability of the models means that the system lifespan is increased while system costs are reduced. Application libraries are constantly evolving thus ensuring that the correct models are always available even in this changing industrial world.



Unrivaled capabilities

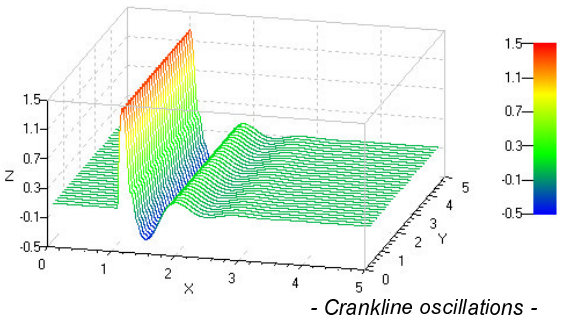
AMESim allows you to discretize your system in order to understand and predict various engineering problems such as:

- **Turbo compressors design** allowing preliminary studies (single turbo, double over boost process,…)
- Impact of **crankline oscillations** on the rotation of turbo
- **Eigenvalues** and **modal shapes**

Performance

Models reliability and accuracy are demonstrated through permanent comparison with experimental data for various operating modes, different supply pressures and load considerations.

Simulation results are so predictive that AMESim may be used to control the industrialization process and to determine where to save money with manufacturing considerations by doing model sensitivity analysis.



- Crankline oscillations -

Applicable libraries

- Standard **AMESim Mechanical** and **AMESim Signal & Control**
- **AMESim Powertrain** for transmission mechanical parts
- **AMESim Electromechanical** library for electromagnetic and piezoelectric actuators dynamics.
- **AMESim IFP Drive** and **AMESim IFP Engine** libraries for internal combustion engines studies

References

AMESim is successfully used for the design of large diesel engines such as MAN B&W Diesel, Detroit Diesel Corporation, L'Orange, HSD, Robert BOSCH AG, Kawasaki, SEMT, DC Offhighway… AMESim is the preferred solution for the transient and steady-state analysis of large diesel engines.

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