

# AMESim



## APPLICATIONS – LARGE DIESEL ENGINES COOLING AND LUBRICATION

### KEY POINTS

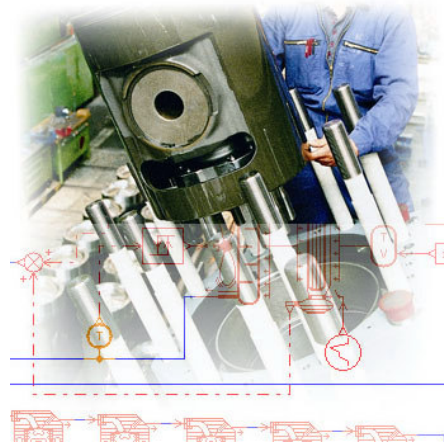
- Steady state and transient simulation.
- Pump design
- State-of-the art for large engines modeling.
- After treatment studies :
  - ⇒ EGR
  - ⇒ Catalytic Reaction
  - ⇒ Dosing Unit
- Fluid properties database for a large range of pressures and temperatures.
- Built-in database of parameters for handy 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.



### 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, ... )

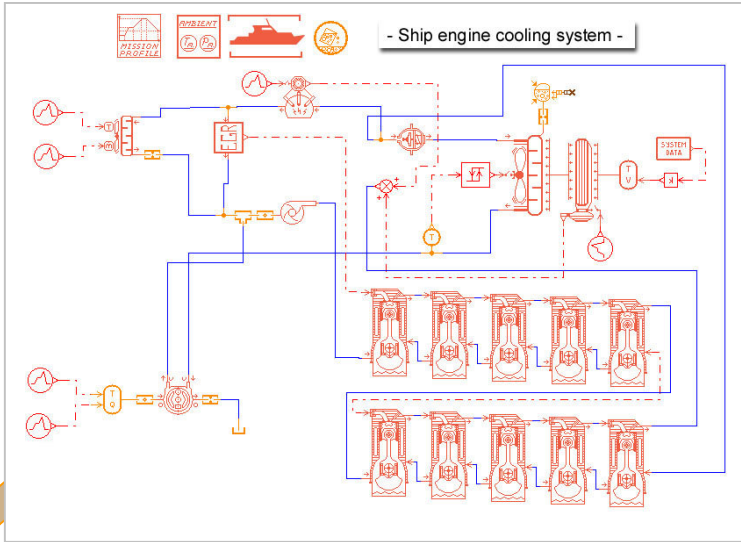
The dynamic behaviors of such systems are hard to predict since every sub-system needs to be taken into account. For early prototyping, it is efficient to use one simulation environment in which coupling different modules is possible: enhanced compatibility, reduced implementation time, easy handling 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 **Combustion analysis**, **cooling systems** and **internal thermo analysis** 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.



## Unrivalled capabilities

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

- **Heavy fuels and high viscosity** characteristics analysis before injection step.
- **Durability and wear problems** due to fuel composition.
- **Heat release and walls heat transfer models**
- **Quality and robustness optimization**

## 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.

## Cooling systems analysis



## Applicable libraries

- **AMESim Hydraulic, AMESim Hydraulic component design and AMESim Hydraulic resistance libraries** for liquid fuel injection systems and lubrication systems without thermal consideration
- **AMESim Thermal-hydraulic, AMESim Thermal-hydraulic component design and AMESim Thermal libraries** for liquid fuel injection systems and lubrication systems with thermal consideration
- **AMESim IFP Drive and AMESim IFP Engine libraries** for internal combustion engines studies
- **AMESim cooling library**

## 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.

## DESIGN EXPLORATION

### SENSITIVITY ANALYSIS : DOE

Full Factorial  
Central/Composite

### OPTIMIZATION

NLPQL

Genetic Algorithm

### QUALITY ENGINEERING

Monte Carlo

## Optimization

New optimization module of the AMESim new 4.2 release allows you to run into your design goal easily thanks to 3 features :

- Sensitivity analysis
- Optimization
- Quality engineering

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