FLOWNEX®

SIMULATION ENVIRONMENT **TURBOMACHINERY**

Flownex® SE simultaneously solves pressure drop, heat transfer and windage power transfer for the connected components of a complete system in both steady-state and transient simulations. These capabilities enable engineers to analyse and design combustion chambers, secondary air systems, blade cooling flows, lubrication systems with oil-air mixtures, as well as overall engine integration and operation.

TYPICAL USES:

ANALYSIS

- Simulation.
- Performance assessment.
- Modification assessment.
- Fault root cause assessment.

DESIGN

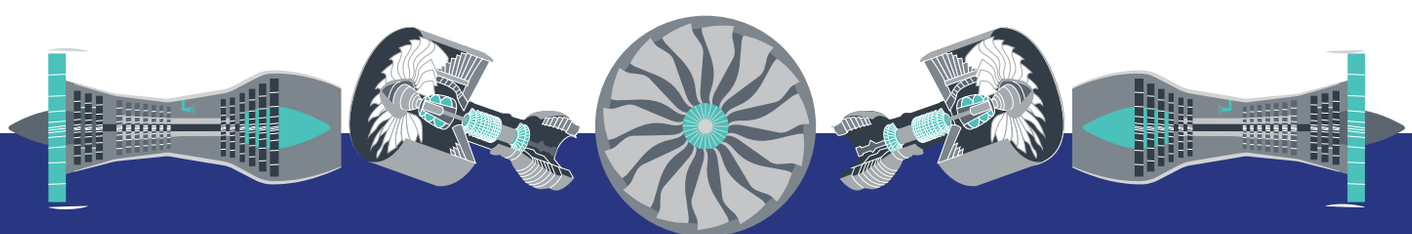
- System sizing.
- Component sizing.
- Determining operating ranges.
- Flow, temperature, pressure, power consumption, etc.
- Testing of control philosophy.

TRAINING

- System behavior examination.
- Performing basic flow and heat transfer calculations.
- Thermohydraulic principles and properties referencing.

BRINGING NUCLEAR QUALITY AND STANDARDS TO SYSTEM SIMULATION

Flownex® is developed in an ISO 9001:2008 quality assurance system and NQA1 supplier approved environment.



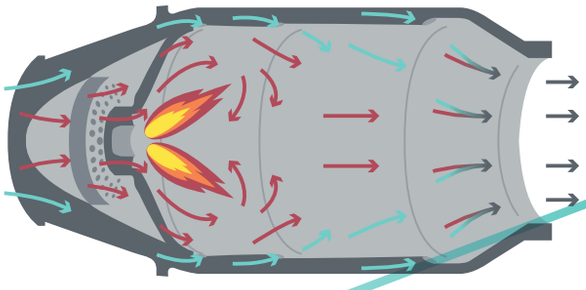
www.flownex.com +27 18 297 0326/7 enquire@flownex.com

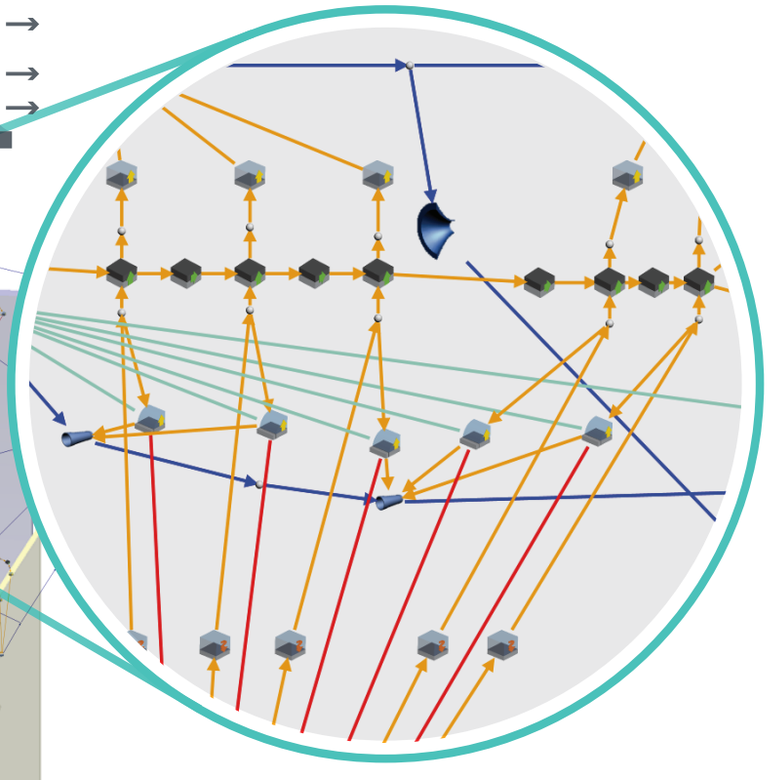
See more at enginsoftusa.com/flownex-CFD.html

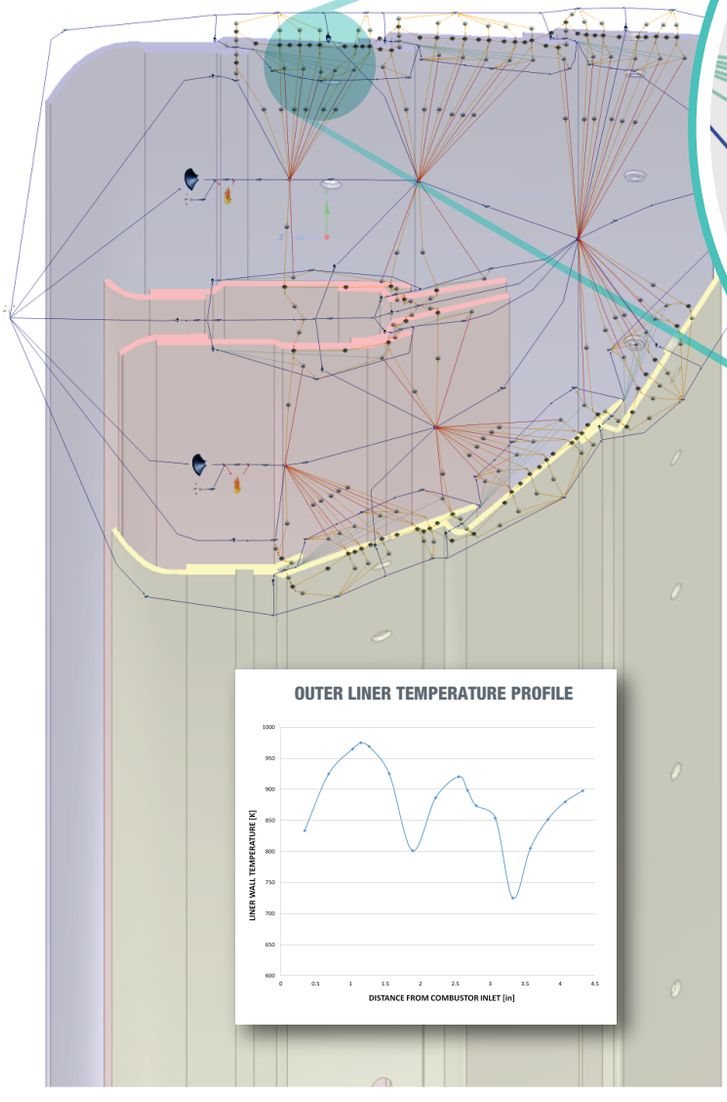
COMBUSTION CHAMBER

Integrated combustion chamber design & optimization including coolant flow.

- Combustion product gas composition calculation.
- Combustion process adiabatic flame temperature calculation.
- Flow distribution between cooling slots and main flow path.
- Thermal capacitance in solids for transient modeling.
- Axial (2D) conduction.
- Jet impingement cooling.
- Film convection heat transfer.
- Solid-Solid radiation heat transfer.
- Gas-Solid radiation heat transfer.
- Convection heat transfer.







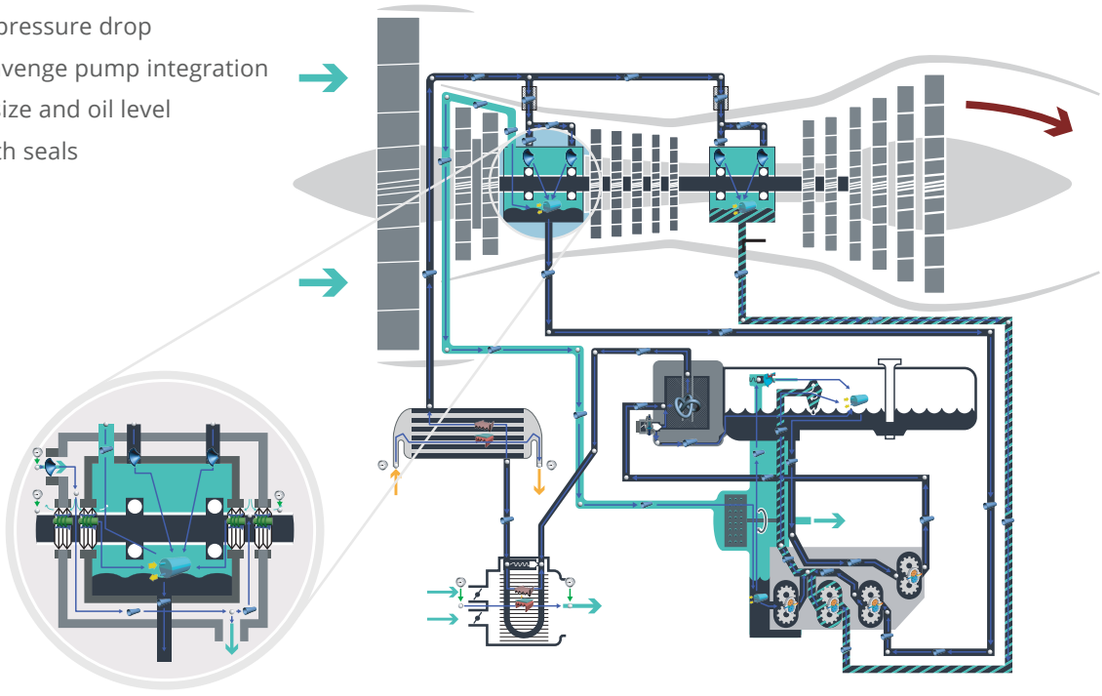
Preliminary combustor design requires that an extensive number of geometrical and operational conditions be evaluated and compared. Especially during this phase Flownex® is an essential tool for combustor design engineers as it accurately captures important parameters such as the mass flow rate distribution through air admission holes, associated pressure losses as well as liner wall temperatures.
Networks can be easily configured and solve within a few seconds. This result in substantial development cost savings because of the reduction in the number of detailed 3D simulations and rig tests required. A further advantage is the ability to use the Flownex® results as boundary conditions to subsequent localized 3D models.

See more at enginsoftusa.com/flownex-CFD.html

GAS TURBINE & LUBRICATION SYSTEM

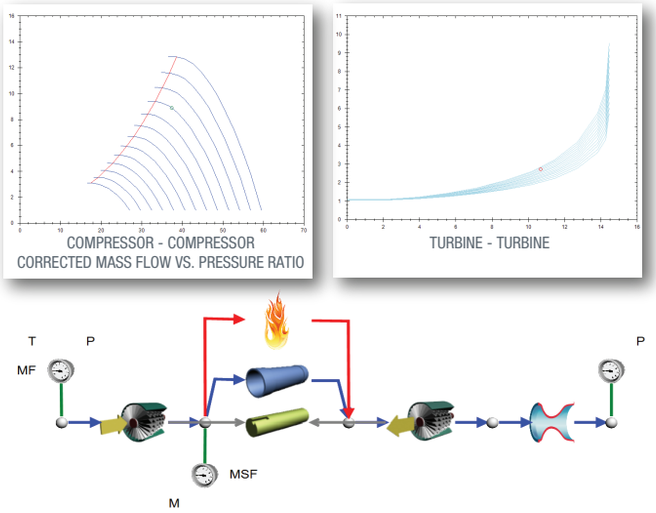
The Flownex® model of the lubrication system is used to determine optimum drain line sizes given the limited space inside the engine.
This requires two-phase pressure drop calculation in lines with oil-air mixtures. In parallel with this the engineer would be able to determine whether or not scavenge pumps are required for fluid transportation in the drain lines and, if so, what will be the pumping requirement.
The Flownex® system model is furthermore used for calculating supply pumping capacity and sump sizing with accompanying oil levels.

- Calculate two-phase pressure drop
- Supply pump and scavenge pump integration
- Determine oil sump size and oil level
- Flow through labyrinth seals
- Bearing housing
- Air vent



GAS TURBINE INTEGRATED SYSTEM ANALYSIS

- Applicable to both industrial and aero-derivative turbine systems.
- Perform power matching.
- Simulate transient events such as start-up or load change.
- Calculate surge margins for compressors.
- Determine heat-exchanger performance.
- Expansion thrust calculation.
- Multiple shafts speeds using a gearbox connection.
- Integrate with auxiliary systems.

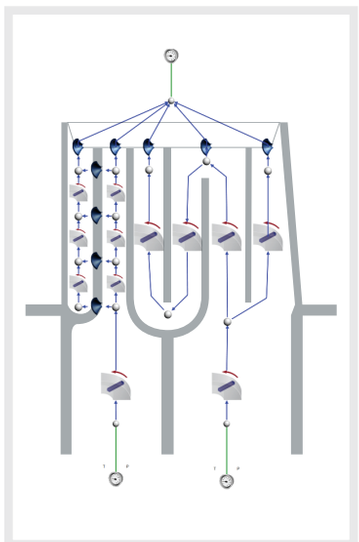


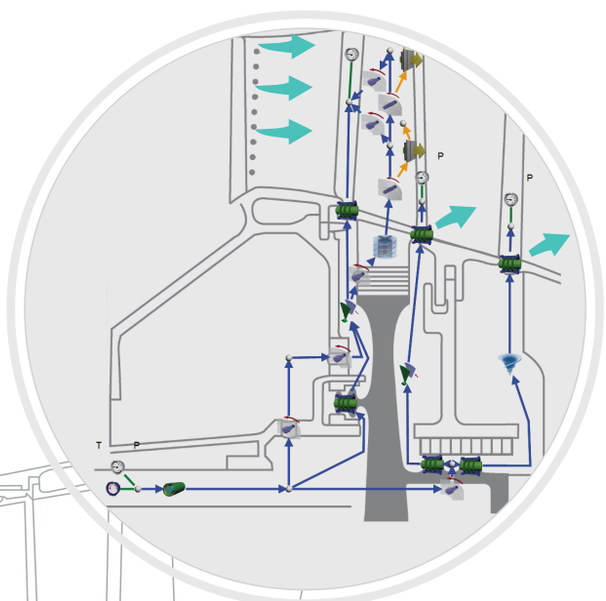
See more at enginsoftusa.com/flownex-CFD.html

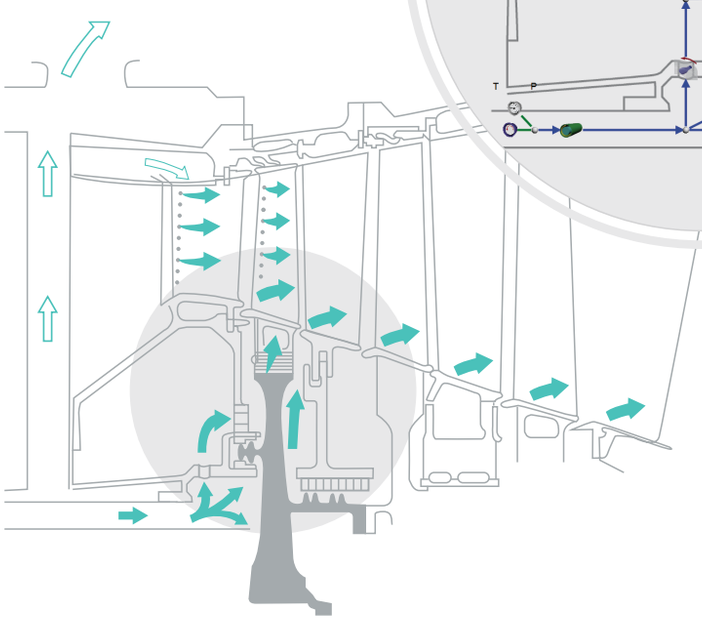
SECONDARY & COOLANT FLOW

Internal cooling system pressure, flow rate, power and heat transfer distribution for ensuring effective film cooling on hot surfaces.

- Swirl calculation through integrated swirl solver.
- Labyrinth seal pressure drop calculation.
- Rotor-Rotor pressure differential and power transfer calculation.
- Rotor-Stator pressure differential and power transfer calculation.
- Free vortex pressure differential and power transfer calculation.
- Forced vortex pressure differential and power transfer calculation.
- Rotating nozzle pressure differential and power transfer calculation.
- Rotating channel pressure differential and power transfer calculation.
- Convection heat transfer between solids and cooling air.

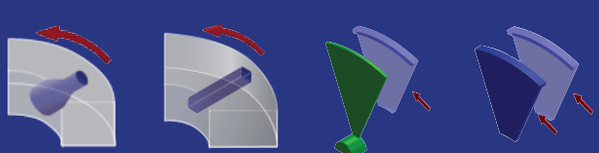






Flownex® includes a comprehensive rotating component flow library for analyzing the coolant rotational flow field inside the gas turbine engine, also referred to as the secondary air system. The Flownex® flow network approach leads to much faster and more cost-effective baseline designs for these systems since the number of expensive, detailed simulations are minimized.

FLOWNEX® COMPONENTS FOR TURBINE USE



SOME FLOWNEX® LICENSE HOLDERS

BLADON JETS

Rolls-Royce

Solar Turbines
A Caterpillar Company

See more at enginsoftusa.com/flownex-CFD.html