FLOWNEX®
SIMULATION ENVIRONMENT **GAS TURBINES**

Flownex SE is an industry leader system modelling tool for the design and analysis of turbomachinery systems, subsystems and auxiliaries.

APPLICATION AREAS

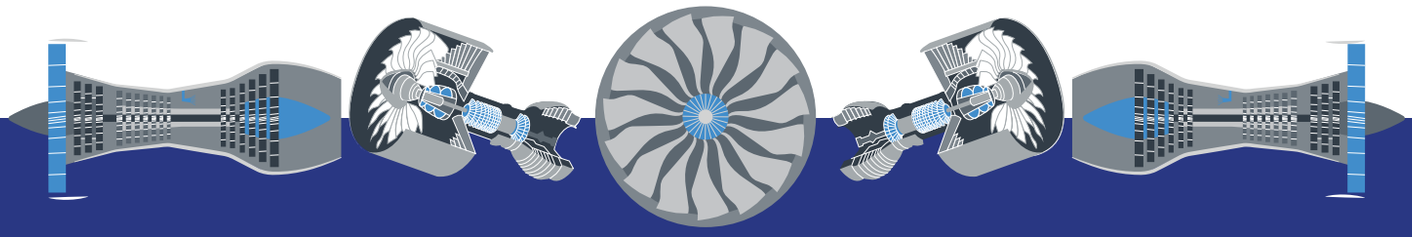
Flownex® SE provides turbomachinery engineers with an easy to use, off-the-shelf tool for modelling combustion chambers, secondary air systems, blade cooling flows, lubrication systems with oil-air mixtures, as well as overall cycle integration and operation.

KEY BENEFITS

A powerful graphical user interface coupled with a fast and robust solver based on fundamental principles of flow, heat transfer and rotation, enables turbomachinery systems to be rapidly prototyped, leading to significant cost-savings.

BRINGING NUCLEAR QUALITY AND STANDARDS TO SYSTEM SIMULATION

Flownex® is developed within an ISO 9001:2015 quality management system that is also ASME NQA-1 compliant.



> Flownex is able to accurately predict flow and heat transfer in secondary air systems, whilst reducing model setup and execution time substantially compared with 3D CFD.

LUFTHANSA TECHNIK AG
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Performance & Design Engineer

PADT

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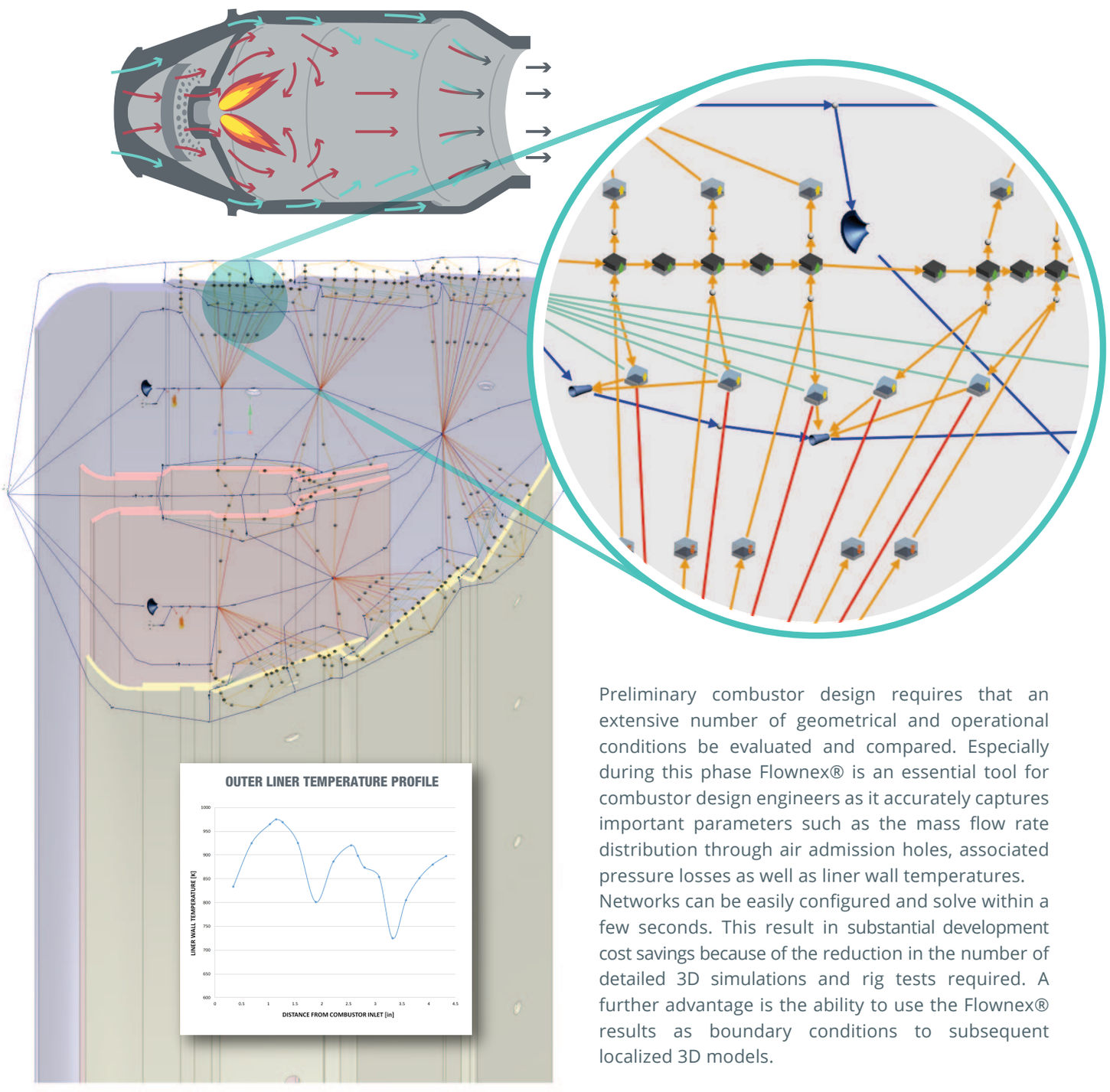
COMBUSTION CHAMBER

Flownex allows 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.

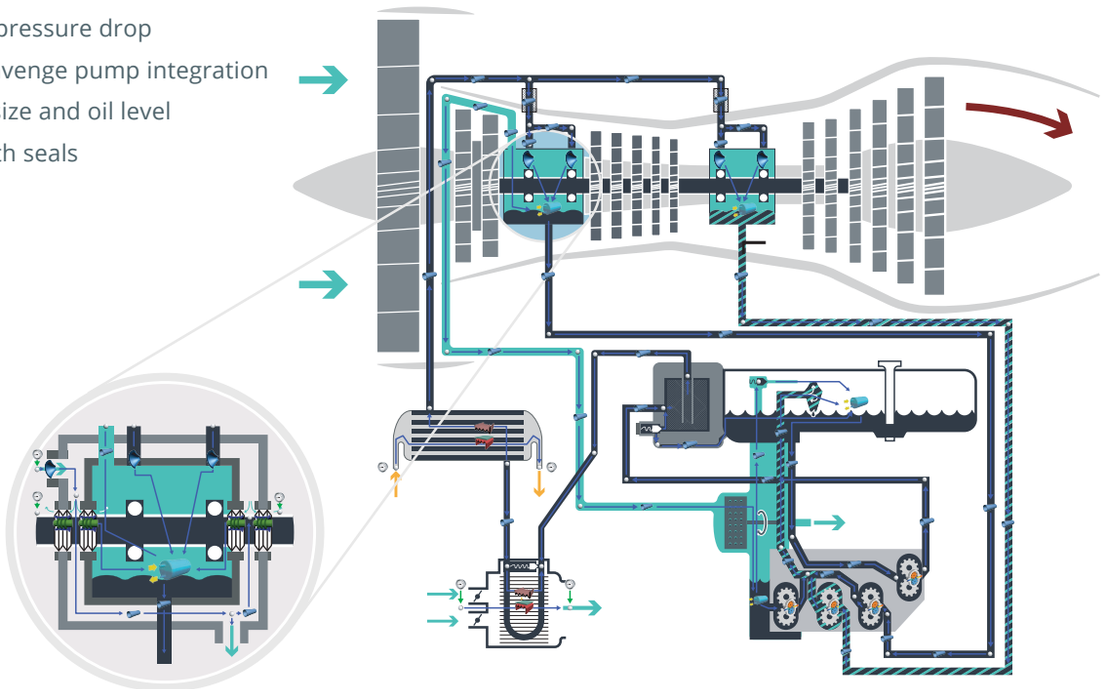


Preliminary combustor design requires that an extensive number of geometrical and operational conditions be evaluated and compared. Especially during this phase Flownex® is an essential tool for combustor design engineers as it accurately captures important parameters such as the mass flow rate distribution 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.

GAS TURBINE & LUBRICATION SYSTEM

A Flownex® model of the lubrication systems 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 engineers are able to determine whether or not scavenge pumps are required for fluid transportation in the drain lines and, if so, determine the pumping requirement.
The Flownex® system model is furthermore used for calculating supply pumping capacity and sump sizing with accompanying oil levels.

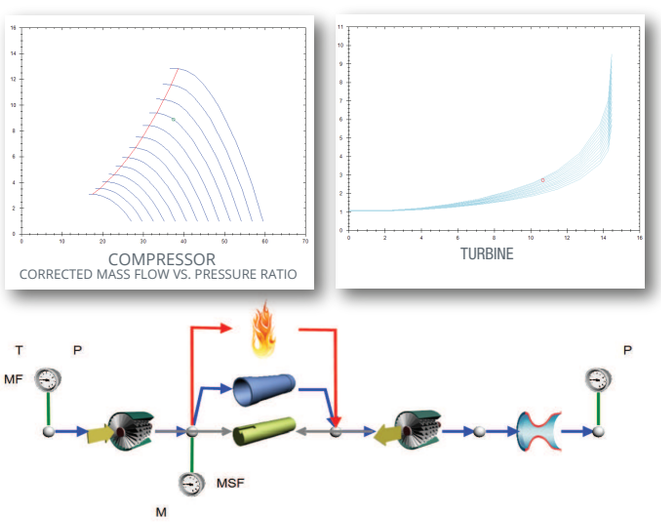
- Calculate two-phase pressure drop
- Supply pump and scavenge pump integration
- Determine oil sump size and oil level
- Flow through labyrinth seals
- Bearing housing
- Air vent



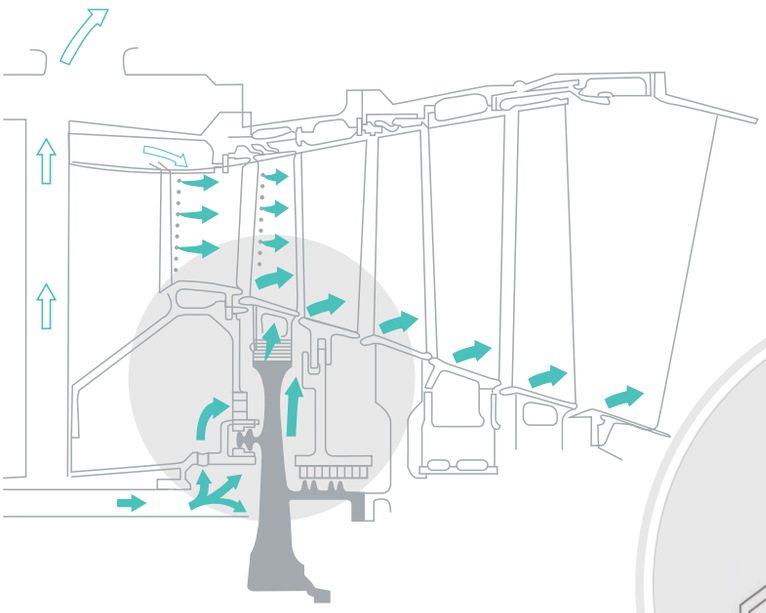
GAS TURBINE INTEGRATED SYSTEM ANALYSIS

Flownex® makes it easy to perform integrated cycle simulation.

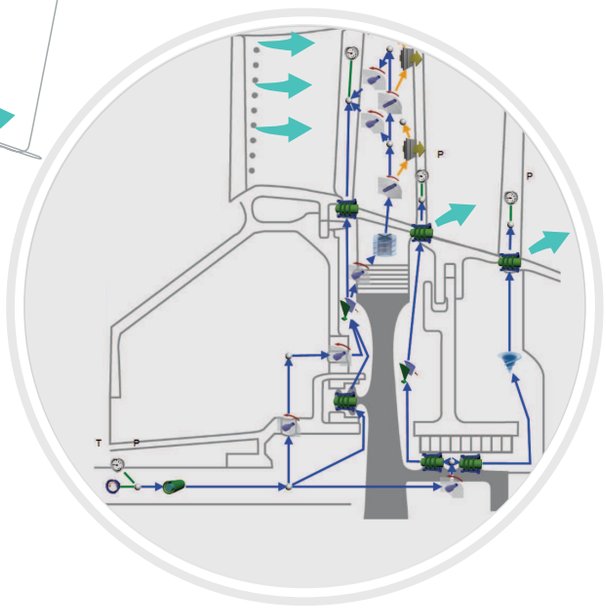
- Applicable to both industrial and aero-derivative turbine systems.
- Perform power matching.
- Simulate transient events such as start-up or load change.
- Calculate surge margins for compressors.
- Determine heat-exchanger performance.
- Expansion thrust calculation.
- Multiple shafts speeds using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



SECONDARY & COOLANT FLOW



Model internal cooling system pressure, flow rate, power and heat transfer distribution with Flownex® to ensure effective film cooling on hot surfaces.

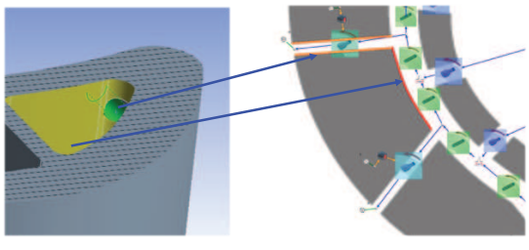


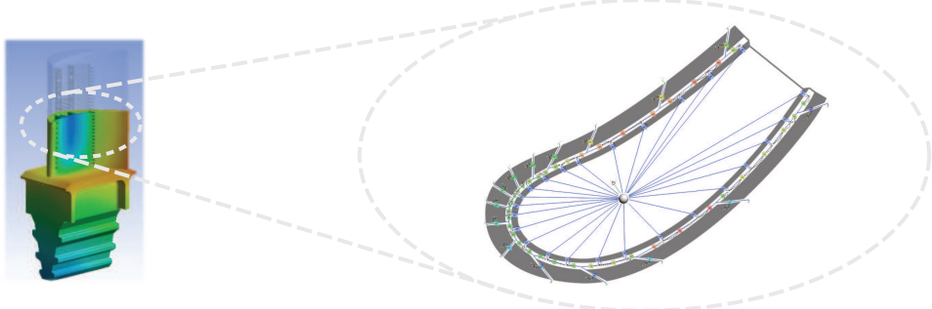
Flownex® includes a comprehensive rotating component flow library for analyzing the coolant rotational flow field inside the gas turbine engine, also referred to as the secondary air system. The Flownex® flow network approach leads to much faster and more cost- effective baseline designs for these systems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

BLADE COOLING

Perform coupled 1D flow and 3D heat transfer using ANSYS Mechanical coupling which forms part of the co-simulation offering in Flownex®.

Industry standard pressure drop and heat transfer correlations for turbulator strips and pedestals.





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Solar Turbines A Caterpillar Company

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