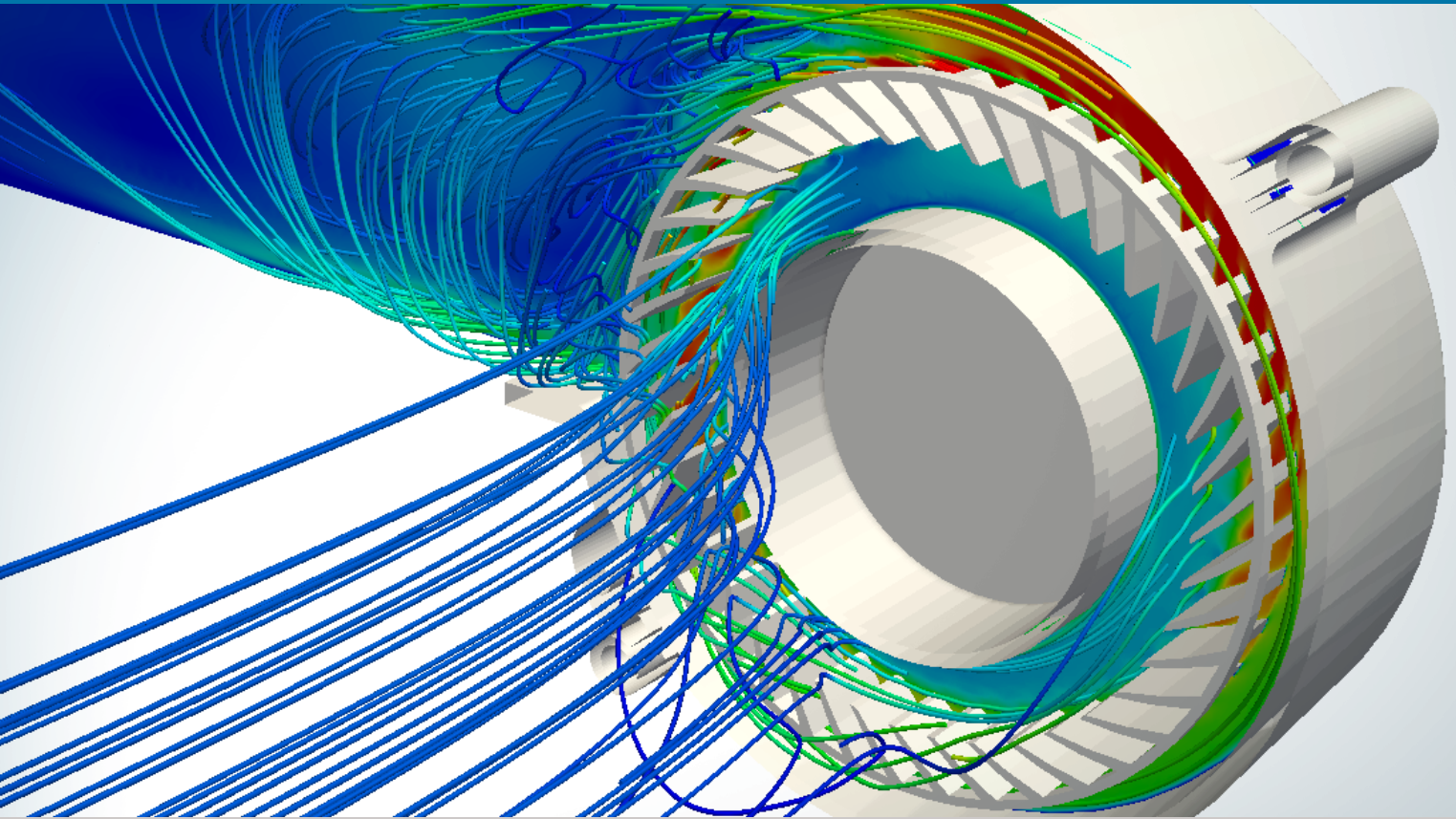


TURBOMACHINERY, PROPELLERS AND PUMPS



Cloud-native high-fidelity CFD, structural and thermal (FEA) simulation tools for pumps, fans, blowers, turbines, propeller and other turbomachinery applications.



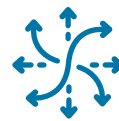
FAST

Cloud-native CFD solution speeds up to 100x traditional CAE tools. Parallelized parameterization enabling fast design iterations with automated performance curve generation.



ACCURATE

Meets and even exceeds the accuracy of traditional CAE simulation tools. Speed doesn't compromise accuracy — Benchmarks have achieved 2-3% accuracy within minutes.



VERSATILE

Fluid dynamics, thermal and structural physics simulation all on the same platform, enabling turbomachinery engineers to investigate flow, rotordynamics and heat transfer.



AUTOMATED

No manual set up of mesh interfaces for rotating parts. SimScale automates moving mesh interfaces, rotating region creation, workflow parity between different solvers, and more.

SIMSCALE TURBOMACHINERY, PROPELLERS AND PUMPS | CAPABILITIES

FLOW ANALYSIS

Incompressible

- Fluid flow (gas or liquid)
- $Mach < 0.3$ (100m/s)
- Negligible density variation
- Multiple frames of reference and transient analysis of rotating components
- Porous media
- Momentum sources
- Non-newtonian fluid modeling

Compressible

- Fluid flow (gas or liquid)
- $Mach > 0.3$ (100m/s)
- High speed flow
- Multiple frames of reference and transient analysis of rotating components
- Porous media

Multiphase

- Two fluids
- Fluid flow
- Incompressible / compressible
- Multiple reference frame and transient analysis of rotating regions

Subsonic

- Incompressible / Compressible CFD
- Turbulent / laminar flow
- Subsonic / Transonic / Hypersonic flow
- Ideal gas and real gas models
- Convective heat transfer
- Multiple reference frames and transient analysis of rotating components
- Internal/External CFD
- Cavitation

Convective Heat Transfer

- Fluid
- Temperature Distribution
- Heat Flux
- Multiple reference frames and transient analysis of rotating components
- Porous media
- Power sources
- Momentum sources
- Non-newtonian fluid modeling

STRUCTURAL & THERMAL ANALYSIS

Static

- Solid
- Steady Loads
- Linear
- Non-Linear
- Snap-fit
- Automatic Contact
- Nonlinear Contact
- Friction
- Large Strains
- Elasto-plasticity
- Hyperelasticity

Dynamic

- Solid
- Linear
- Non Linear
- Drop-Test
- Shock
- Material Damping

Thermomechanical

- Solid
- Temperature
- Heat Flux
- Thermal Stress
- Thermal Expansion
- Thermomechanical Fatigue
- Interference-fit
- Thermal Shock
- Bolt preload

Frequency (Modal) Analysis

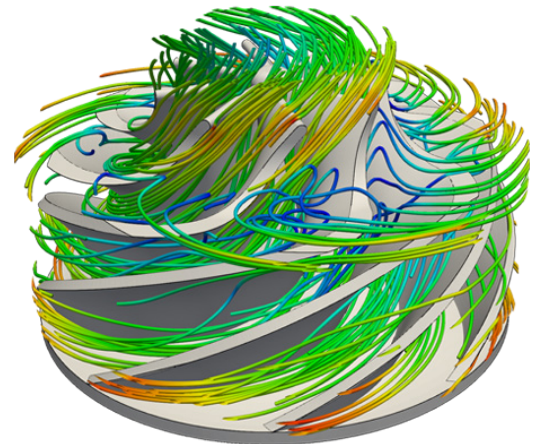
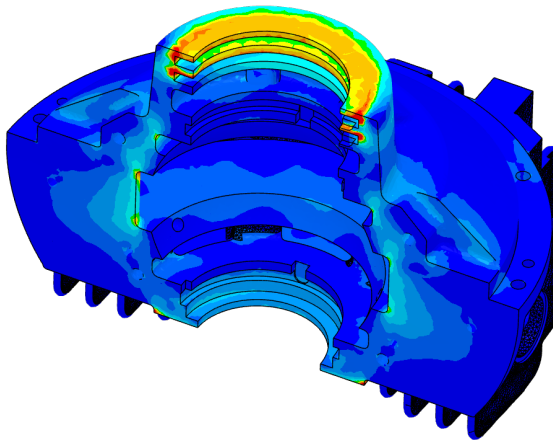
- Solid
- Frequencies
- Eigenfrequencies
- Eigenmodes
- Bolt preload
- Prestress for rotating parts

Harmonic Analysis

- Solid
- Periodic/Cyclic/Sinusoidal Loads
- Forced Vibration
- Shaker Table Test
- Frequency Response
- Damping

CONNECTIVITY (API INTEGRATIONS)

The SimScale API enables easy integration with your preferred CAD, simulation pre & post processing and workflow tools, such as Esteco's modeFrontier and VOLTA enabling sophisticated parametric optimization loops.



SIMSCALE TURBOMACHINERY, PROPELLERS AND PUMPS | FEATURES

PRE-PROCESSING

CAD Compatibility

- 3D Systems® STL
- Autodesk Inventor®
- Dassault Systèmes® ACIS®
- Dassault Systèmes CATIA™
- Dassault Systèmes SolidWorks®
- IGES
- PTC® Creo®
- Rhinoceros®
- Siemens® NX™
- Siemens Parasolid®
- Siemens Solid Edge®
- STEP

CAD Plugins

- SimScale Connector App for PTC Onshape®
- SimScale plugin for Solidworks®
- SimScale Integration for Autodesk® Fusion 360™

CAD Mode

A dedicated environment to interact with your CAD model, delete, extrude, or scale CAD parts, and perform CAD-related operations directly within the platform. Operations are being added continuously, currently includes:

- Edit
- Create - Flow Volume-Internal
- Create - Flow Volume-External
- Close sheet
- Boolean
- Transform
- Simplify
- Fix Interferences
- Tools - Gaps
- Tools - Interferences
- Export

Meshing Tools

Current meshing strategies available on the platform are:

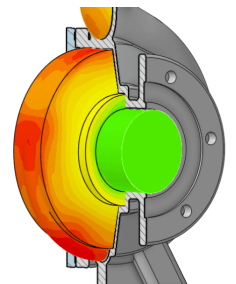
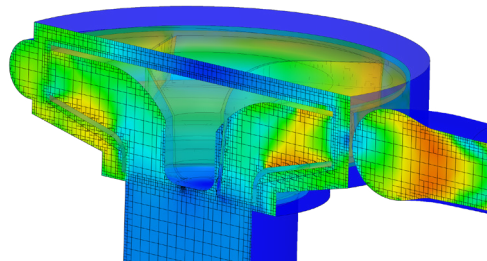
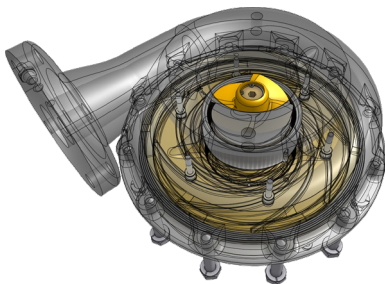
- Standard
- Hex-dominant
- Hex-dominant parametric
- Meshing for subsonic analysis type

Materials Library

Default materials include both solids and fluids according to the analysis type selected or define your own custom material.

Advanced concepts

SimScale allows its users to model advanced flow characteristics, like rotating zones or porous media, which would otherwise require sophisticated geometries or large meshes leading to expensive simulations.



SIMULATION

Cloud Native Solvers

Individual runs can access up to 96 CPU cores. Run as many simulations in parallel as desired, while continuing to work. That's the power of the cloud.

Collaboration

Share projects with other users, within or outside an organization, and also with the SimScale support team.

Create shareable simulation templates for repetitive analysis.

Solver Numerics

All numerical settings are made available for users to have full control over the simulation. These settings can be found for Fluid Dynamics (OpenFOAM®), Subsonic (Simerics®) and Solid Mechanics (Code_Aster®) analysis types.

POST-PROCESSING

Visualization

SimScale's integrated post-processor offers 3D visualization of the result fields.

- Statistics and Inspect Point
- Visualization and Selection Modes
- Cutting Plane
- Iso Surface and Iso Volume
- Particle Trace
- Animation
- Field Calculator (Beta)
- Custom Camera Position

Data/results can also be exported in open formats (*.CSV) for further post processing in third party tools & export of animations in MP4 format.

