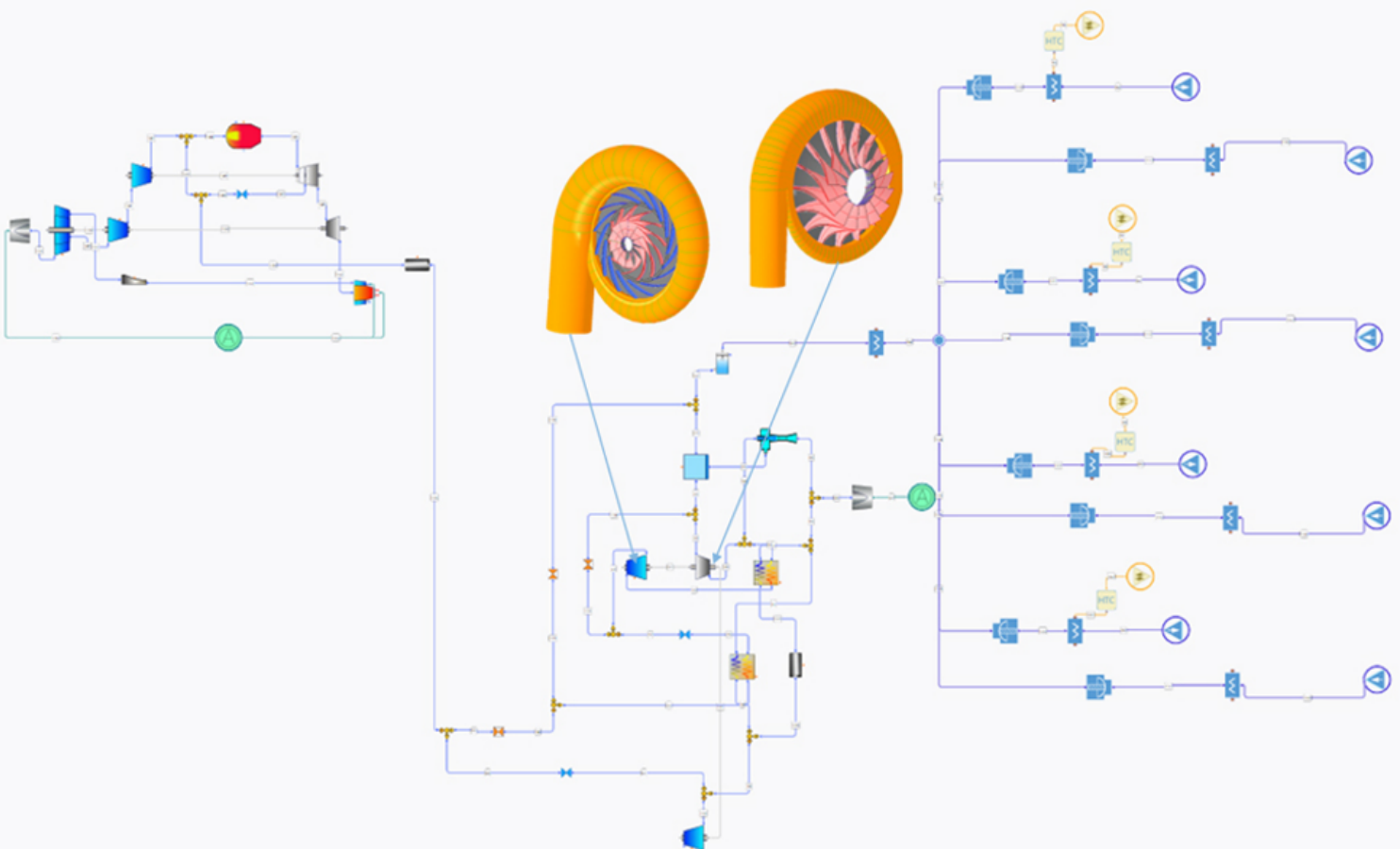


Holistic Multi-Fidelity Thermal-Fluid System Modeling & Analysis

xSTREAM SYSTEM SIMULATION

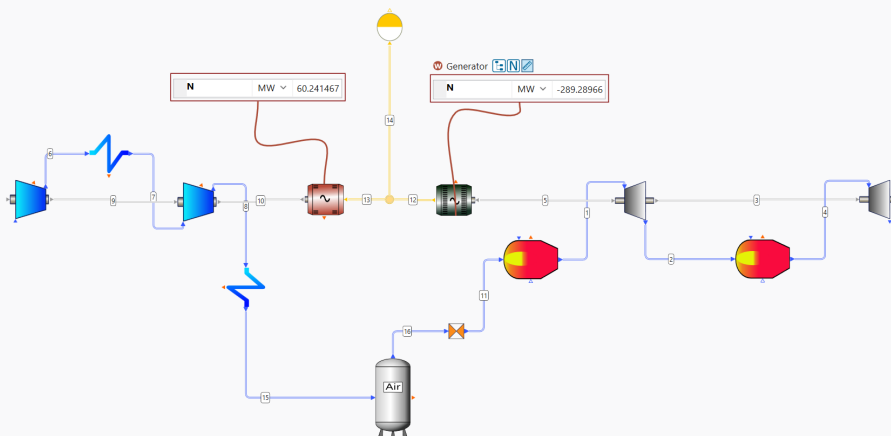
Seamless Integration, Faster Result, Better Engineering



Simplifying the Complexity of System Level Engineering Through Coupled 0D & 1D Simulation

AxSTREAM System Simulation

Developed by engineers, for engineers, AxSTREAM System Simulation™ is a modeling software designed to integrate thermodynamic cycles and thermal-fluid networks within a single platform. Its flexible drag-and-drop component library allows users to design and analyze energy and propulsion systems in both steady-state and transient conditions.



How you can utilize AxSTREAM System Simulation:

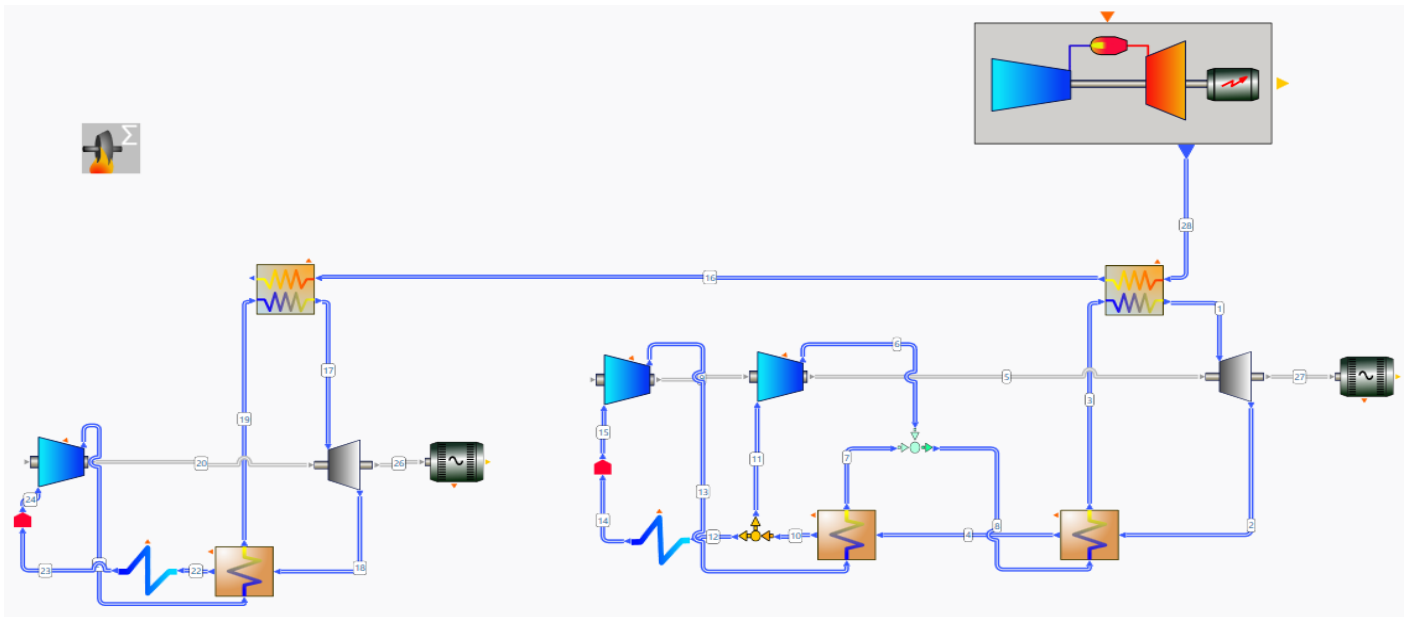
- Design, model, and explore new energy conversion systems including propulsion, HVAC, refrigeration, power generation, etc., as well as related auxiliary systems
- Evaluate different cycle architectures and analyze the performance of off-the-shelf products.
- Optimize existing equipment (including engines and power plants) accounting for all affected technologies in one interface.
- Run parametric studies to rapidly iterate and optimize new and existing technology for peak performance.

Transforming Product Development Through Advanced Simulation

Leverage AxSTREAM System Simulation to drive innovation without compromising on speed or quality

Overhaul your designs with AxSTREAM

- Run steady-state and transient calculations, enabling a more practical understanding of system performance under real-world conditions.
- Various fidelity levels are available, ranging from basic 0D to advanced 1D tubular heat exchangers and detailed components, enabling flexible modeling from simple pumps to complex piping configurations for comprehensive system analysis and optimization.
- Integrate system-level modeling with other software through co-simulation for a comprehensive and holistic design approach.
- Customize components and parameters throughout the system via scripting (Python, C#, etc.) and tables, empowering users to create their own control logic.



Virtual Testbench:

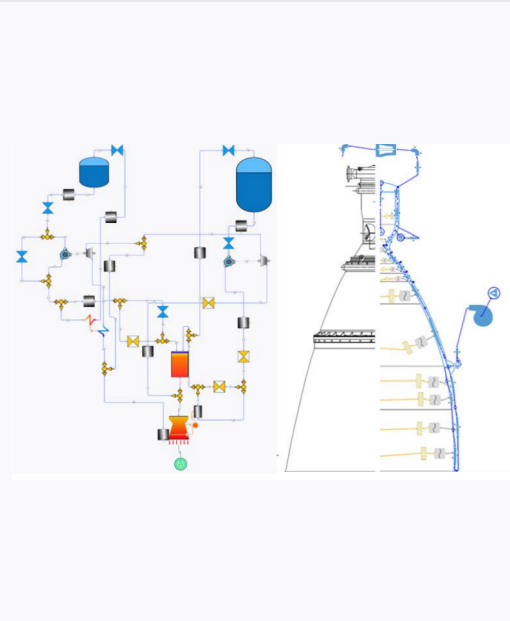
By empowering users to optimize their designs digitally with a seamless blend of steady-state and transient calculations, along with an extensive fluid library, AxSTREAM System Simulation serves as the ideal virtual testing ground for engineering teams, reducing the need for physical testing and unnecessary costs.

Digital Twin:

AxSTREAM System Simulation offers digital twin modeling capabilities by removing the interface and communication gaps between siloed software or sub-systems and teams through integrated 0D-1D reduced-order modeling of dependent multidisciplinary systems, eliminating challenges when multiple tools and models are required.

AxSTREAM System Simulation Use Cases:

Rocket Nozzle Cooling System Modeling



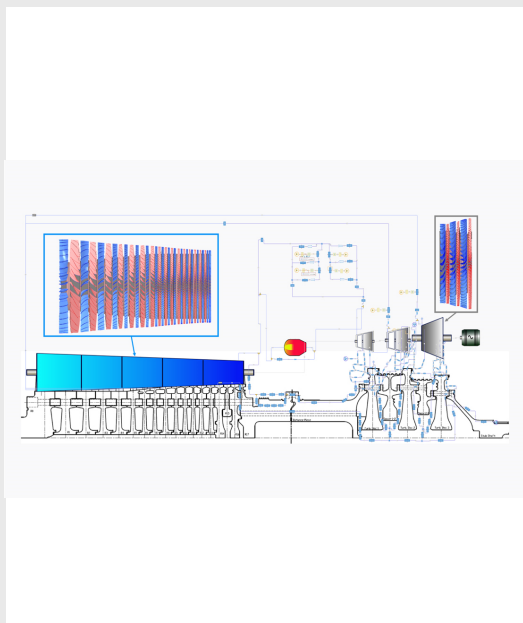
Objective: Model and optimize LRE's regeneratively cooled nozzle for modeling of complete propulsion and cooling system at full thrust and throttled conditions.

Challenge: Model wall temperature and heat transfer throughout nozzle cooling channels accounting for supercritical fluid properties and propellant phase change.

Solution: Coupling the 0D propulsion and 1D thermal-fluid systems into a single model allowed investigating and optimizing the rocket engine at different operating conditions.

Benefit: Accurately modeling the nozzle cooling system enabled precise boundary condition estimates for turbine design and detailed thermal and structural analysis of wall materials, enhancing overall system performance and reliability.

Gas Turbine Secondary Cooling Flow Path Modeling



Objective: Estimate pressure and velocity distributions, analyze swirl momentums, and evaluate heat transfer in complex secondary flow paths under specified boundary conditions.

Challenge: Design and verify complex secondary flow paths, considering flow resistance, pressure losses, and heat transfer coefficients.

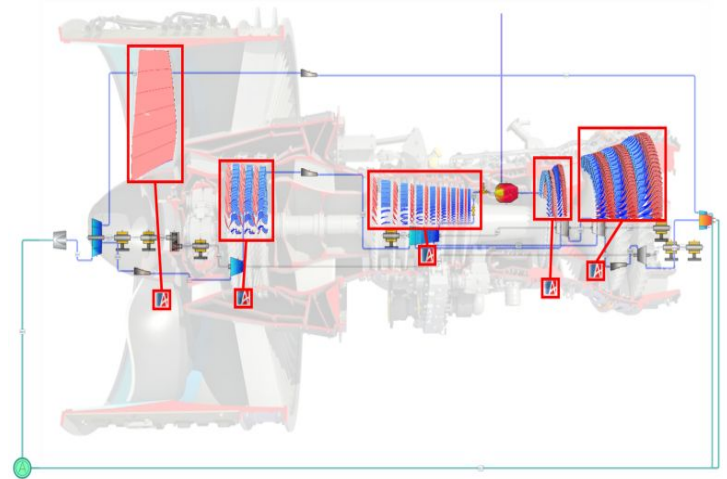
Solution: Employ a holistic approach integrating compressor and turbine design, stress prediction, and thermodynamic cycle modeling with automated iteration for optimizing cooling flow paths and thermal stress management across operational regimes.

Benefit: Accurate domain discretization predicts flow path pressures, temperatures, and velocities, while built-in criteria correlate heat transfer coefficients for turbine operational efficiency and performance, saving time and reducing development cost.

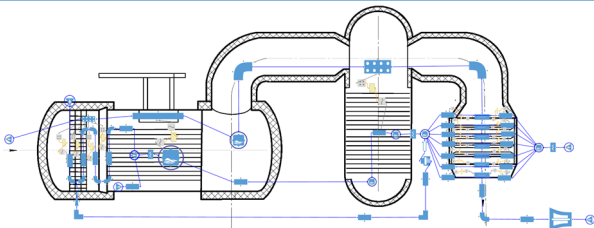
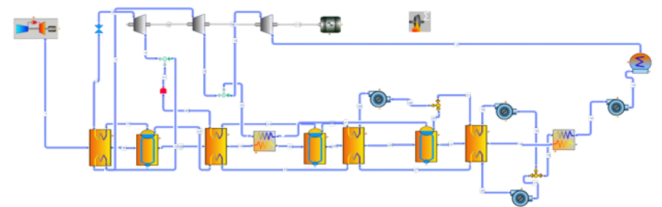
Gain a Competitive Edge With AxSTREAM System Simulation

The AxSTREAM Advantage:

- Intuitive interface for rapid learning and efficient workflow development
- Built-in tools for parametric studies, optimization, and design exploration
- Supports multidisciplinary modeling of turbomachinery and non-turbomachinery systems
- Flexible component, fluid, and material customization with external tool integration
- AI-assisted system creation and engineering workflow acceleration
- Backed by 100+ engineers and continuous enhancements driven by 750+ global customers



Maximize your scripting capabilities with AxSTREAM System Simulation. Leverage C#, Python, and more alongside tabular parameters for each component, combining the power of custom scripts with an intuitive graphic user interface, enhancing flexibility and ease of use



Skip the time-intensive 3D design process and explore a wide range of 1D designs with AxSTREAM System Simulation. By leveraging these features, engineers can achieve faster design iterations, reduce development costs, and accelerate time-to-market.

" AxSTREAM System Simulation is a fantastic tool for thermodynamic cycle modeling. It allows me to optimize efficiency by examining various inputs while ensuring compatibility between our thermal input and power conversion system. The simple interface, built-in fluid library, custom variables, and multi-run tools make it easy to model, analyze, and maximize cycle efficiency. "

Skyler Allen, Mechanical Engineer
Flibe Energy Inc.

Understanding Dynamic System Behavior Through Advanced Calculations

Take your machine performance to the next level with AxSTREAM System Simulation's transient calculations

Transient Calculations

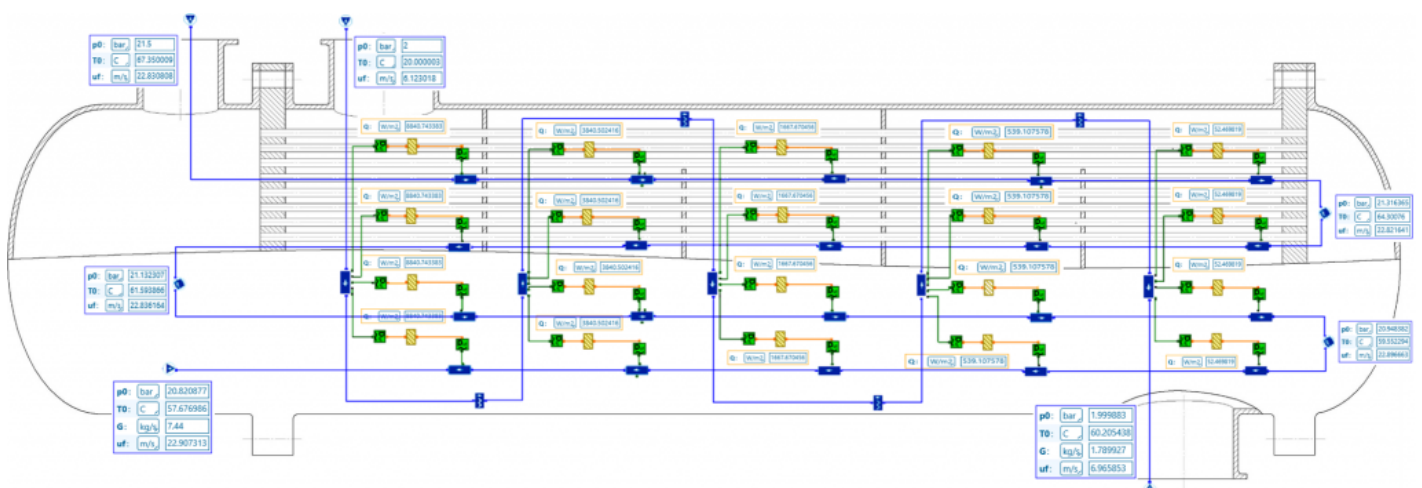
AxSTREAM System Simulation provides comprehensive insights into the dynamic responses of turbomachinery, energy conversion, and propulsion technology systems.

Engineers leverage advanced full transient solvers to assess real-time system behavior, crucial for design, safety, and stability in applications ranging from rocket engines and small modular reactors (SMRs) to energy storage systems and cooled gas turbines.

The software supports detailed studies on system responses to external inputs, facilitating optimization of performance and operational efficiency across diverse applications.

"For the past four years, over 250 students at ECPI University have benefited from the AxSTREAM System Simulation software to deepen their understanding of basic thermodynamic cycles, including Rankine, Refrigeration, and Brayton cycles. They learn how to create combined cycles to enhance overall system efficiency and performance. AxSTREAM System Simulation provides students with hands-on experience assembling thermal and fluid equipment components, such as pumps, turbines, compressors, and heat exchangers, into operating systems. They can then observe the system's behavior and see how changes to the system's design, such as boiler temperature or pump pressure, affect its overall performance."

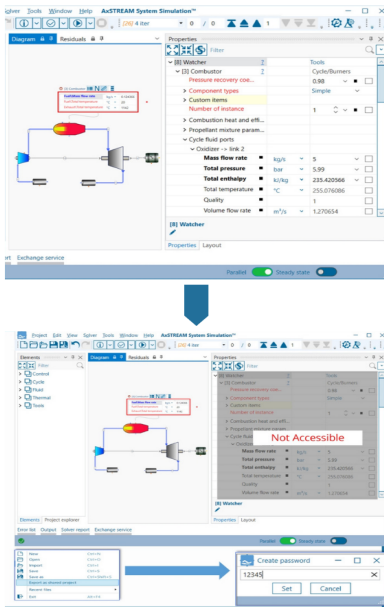
Dr. Bryan Lewis
Adjunct Faculty
ECPI University



Practical System Design & Intelligent Simulation

Build, analyze, and share engineering models faster with AI-assisted workflows and secure collaboration tools

AxSTREAM Twin



AxSTREAM Twin enables you to securely share engineering models while maintaining full control over your intellectual property.

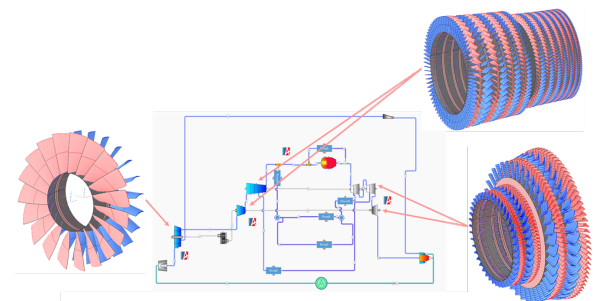
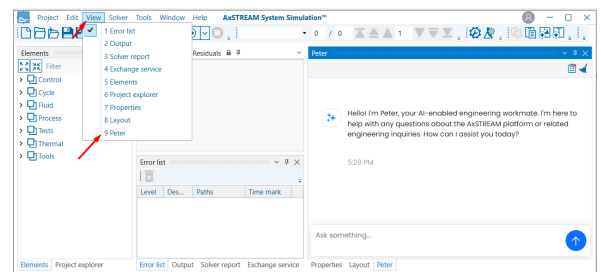
- Share interactive engineering schemes with partners, customers, trainees, and third-party evaluators
- Enable calculations and analyses while restricting what users can modify
- Expose only selected parameters through Watcher components
- Protect model structure, components, and connections from editing
- Secure files with password protection and the dedicated .axns format
- Control exactly what is shared and what remains proprietary

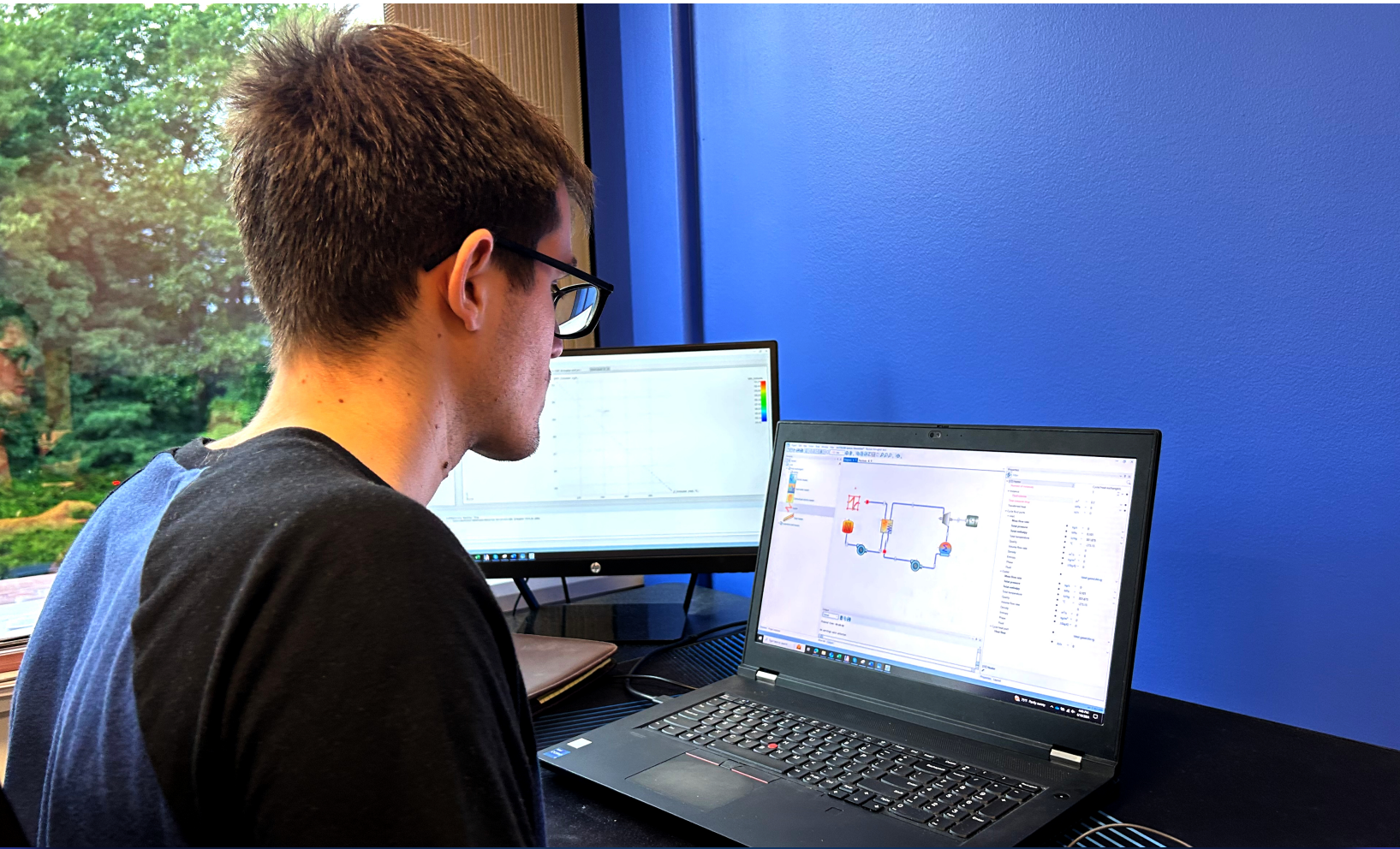
Peter - Design Intelligence

Peter is an AI assistant built directly into AxSTREAM System Simulation, helping both new and experienced users work more efficiently. With Peter, users can:

- Create engineering schemes from plain-language descriptions
- Learn how components should be connected
- Discover relevant sample projects as starting points
- Accelerate model setup and simulation workflows
- Receive recommendations for component & system layouts

Rather than replacing engineering judgment, Peter acts as a smart co-pilot—explaining its recommendations so users can make informed decisions and achieve accurate simulation results faster.





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