



# Turbomachinery Mastered

Design and analysis of turbomachinery



SOFTWARE PLATFORM

design. analyze. optimize.

[www.softinway.com](http://www.softinway.com)

# Software Platform



Radically reduce  
engineering design  
cycle times and  
design iterations with  
a single software  
platform!

The premier software platform for multidisciplinary design, analysis and optimization provides an integrated and streamlined approach to turbomachinery design. This world class software solution encompasses the complete process of conceptual design for radial, axial and mixed flow turbomachinery: turbines, compressors, pumps, fans, rotors, bearings, and blowers.

AxSTREAM® has a preliminary design procedure that is used to create machines from scratch, using a set of boundary conditions, geometrical parameters and taking into account your specified constraints. With this information, AxSTREAM® performs the inverse and direct 1D analysis, 2D axisymmetric analysis, cascade profiling, 3D stress and modal analysis (FEA), 3D CFD analysis, rotor design, bearing analysis, and rotor dynamics.

AxSTREAM® is the perfect tool to design, redesign, analyze, and optimize your turbomachinery. AxSTREAM® simplifies the design of new machines from scratch, and streamlines the design and analysis of existing machines and their performance and provides redesign solutions to optimize and upgrade existing machines. AxSTREAM® provides a full design and analysis solution for turbomachinery in a flexible and integrated environment that works with **compressible** and **incompressible** fluids.

In addition to AxSTREAM, SoftInWay is also a Siemens Channel Partner, providing STAR-CCM+, NX CAD and Simcenter 3D for complete digital twin capabilities.

New project creation

**AxSTREAM**

Preliminary Design  
 Existing Design Analysis

Number of modules: 1

Working fluid: Liquid Oxygen

cp spec.	1666.90	density	1103.75
heat		viscosity	1.45e-00
Temperature	106.000		

New project creation

Preliminary Design  
 Existing Design Analysis

Number of modules: 1

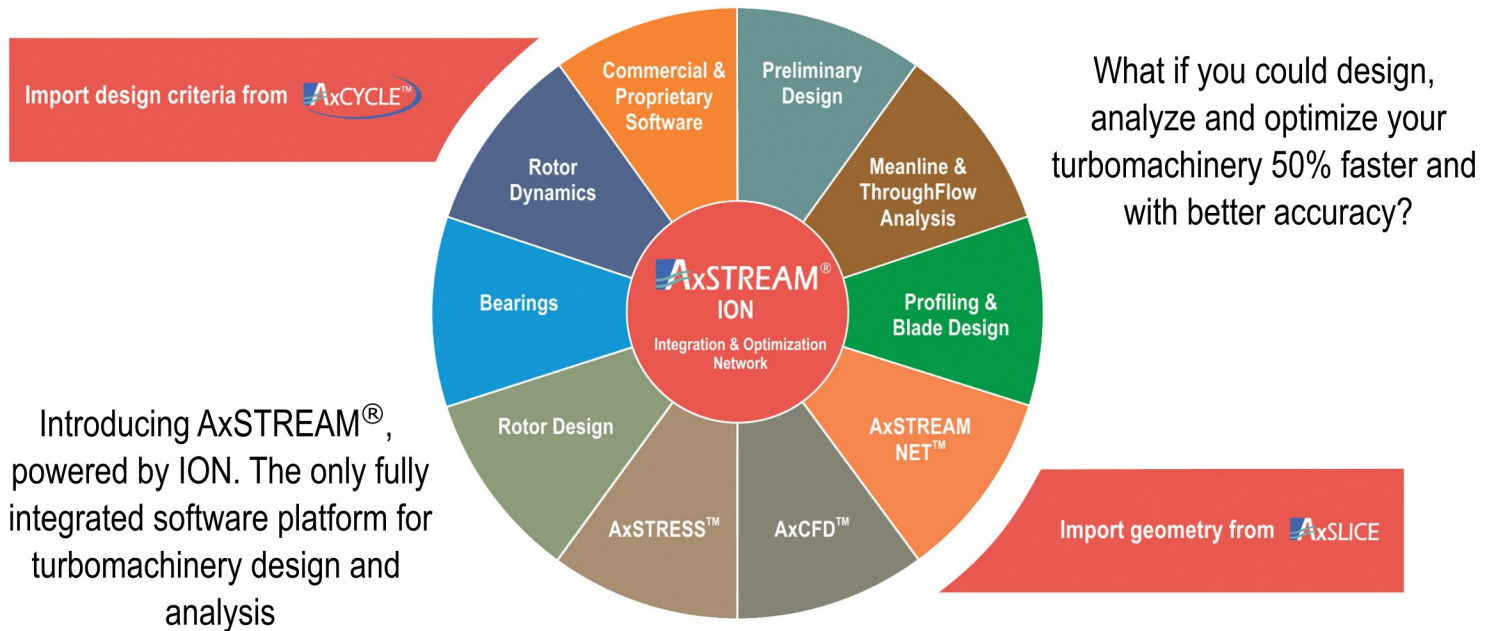
Working fluid: AxS Ideal Gas

isentropic exponent	1.4	gas constant	53.4354
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Set loss models... Set units ...

Click 'OK' to run preliminary design

OK Cancel



## What do we mean by integrated?

AxSTREAM® consists of modules that work together in an integrated design approach. Each module inside AxSTREAM® works from a central database, giving you a shortened and streamlined design experience that easily exchanges information between modules. Our architecture allows designers to perform different aspects of the design all in one convenient, integrated environment, which ultimately saves on engineering hours without sacrificing accuracy.

## AxSTREAM® Licensing

A flexible licensing system allows the customer to choose the appropriate set of modules. AxSTREAM® comes as either a single seat (attached to defined PC) or a floating license which can operate from a server on multiple computers.

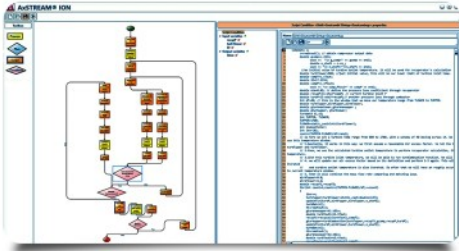
## Loss Models for Turbines, Compressors and Pumps:

AxSTREAM® has loadable, customizable and industry-standard loss models that include profile, transient, blockage and secondary losses as well as deviation angles for axial and radial turbines, compressors and pumps.

Some common loss models include Craig & Cox, Kacker & Okapuu, Wright-Miller and Mitrohin-Stepanov. Users can also incorporate their own, personalized loss-models or benefit from the ones developed by SoftInWay.

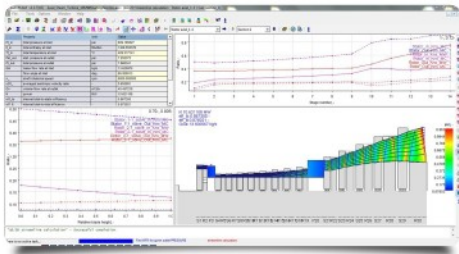
For pumps, important characteristics such as NPSHR, cavitation specific speed and cavitation suction lift are taken into account early on in the design process.





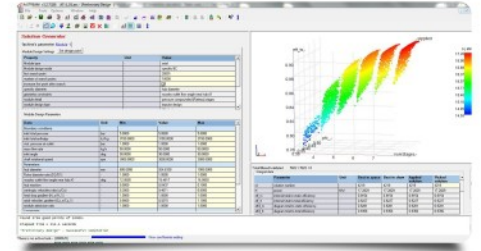
## Preliminary Design

Create machine flow path design from scratch or redesign partial or complete machines using a set of boundary conditions, geometrical parameters and specified constraints. Designers can generate a large amount of designs in a short time with our unique inverse solver. Each solution can be explored in the Design Space Explorer, where you can select and review appropriate solutions by specifying different types of constraints and limitations.



## ION

Optimize and structure tasks to accelerate the overall design process utilizing AxSTREAM ION. In addition to facilitating rapid design, this module permits the user to input their own personal criteria and modeling rules for intuitive use. ION also enables the integration of both commercial and in-house software systems for multi-criteria and multi-parameter optimization tasks & off-design studies.

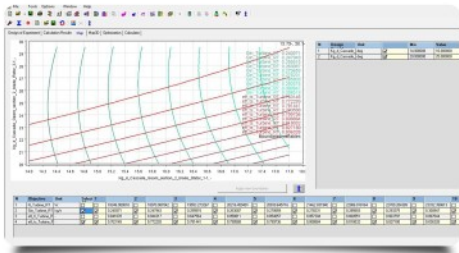
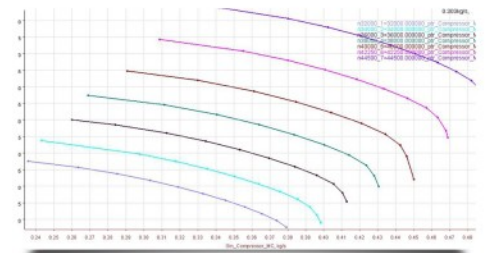


## Meanline / Streamline Analysis

Perform meanline (1D), streamline (2D), or full streamline (FSC) calculations of the machine while taking into account a machine's geometry and boundary conditions. In addition to the existing loss and leakages models, you can add your own! Distribution of parameters can be visualized as colorful contours. At this stage it's possible to edit axial and radial dimensions and clearances, and much more.

## AxMAP

This module uses the streamline solver for the purpose of developing automatic generation of performance maps as well as study the influence of operational conditions and geometry variations on the performance. Each file can store existing experimental data to compare with calculation results.

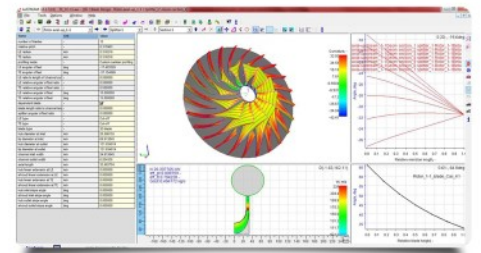


## AxPLAN

Using the streamline solver, this module can be run in meanline or streamline task formulation. It is the main optimization tool at the last phase of flow path design. The AxPLAN module allows the performance of various design tasks, utilizing fast Design of Experiment (DoE) study methods.

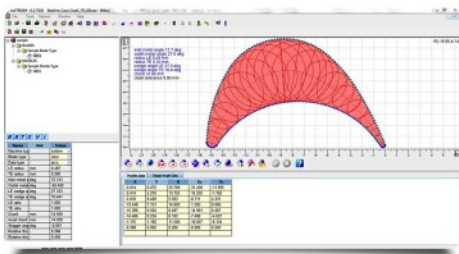
## Profiling and 3D Blade Design

This module is used to create and edit 3D airfoils. The wide range of geometrical tools and interactive charts allows you to configure the blades easily and in a short time for each spanwise section before proceeding to their stacking by changing sets of profile parameters like inlet and outlet angles, wedge angles, edge radii, lean, sweep, etc. Users can also utilize the export module to export 3D blade geometry in various CAD, FEA and CFD formats including IGES and STL.



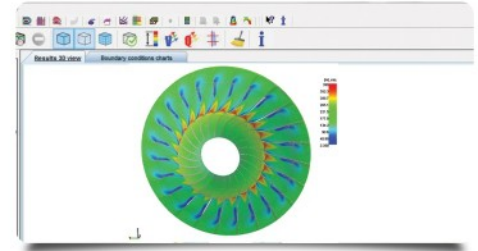
## ATLAS

This system stores blade profiles that are standard for company practice, designed within AxSTREAM® and/or taken from the 140+ industry-approved steam and gas turbine profiles we provide. Profile creation and editing in ATLAS is flexible thanks to points, arcs or thickness distribution definition. Standard profiles can be inserted in the ATLAS module and then used in different projects and shared across a company network.



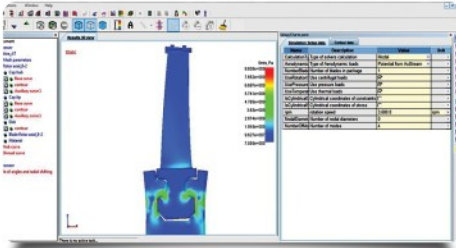
AxCFD

Perform 2D (Cascade CFD and axisymmetric ) as well as 3D flow analysis in blade-to-blade channels using CFD formulation (Navier-Stokes, viscous with various turbulence models (standard k-ε, k-ε RNG, k-ω, k-ω SST models)). CFD can be calculated for individual rows, for a stage or for an entire machine! Results are the values of flow rate, efficiency, kinematic, and thermodynamic parameters distribution. All geometry data is automatically transferred from your AxSTREAM® project.



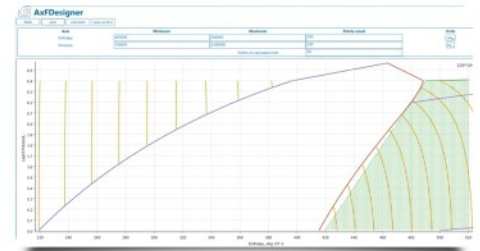
AxSTRESS

Perform express 3D Finite Element Analysis (static, modal, harmonic calculations) on blades and attachments (root, disk, shroud, lashing wire). Included are tools for automated, turbomachinery-specific mesh generation and results post-processing (including inside the object) as well as attachments creation and library. Seamless data transfer between the AxSTREAM® project and AxSTRESS™ is ensured for optimized iteration between aerodynamic and mechanical analyses through automatic inheriting of geometry and boundary conditions.



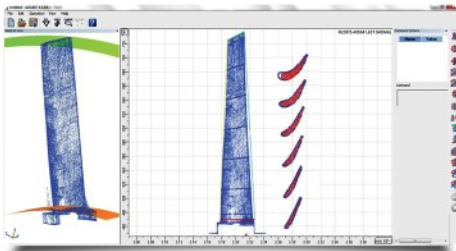
Fluid Tool Box

Utilize a combination of tools relating to fluid properties and calculations. The Fluid Calculator tools facilitate the calculation of thermodynamic properties of any AxSTREAM®-embedded or custom fluid. The Fluid Designer tools allow creation of custom fluid files to be used inside AxSTREAM® for any pure fluid, mixture, or combustion products of more than 1000 different fuels and oxidizers with chemical equilibrium considerations.



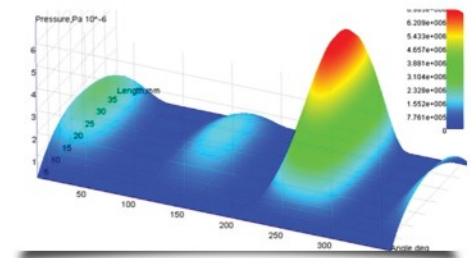
AxSLICE

Extract the profile geometry of 3D blade models using AxSLICE. This module uses 3D models in STL, IGES, and CURVE formats. AxSLICE also provides a special option for extracting profiles from “cloud of points” obtained with a laser 3D scan. Results of the extraction can be immediately loaded into the AxSTREAM® project for analysis and redesign tasks.



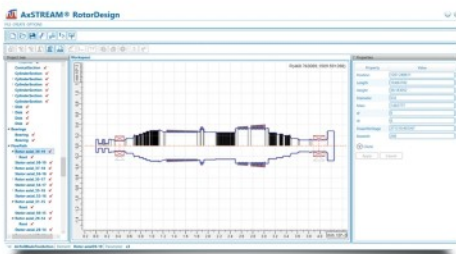
Bearing

Determine the performance and mechanical characteristics of radial (hydrodynamic, aero, and rolling element bearings) and thrust bearings. Bearing allows users to synthesize and analyze detailed models of bearings for different configurations by performing steady-state, stability, and map analysis. This module has a flexible geometry configurator to model features such as pockets, lobes, and oil supply channels.



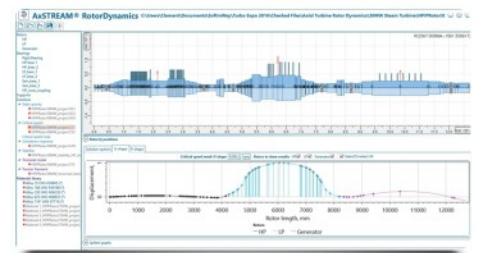
RotorDesign

The AxSTREAM RotorDesign tool allows users to import a new/existing/optimized flow path design from any AxSTREAM® project in order to design the rotor. The user can utilize the AxSTREAM 2D flowpath layout or a manual input of the blade axial and radial positions and mass-inertia characteristics. After the rotor design is complete, it can be utilized/processed for rotor dynamic simulation or can be exported to CAD software.



RotorDynamics

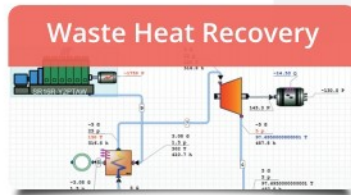
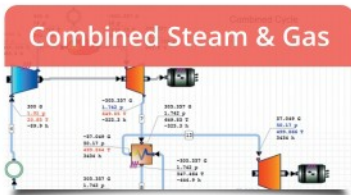
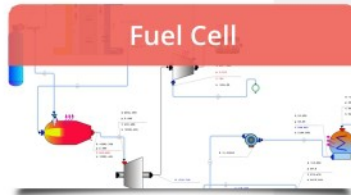
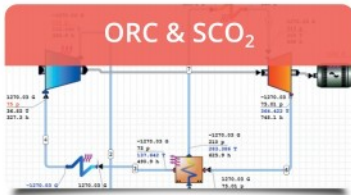
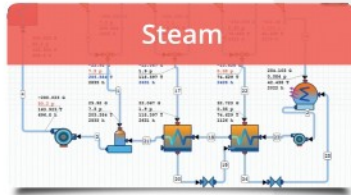
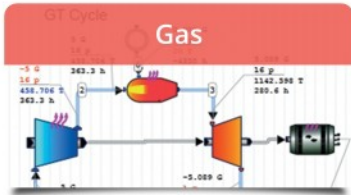
Applications of AxSTREAM RotorDynamics include different types of rotors that can be used in machines such as steam turbines, compressors, pumps, electric motors, generators, and more. AxSTREAM RotorDynamics can perform several types of analysis including static rotor deflection, lateral critical speeds, critical speed map, damped unbalance response, stability, and rotortrain torsional analysis, both modal and transient analyses.



# AxSTREAM System Simulation

Coupled 0D & 1D system modeling and analysis

## Simulate numerous types of cycles:



## Features

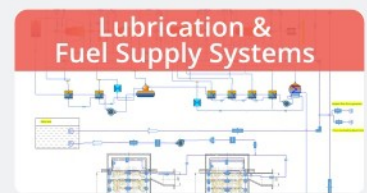
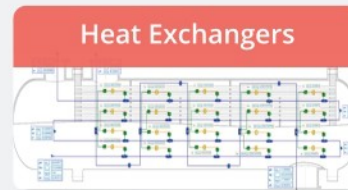
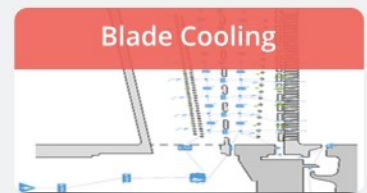
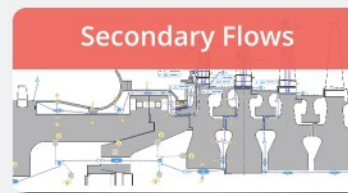
- Integrated propulsion and power generation systems with their auxiliary counterparts to create a holistic model encompassing all relevant components and subsystems
- Design, model, and explore new energy conversion systems
- Evaluate different cycle architectures and analyze the performance of new and off-the-shelf products
- Assess novel thermal-fluid systems through customization of fluids, components, and schemes
- Freeze components and sub-system geometries to study of-design conditions and transient operations
- Utilize library of embedded compressible and incompressible fluids, expandable through customization
- Seamlessly pass data to other software packages and perform multi-disciplinary optimization asks and parametric studies

## Study thermodynamic cycles and fluid system behavior in a flexible, user-friendly software interface

## Benefits

- Quickly evaluate different cycle architectures through conceptual phase
- Analyze existing systems where data is limited
- Intuitive drag and drop interface
- Embedded tool for parametric studies and optimization
- Flexibility of problem formulation
- Customization of components
- Steady-state and full transient capabilities
- Account for component performances including maps
- Reduce the need for costly physical prototypes and experimental testing
- No need for mechanical or geometric data

## Explore 1D thermal-fluid systems



# About SoftInWay

The Leaders in Turbomachinery Design and Optimization

## AxSTREAM® Training Workshops:



SoftInWay delivers software tools and industry training that enable you and your organization to be more effective. With our extensive curriculum from AxSTREAM® hands-on workshops to Waste Heat Recovery and Rotor Dynamics and Bearing Design courses, we cover the diverse training needs of our global turbomachinery customers through:

- Traditional classroom training
- Online courses
- Corporate learning programs
- Self-paced video courses

AxSTREAM® 3.9 Software Platform  
New Modules:  
AxSTREAM.AI™

Engineering Services

Education  
Classroom Workshops  
Online Courses  
Self-Paced Video Courses

SoftInWay, Inc. is a global R&D engineering company specializing in the development of efficient turbomachinery components and systems through its integrated and automated software platform, AxSTREAM® for all steps of the turbomachinery development process (including complete 3D design, thermodynamic cycles, rotor dynamics, and secondary flow and cooling system simulation). SoftInWay also offers a number of engineering services and educational courses, available both online and in a classroom-style setting

Being an ISO 9001:2015 and AS9100:2016 certified company, SoftInWay is committed to providing its customers with products and services that meet international quality standards.

With offices around the globe, SoftInWay supports more than 450 companies worldwide, and works closely with universities, research laboratories, and government organizations.

## Industries Served:

### Power Generation



### Oil & Gas



### Aerospace



### Clean Technology



### Government & Defense



### Appliances & Medical Devices

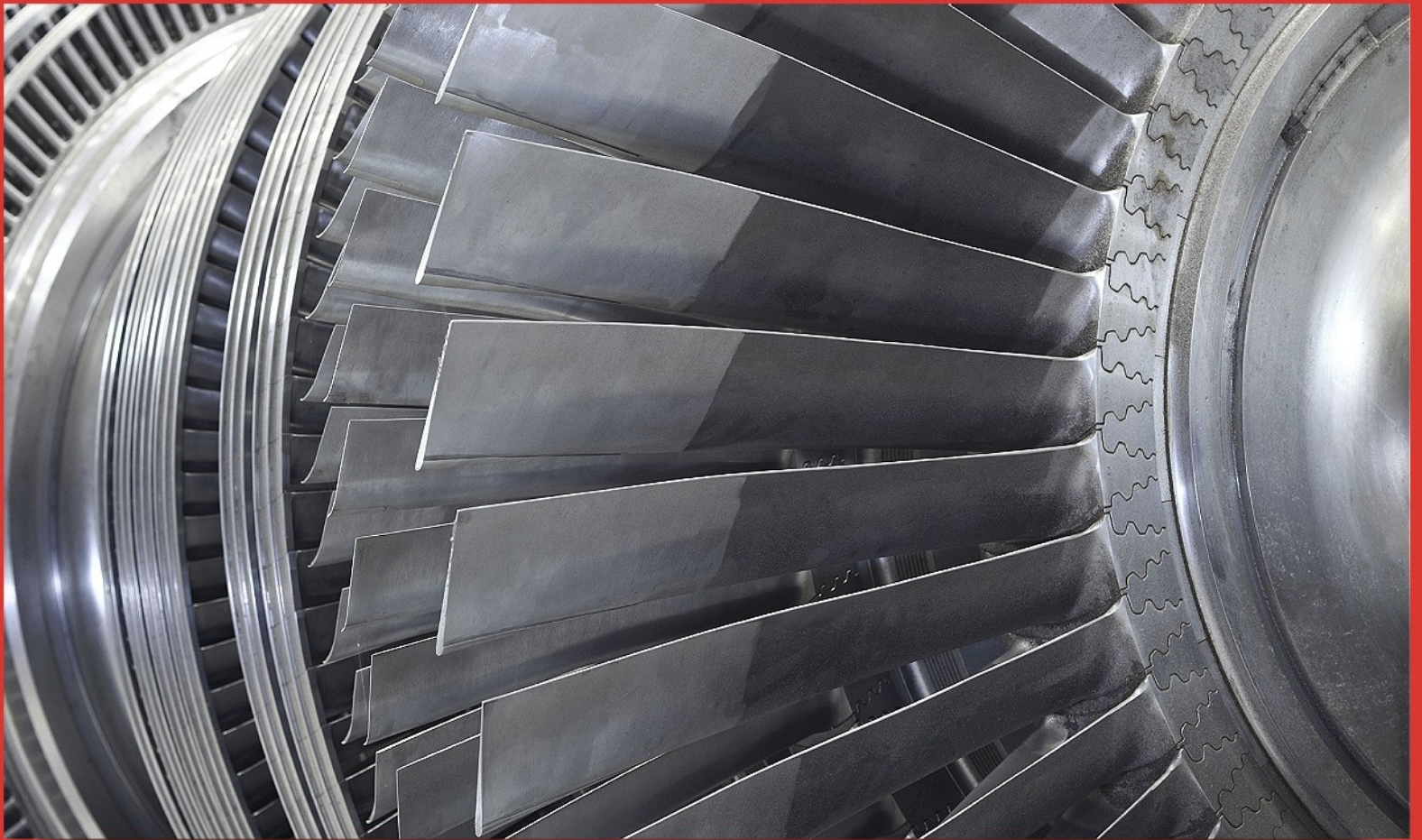


### HVAC & Refrigeration



### Automotive





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