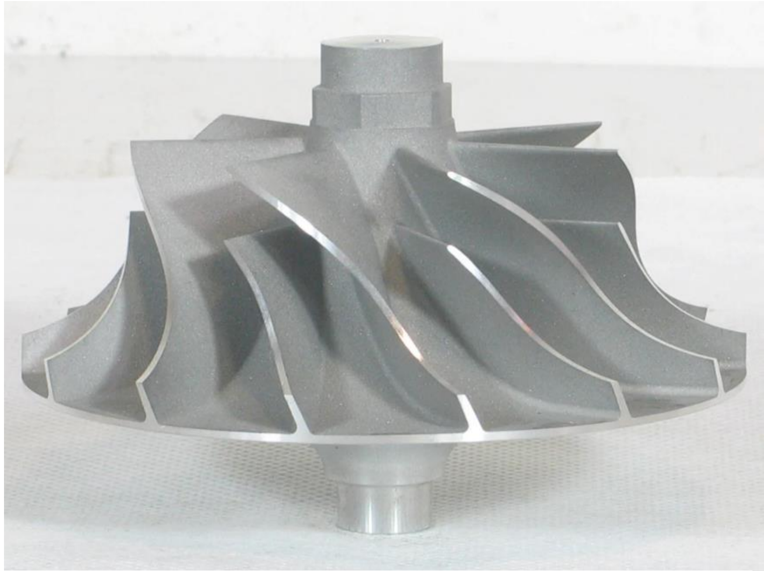
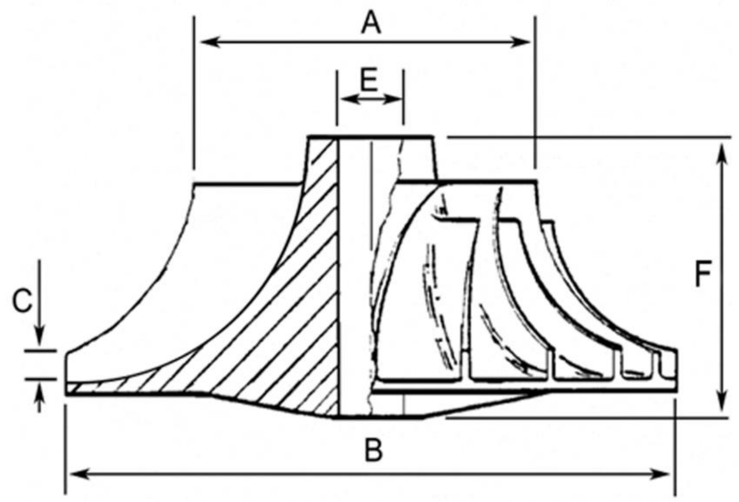
Reverse Engineering

What is Reverse Engineering?

- Many turbomachinery companies have collected a large number of legacy designs for which 3D CAD data are available
- Those CAD models are often non-parametrized or parametrized with limited flexibility for redesign
- Turbomachinery designs should be accessible for convenient and fast geometry modifications to improve performance and efficiency
- The conversion into a turbo-machinery specific parametric modeling is required

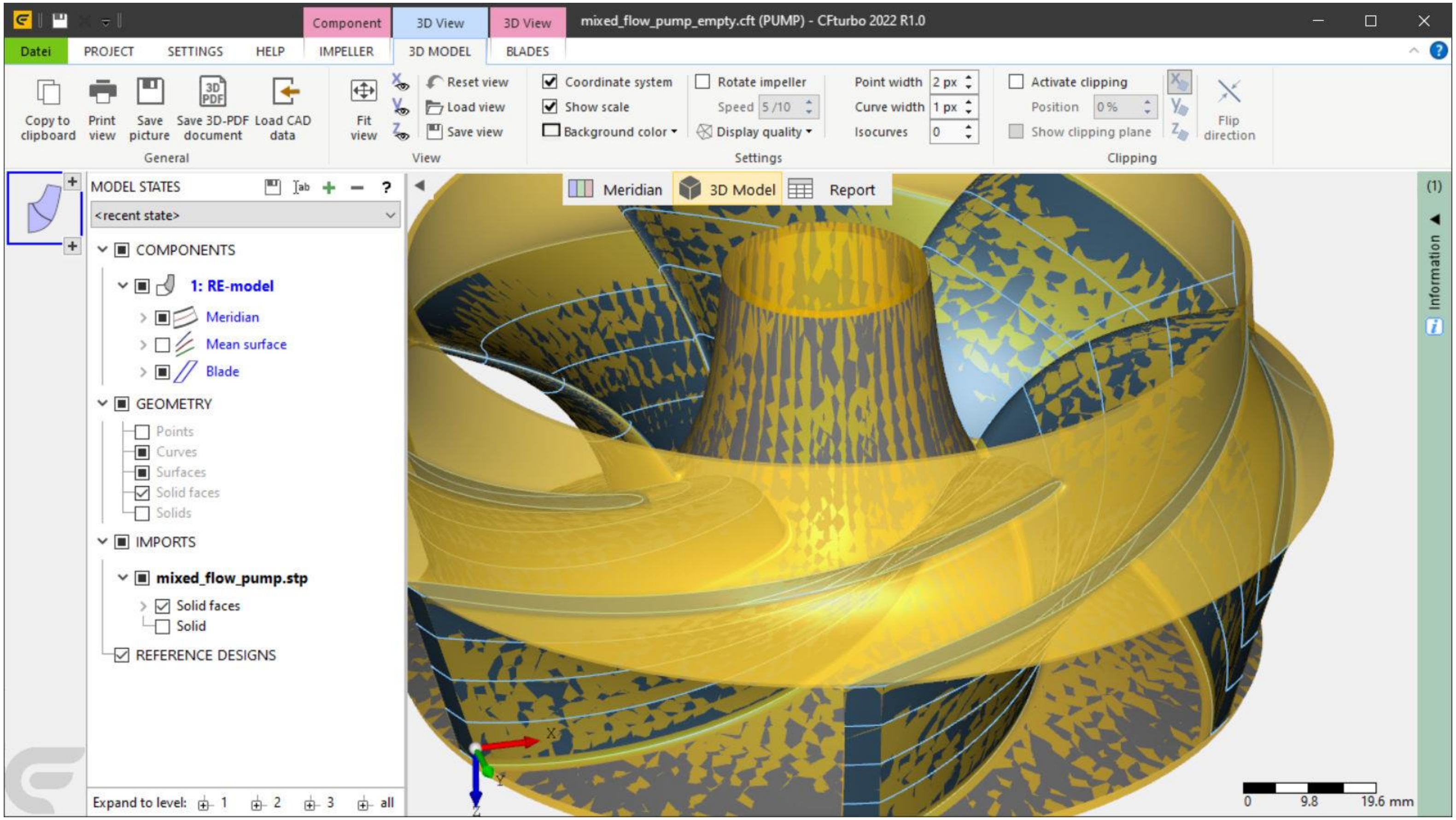




What is Reverse Engineering?

CFturbo

- CFturbo’s new reverse engineering tool converts any bladed turbomachinery CAD model into a **fully parametric** CFturbo file for further design exploration in a very short time



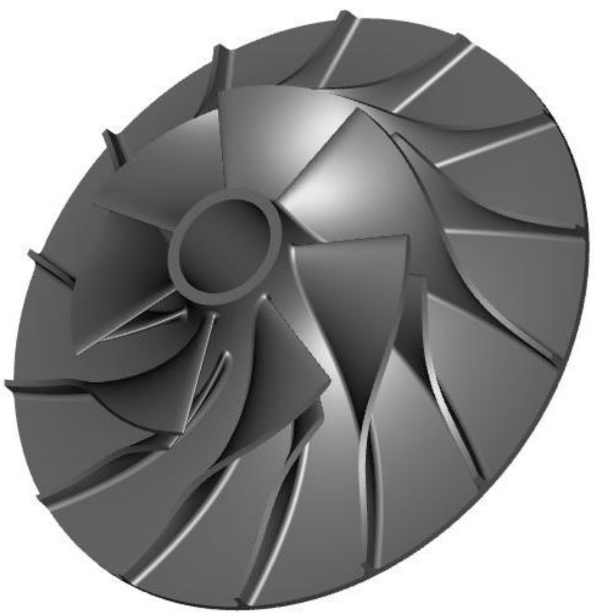
Why do Reverse Engineering?

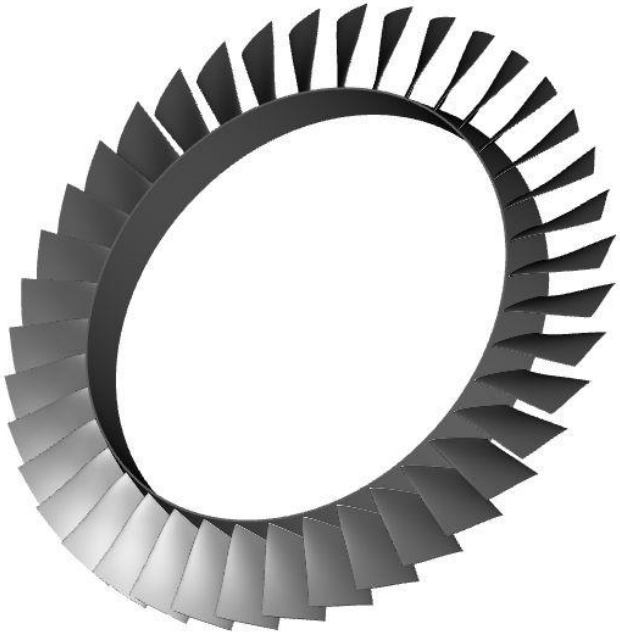
- If legacy designs are available but no parametric CAD drawing, CFturbo modeling helps to rebuild 3D-CAD files of Turbomachinery components
- CFturbo reverse engineering will be effective for comparing data and geometry models with other parts on the market
- In the after-market business, reverse engineered models are key for re-design and production of turbomachinery parts and components

Step1. Import of the 3D CAD model

Any number of files in STEP, IGES, Parasolid or BREP format can be selected.

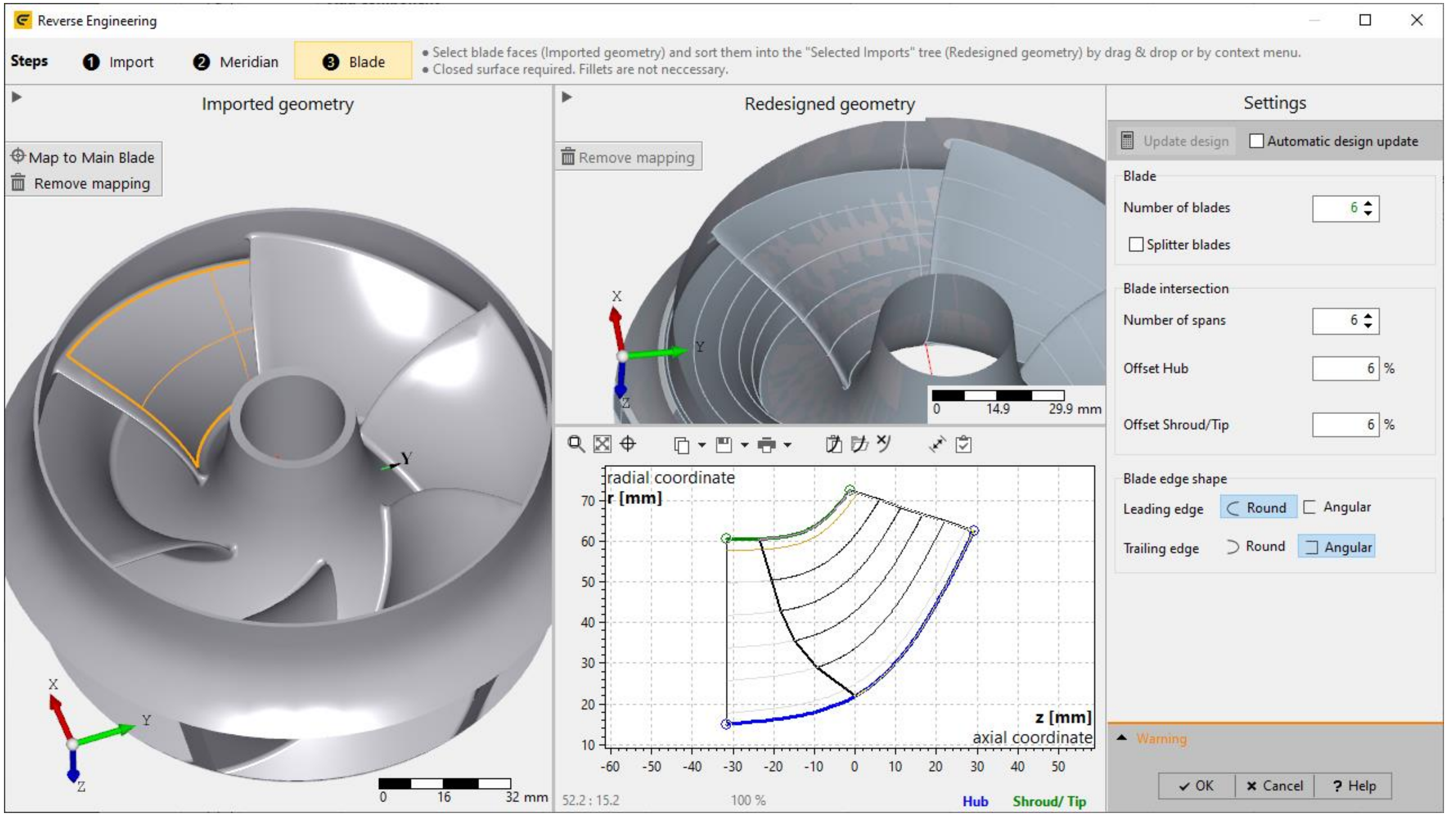
Reverse engineering is currently possible for radial, mixed-flow and axial impellers, as well as vaned stators of pumps, blowers, fans, compressors, hydro turbines and gas turbines.





Step 2. Detect the meridional contour and blades

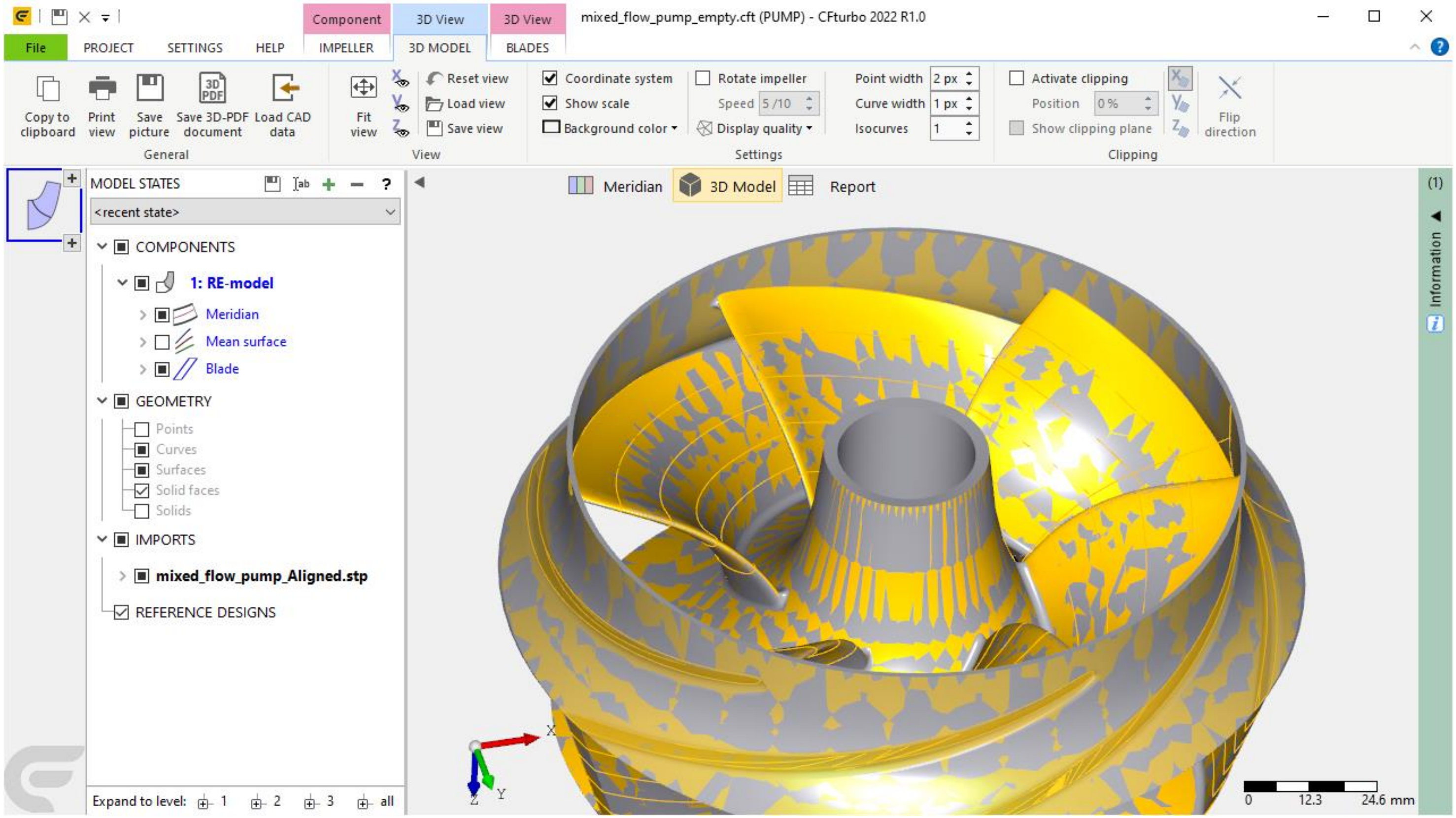
By selecting the corresponding surfaces in the original 3D model, the meridional contours, and the surfaces of the main blades can be defined, if required also those of the splitter blade.



How does Reverse Engineering work?

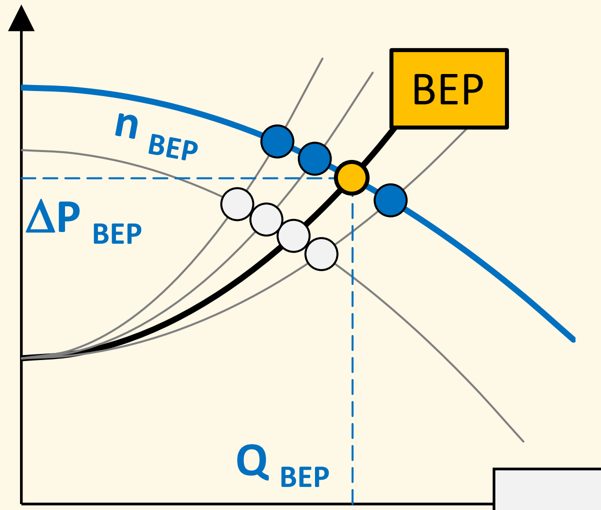
Step.3 Continue work in CFturbo design process

Subsequently, all geometry parameters are available in CFturbo, for manual variations or optimizations, allowing the full potential for product improvements to be unlocked.



CFturbo Design Methodology

Adjust, modify, re-design, export ... all fully parametric



Define operating point Best Efficiency Point (BEP)

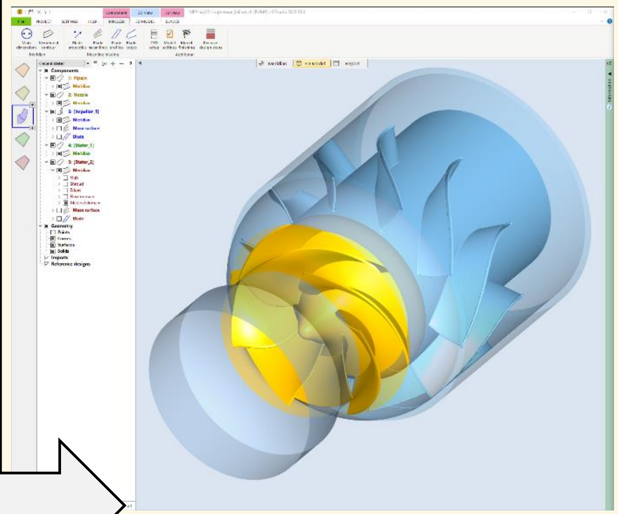
Volume flow rate, head or total pressure difference, rotational speed, fluid properties, inlet conditions

Fundamental equations

Bernoulli-, Euler equation, Mass-, Momentum-, Energy conservation, ...

Empirical correlations

Using publicly available knowledge, or own proprietary data



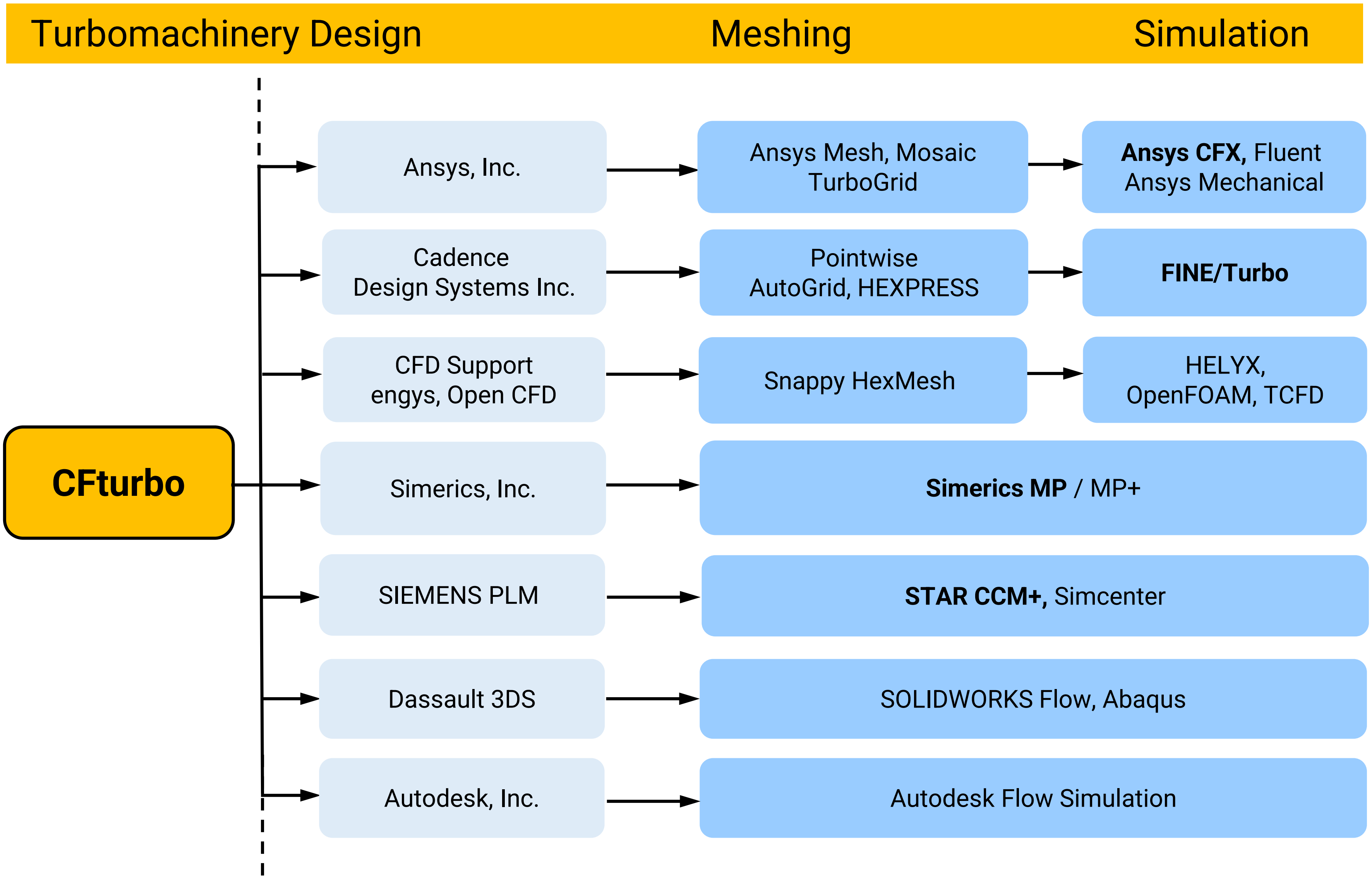
Get 3D-CAD-model

Fluid and solid domains

CAD / CFD / FEM - export formats define batch-mode

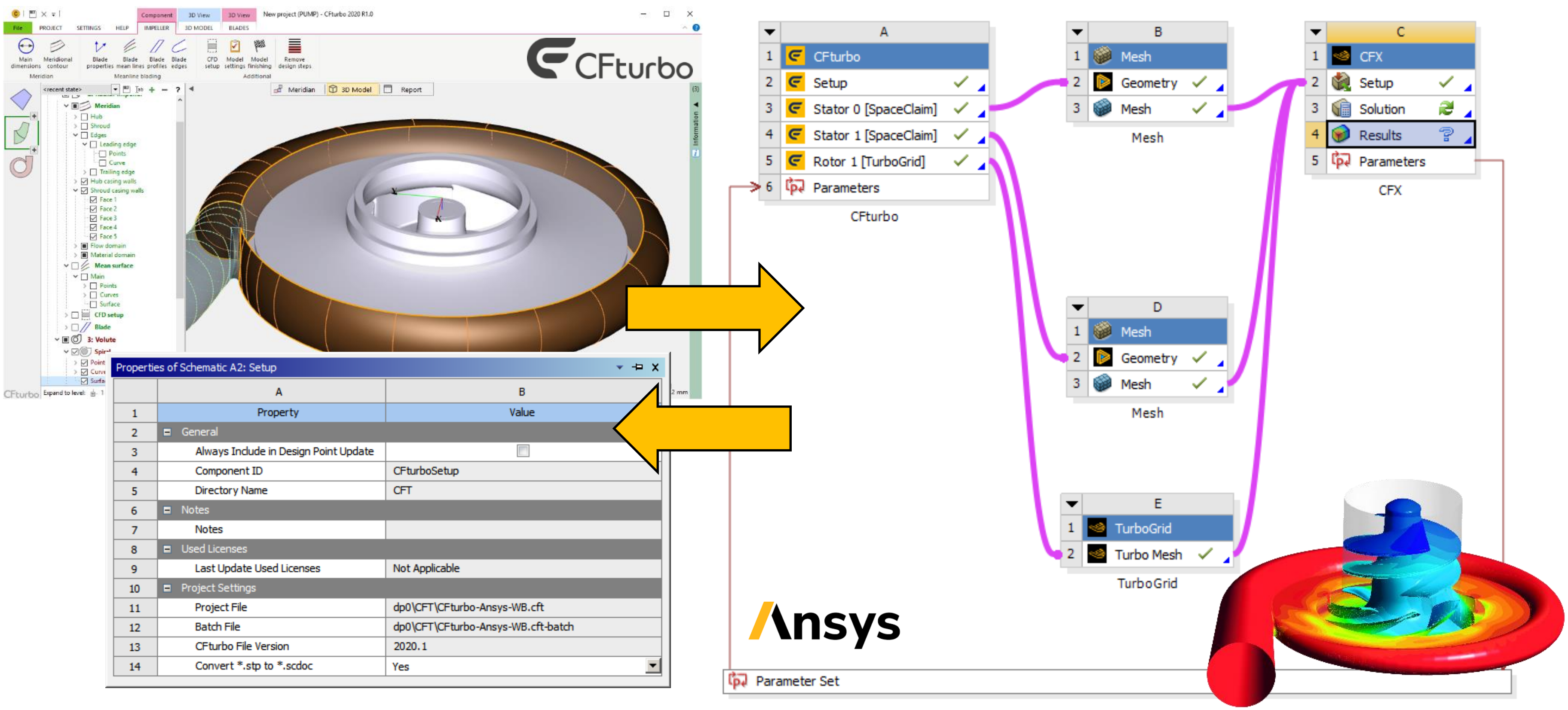
Option: CFturbo Interfaces to 3D-CFD/FEA

CFturbo



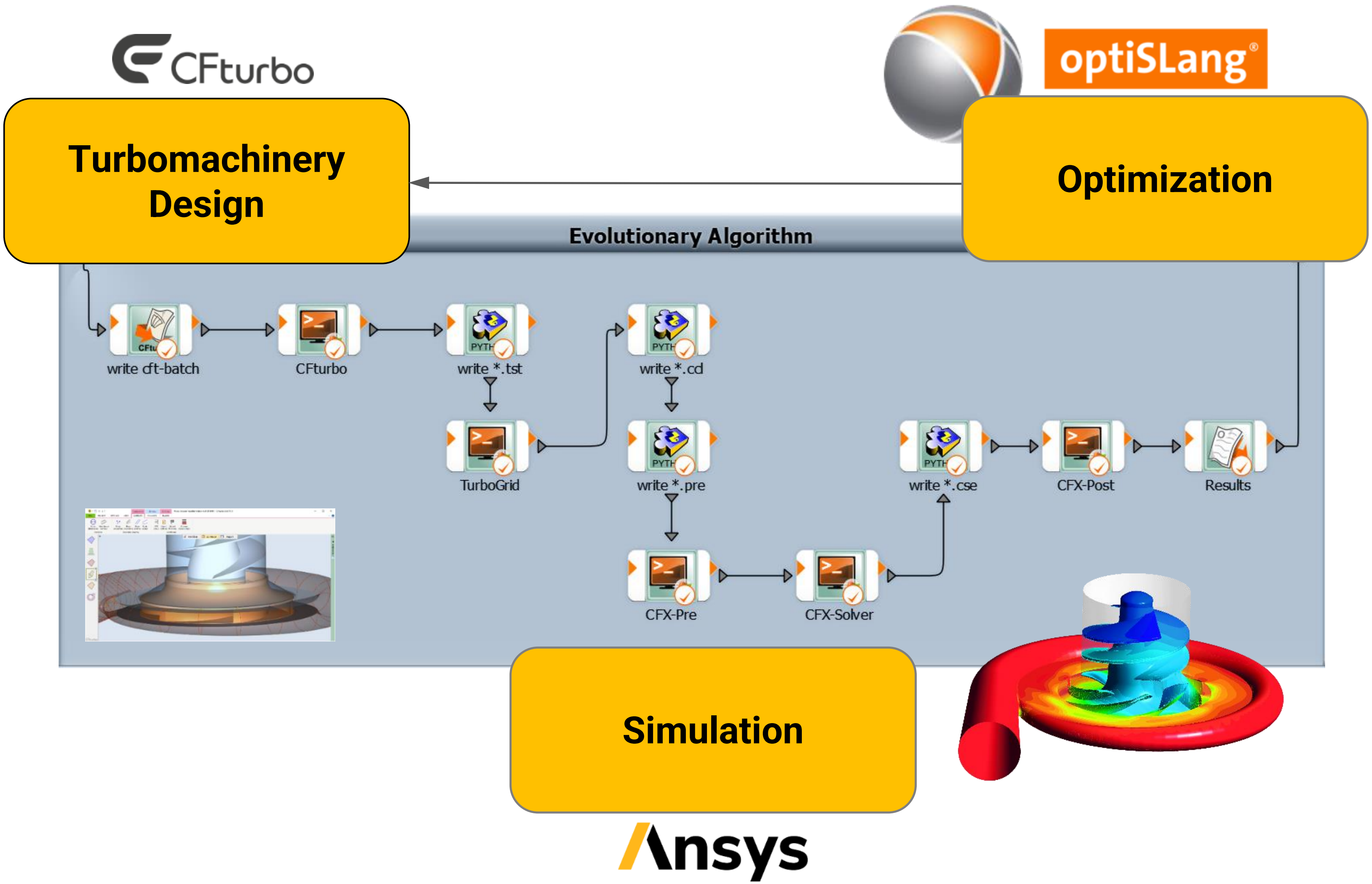
Option: CFturbo for Design Exploration and Optimization

Bi-directional Integration, example Ansys Workbench



CFturbo can be combined with other CFD, FEA, optimization code

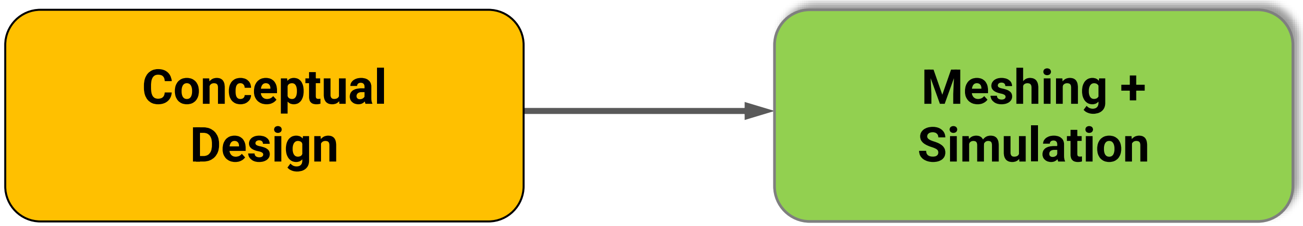
Optimization Workflow: CFturbo - Ansys CFX - optiSLang

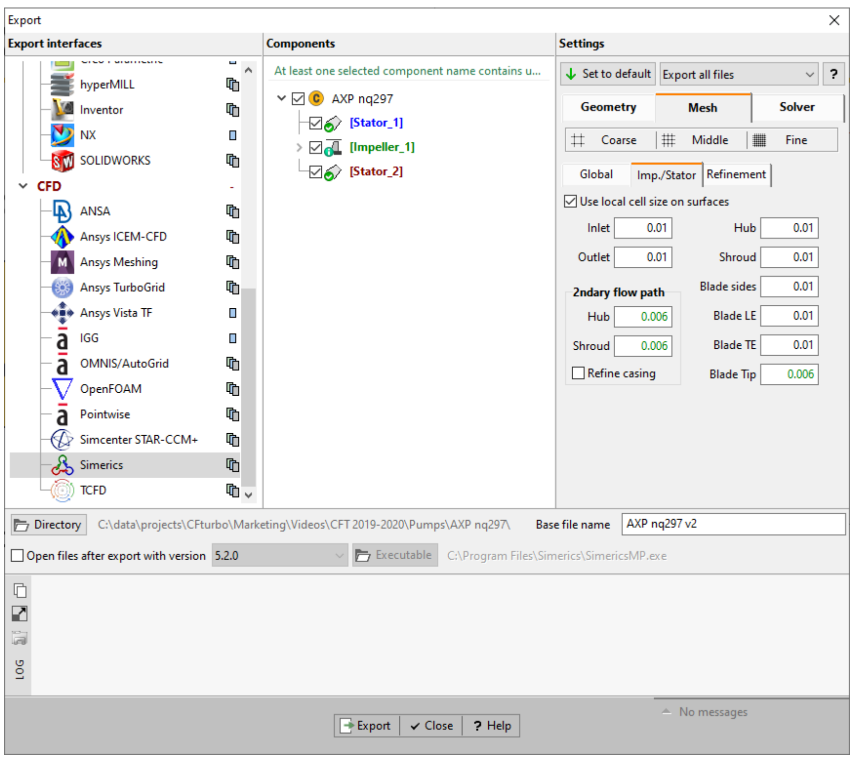


CFturbo with CFturbo SMP (Simerics MP)

CFturbo

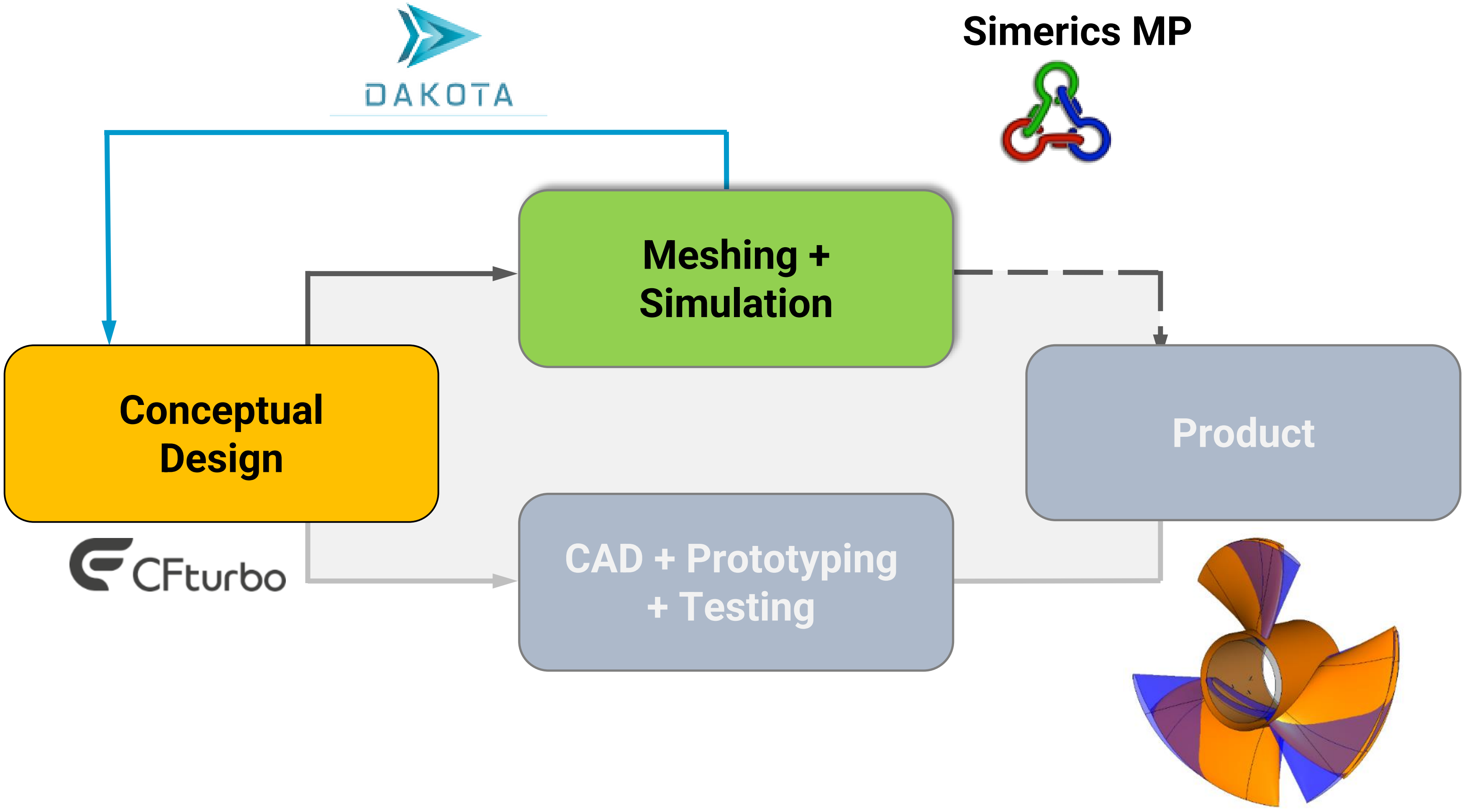
SMP



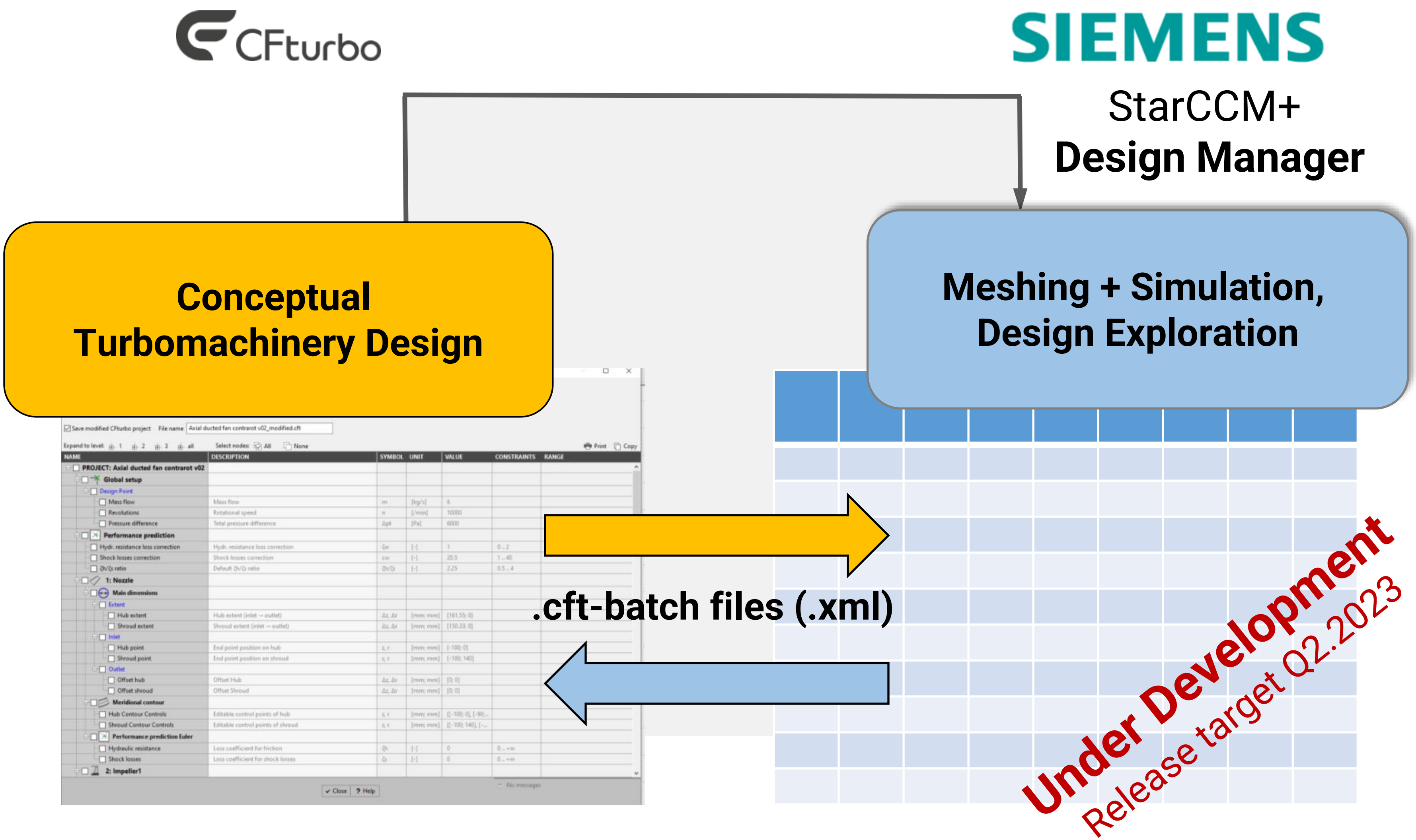


- Define mesh parameters and solver settings in CFturbo export window
- Immediate start of simulation for the CFturbo design point
- Python scripts for batch runs are available to get performance curves

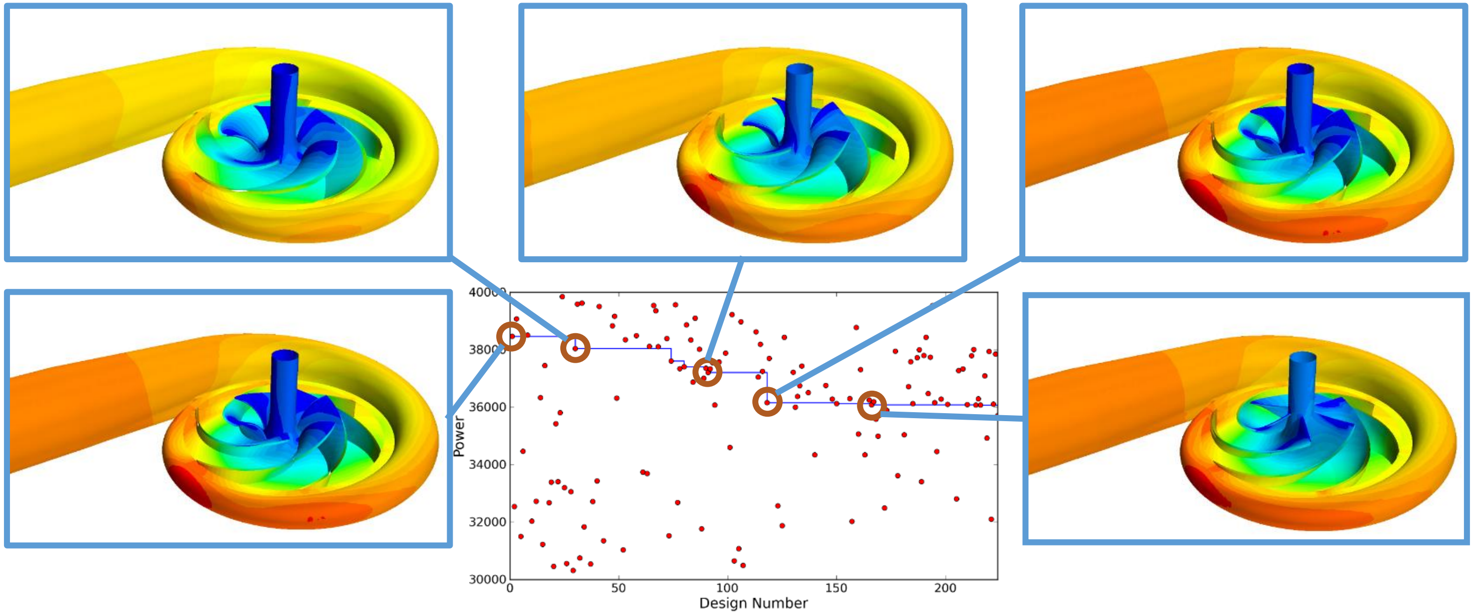
Optimization Workflow: CFturbo - Simerics MP - DAKOTA



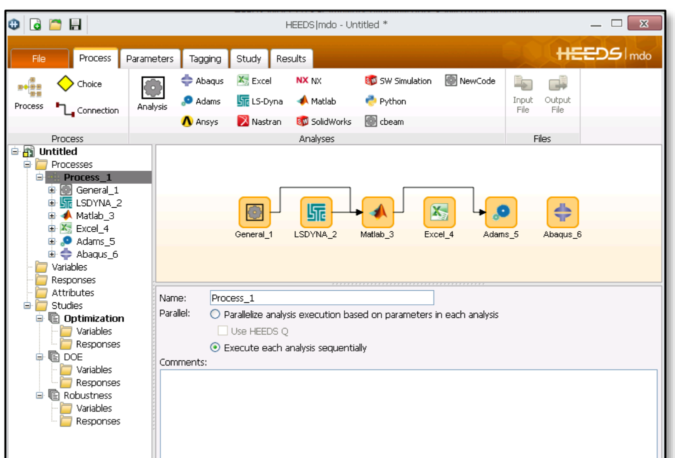
CFturbo with StarCCM+/Design Manager



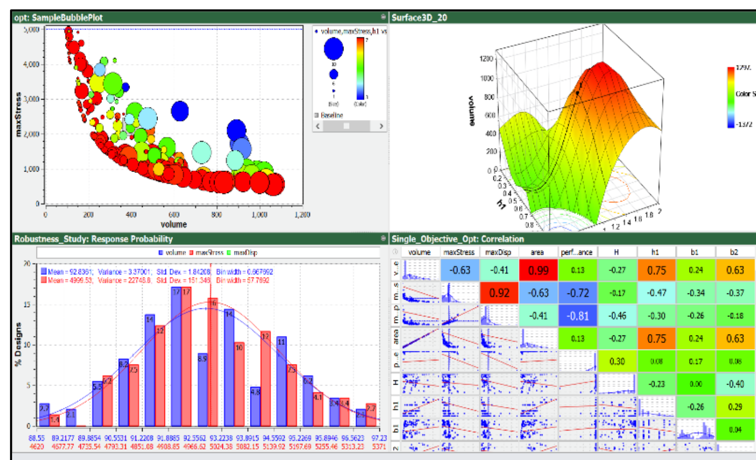
Optimization Workflow: CFturbo - StarCCM - HEEDS



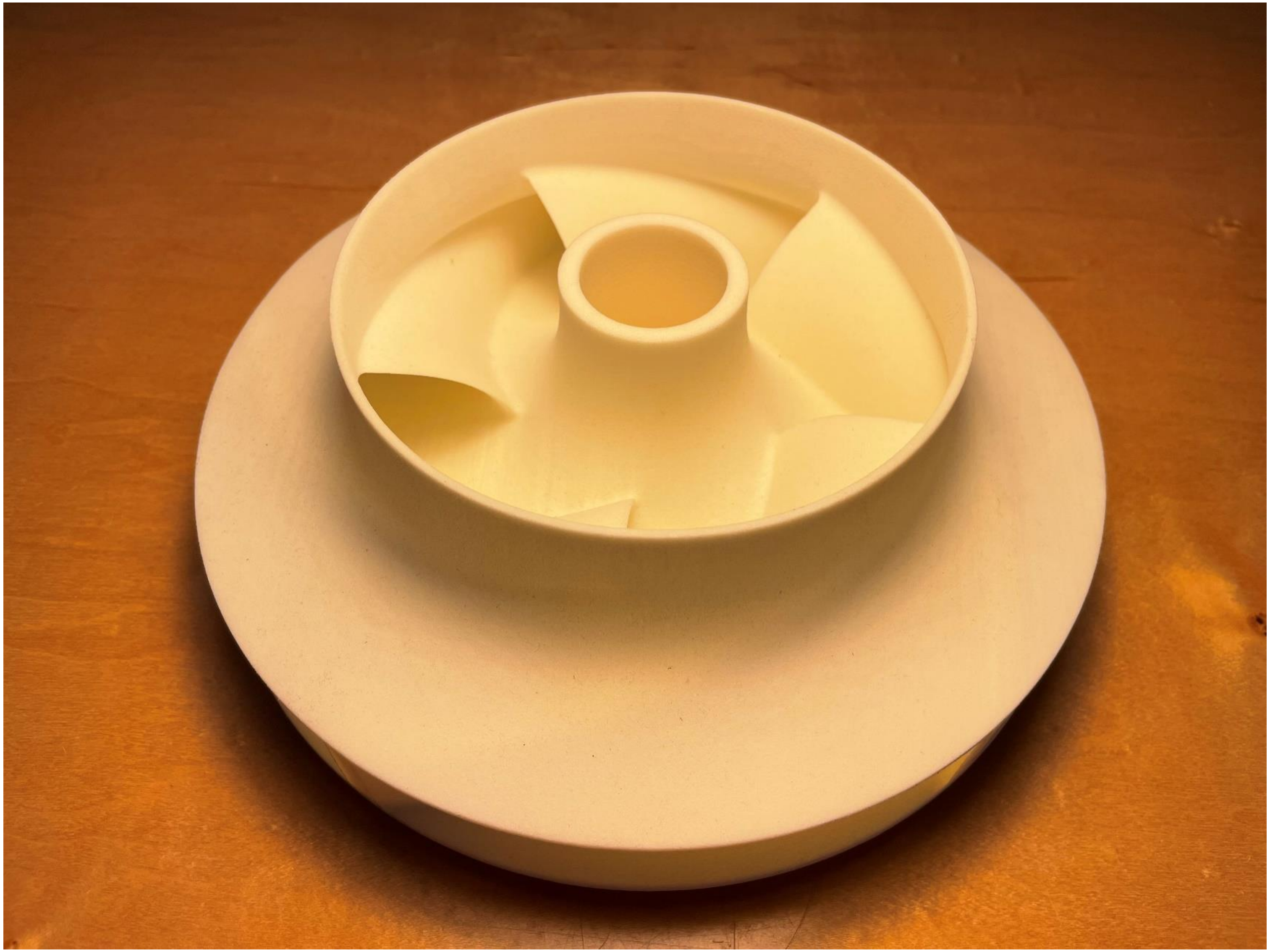
Process Automation

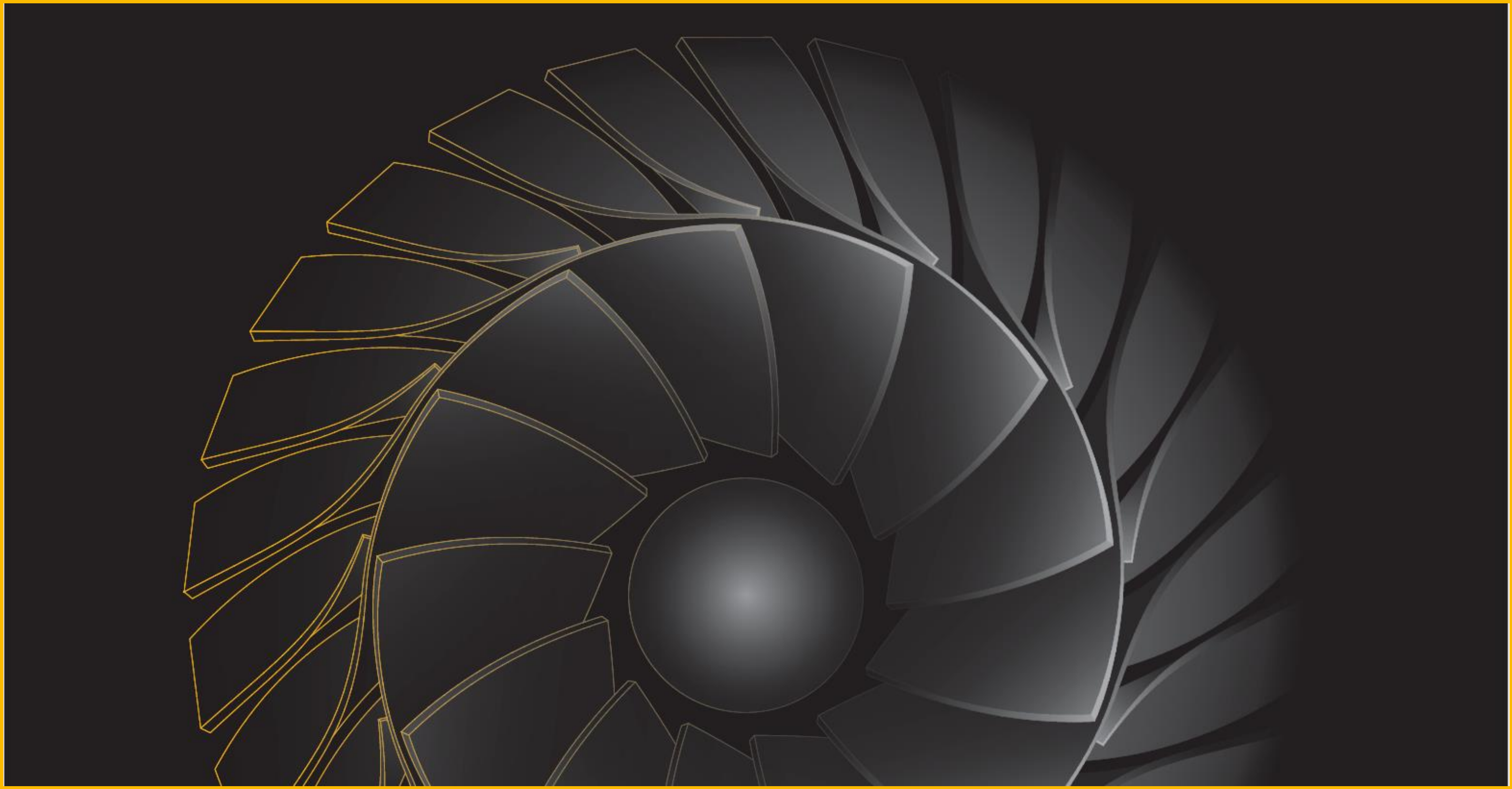


Design Exploration



Option: direct export of 3D printed models





For more information and to register for a free trial visit

cfturbo.com