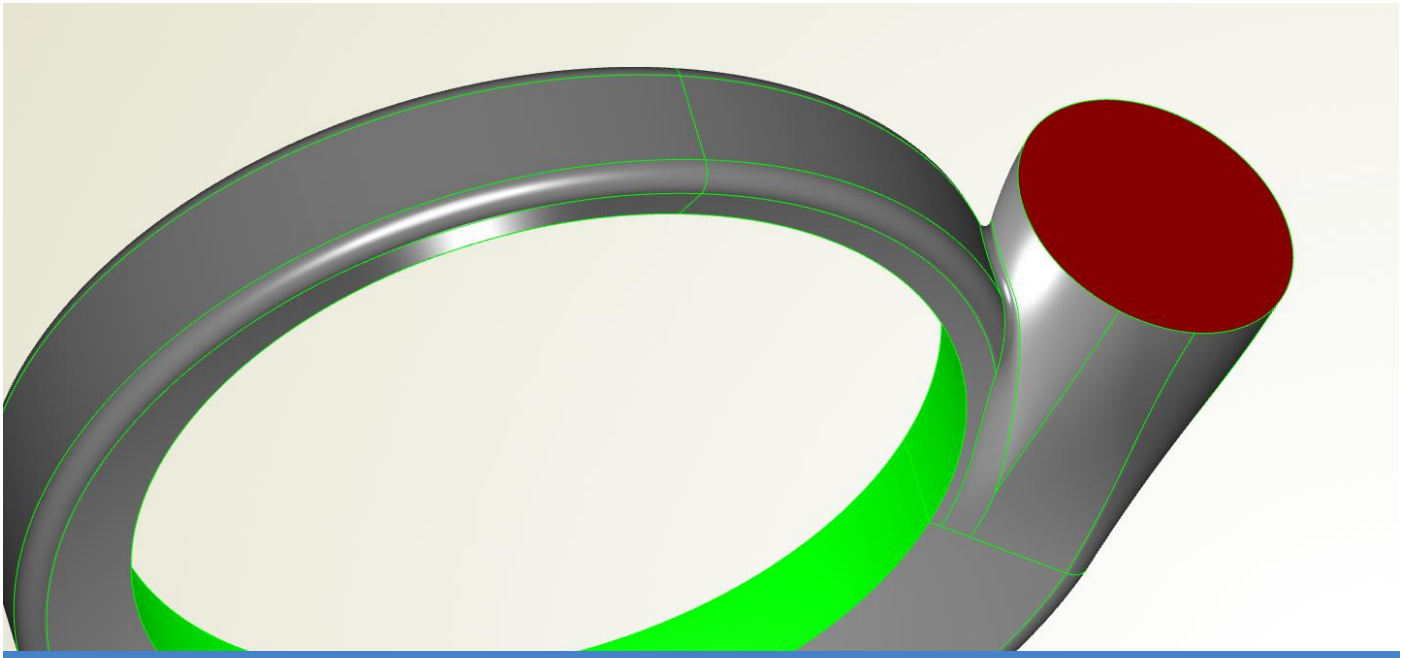
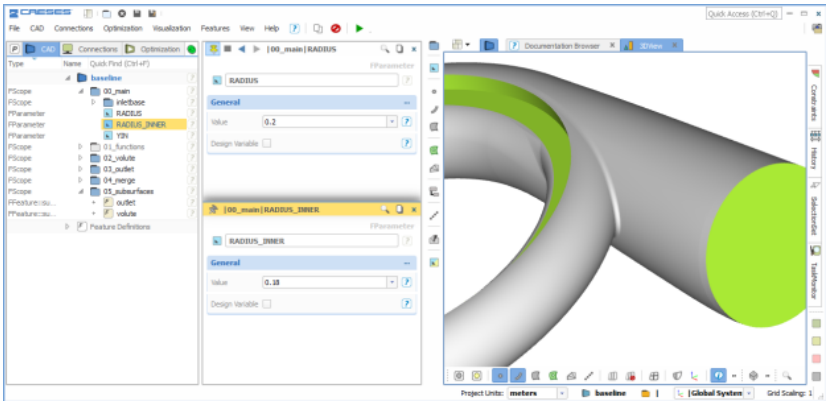


TECH BRIEF

VOLUTE DESIGN AND OPTIMIZATION

Volutes are integral to most radial turbomachines for which a variety of cross sectional definitions can exist.
The cross section is the 2D curve that is swept along the circumferential direction.
Generally, volutes can be found in pumps and turbochargers, together with a rotating impeller in the center of the scroll.
For pumps and compressors, the volute has the function to convert kinetic energy into pressure by reducing the fluid's speed and increasing pressure, while turbine volutes have the opposite function i.e. converting exhaust gas pressure into kinetic energy (to drive the impeller).

CAESES® is the leading volute design tool in the context of automated shape optimization with CFD. The advanced parametric volute models can save you weeks of engineering time through the high automation level and the robustness of these models.



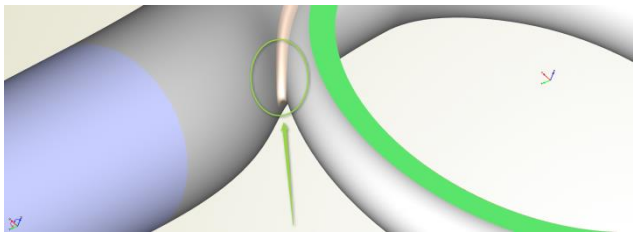
Parametric volute model in CAESES

WHAT IS THE CHALLENGE WHEN IT COMES TO VOLUTES?

The systematic flow optimization of volutes can be a time-consuming task. Often this is an iterative process where the CFD engineer analyzes a new design candidate that was previously prepared by the CAD department. After the analysis, the CFD engineer gives recommendations to the CAD colleague on how to change the shape. The CAD expert adjusts the model accordingly, and returns the geometry to the CFD engineer. This is a loop that can take several days to weeks until a new and improved volute is developed. Things can even get more complicated, having in mind that other components also need to be considered (e.g. impeller and diffuser) to have more exact performance predictions. CAESES® can dramatically shorten such a process from literally months to just a few days.

VOLUTE TONGUE MODELING

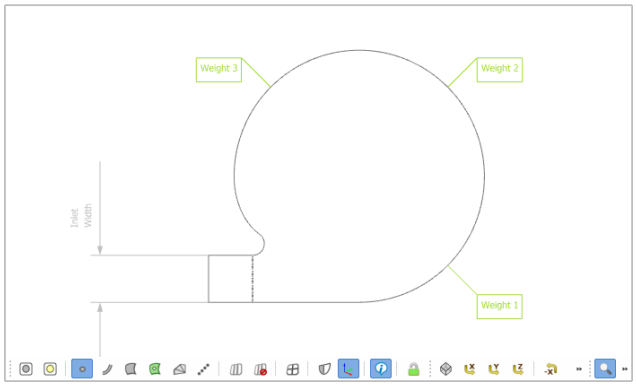
This is the region where the main volute surface intersects the inlet (turbine) or outlet (compressor) geometry, respectively. CAESES® provides various techniques and solutions which solve this tricky task for you. This tremendously accelerates the modeling process of tongue geometries, and makes the final volute absolutely robust during automated variations and optimizations.



Robust tongue modeling for automated variations and optimizations

CROSS SECTION DEFINITION

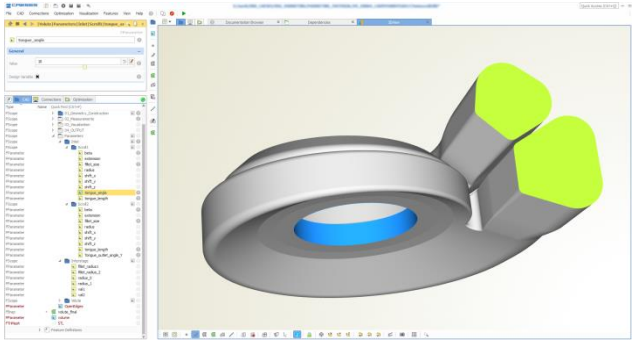
Define custom 2D definitions of cross sections, or import existing data to convert it to a parametric profile. Volutes are often controlled by typical distributions such as A/R ratio which can be inbuilt as well. CFD experts typically want to try out their own ideas, having in mind more flow-related shape controls. These ideas and any geometry constraints can be directly considered in the volute model using the integrated geometry types.



User-defined 2D cross section definition

YOUR SOLUTION FOR ALL TYPES OF VOLUTES

No matter which application you have or how complex your volute is: For the fully automated shape optimization of volutes, CAESES® is an ideal choice which will save you months of engineering work and loads of human resources. CAESES® is used for volute design by leading companies such as IHI, Toyota and MTU.



Variable and robust twin-scroll model in CAESES