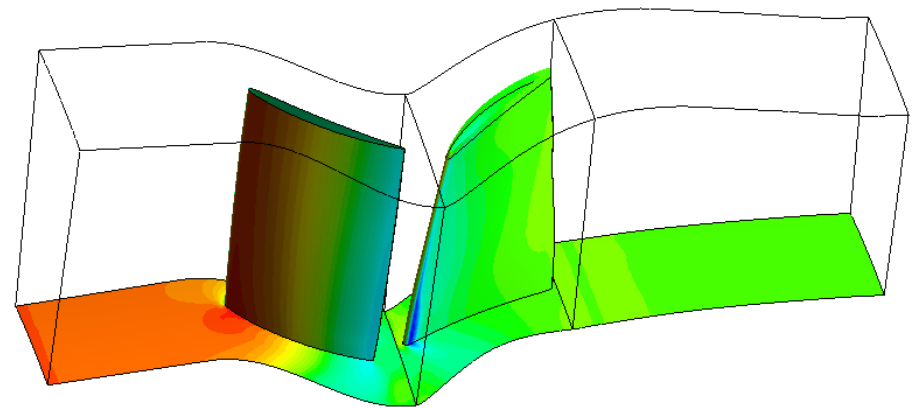
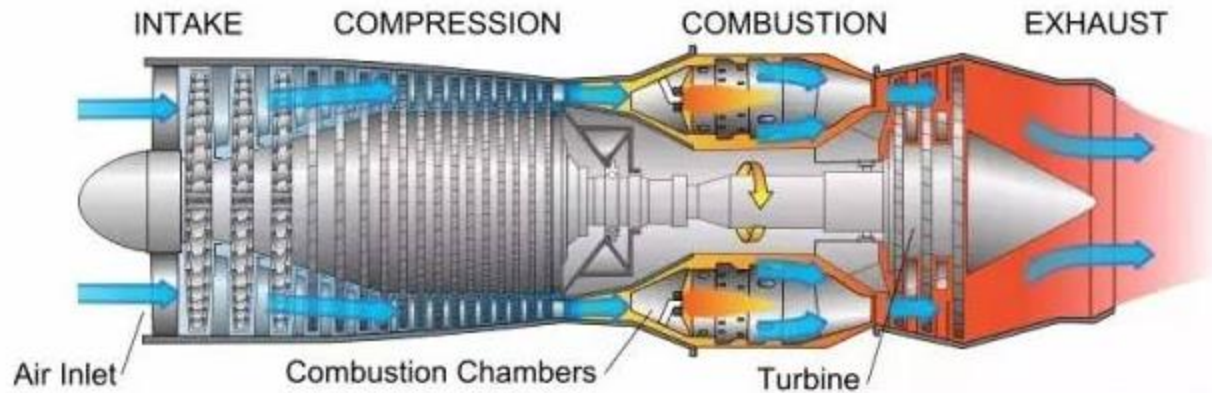
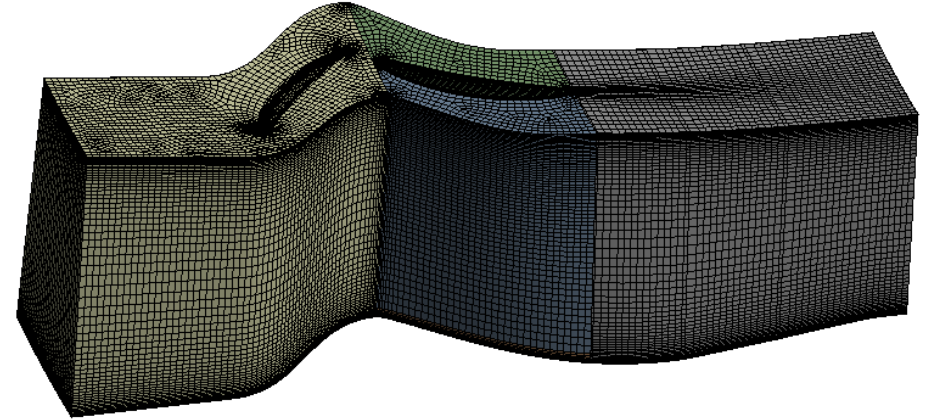


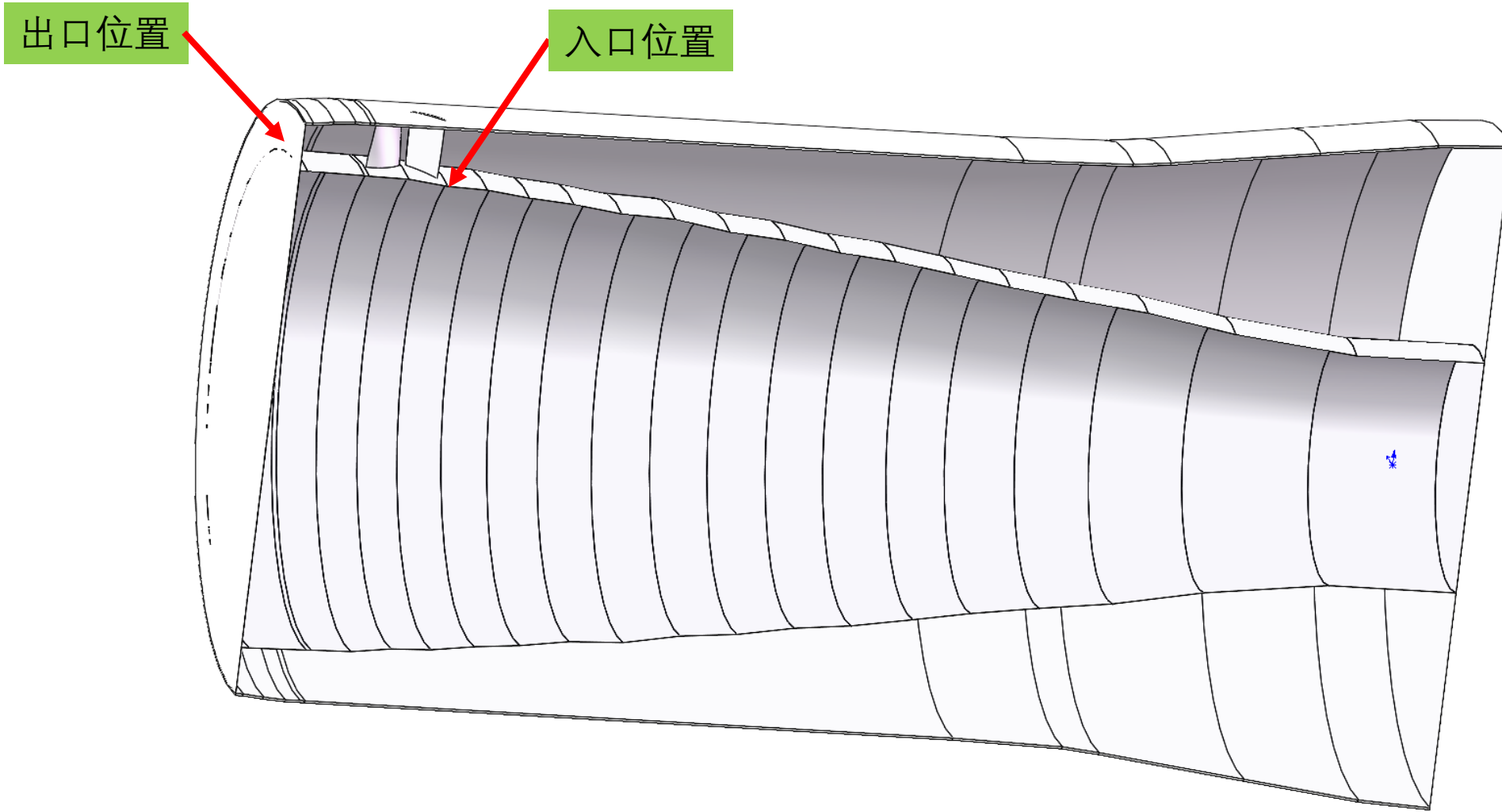
# CFX Gas Turbine 燃气轮机 叶片的网格及稳态流场分析

# 稳态流场分析

- 如何进行几何处理，制作周期对称模型
- 如何制作六面体网格
- 如何进行CFX稳态流场分析设置

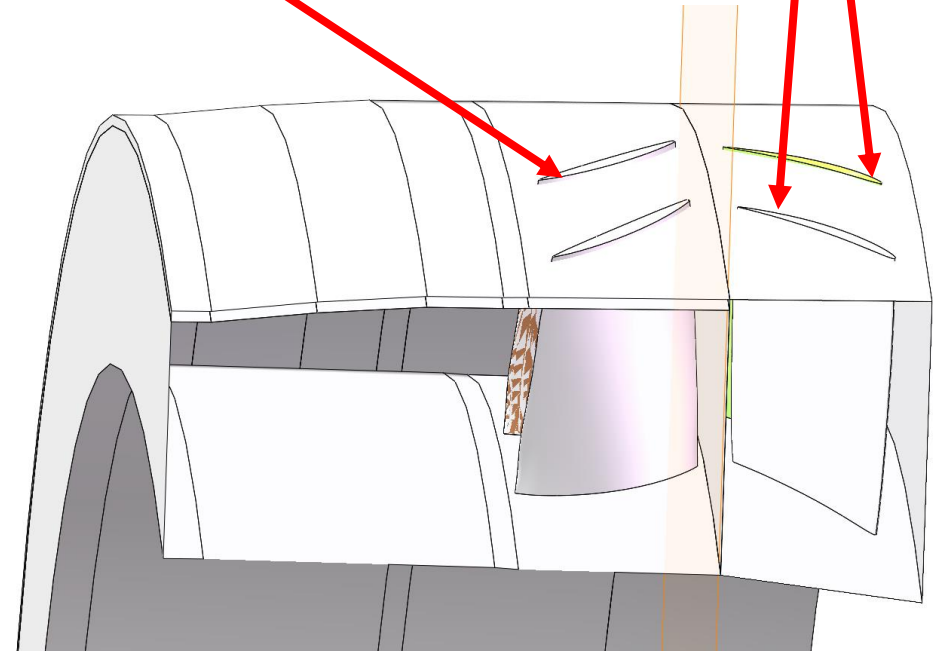
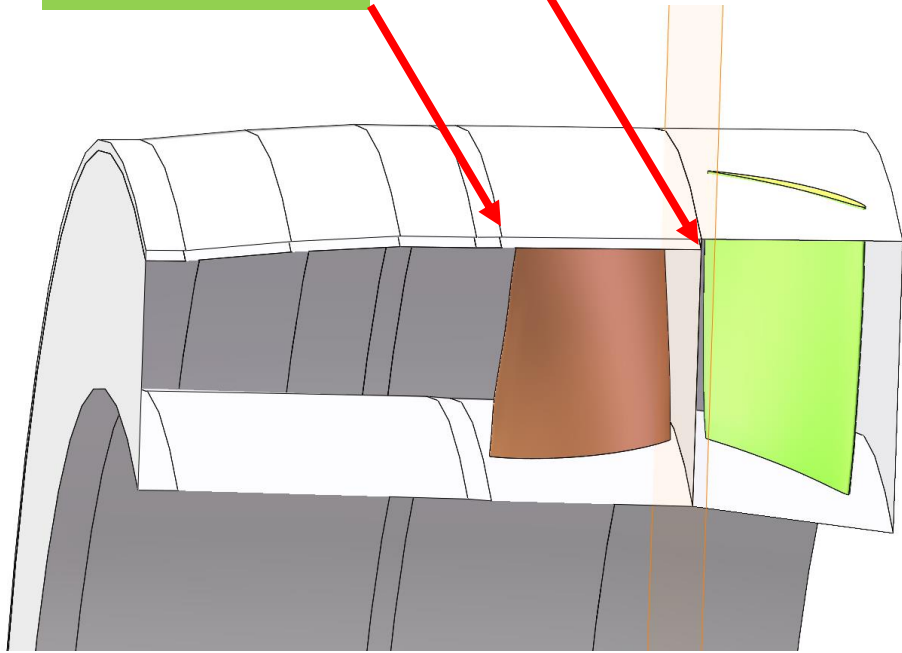


# 两个叶片，一静一动，截取一段



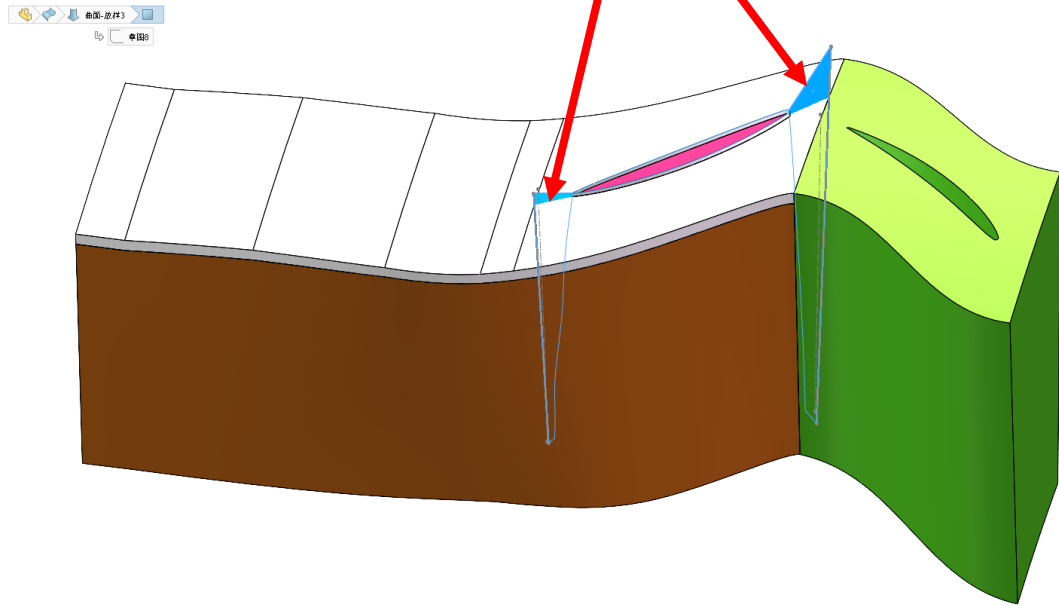
# 动静区域切开，动叶顶加高，复制一个周期的叶片

出口通道切开

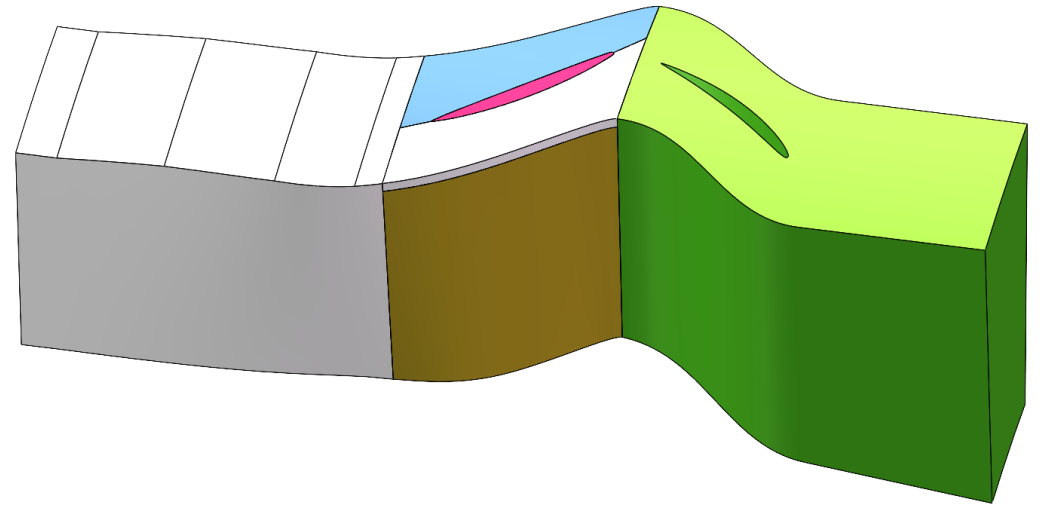


# 利用曲面切出一个周期

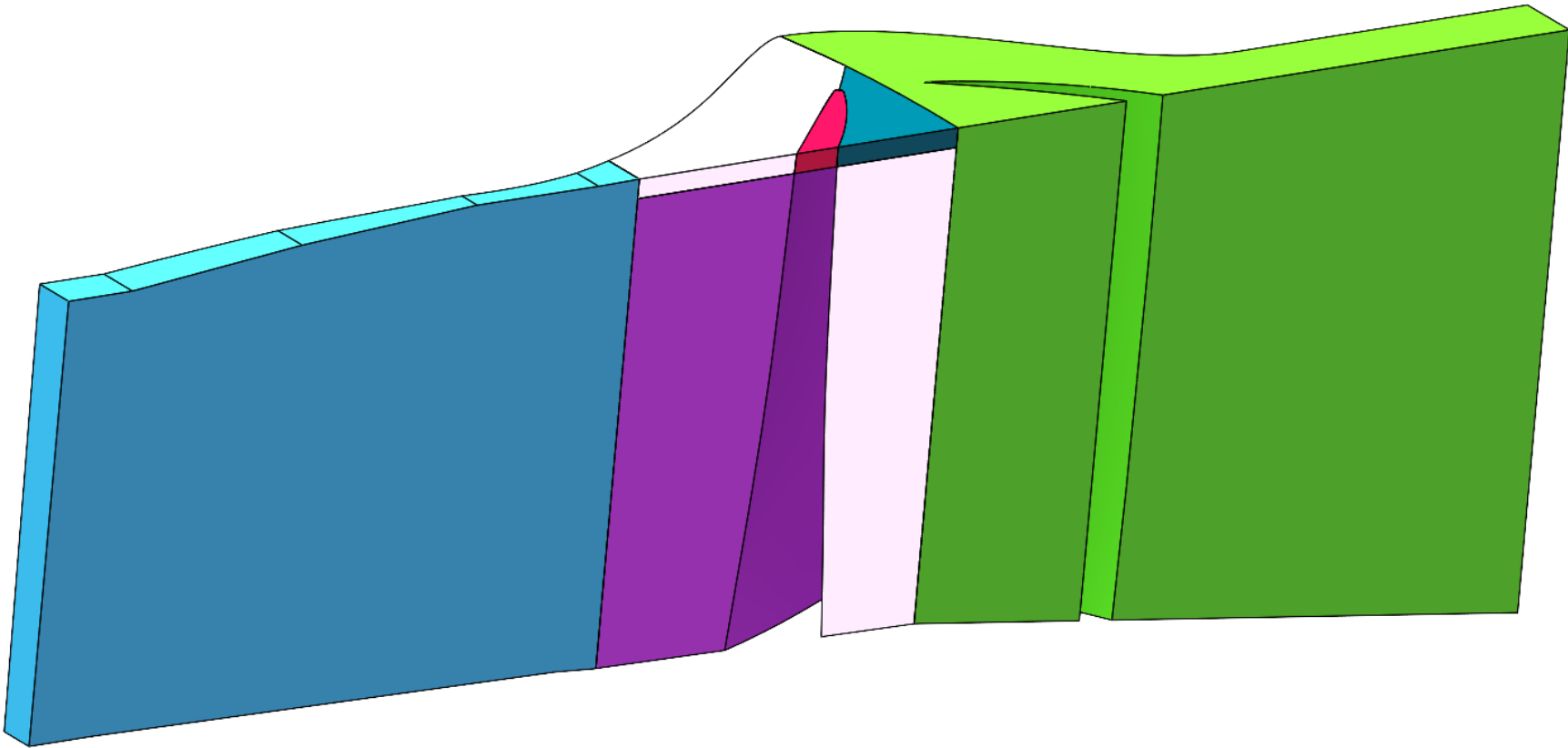
动叶片扭曲严重，需要再次切开



切割完成

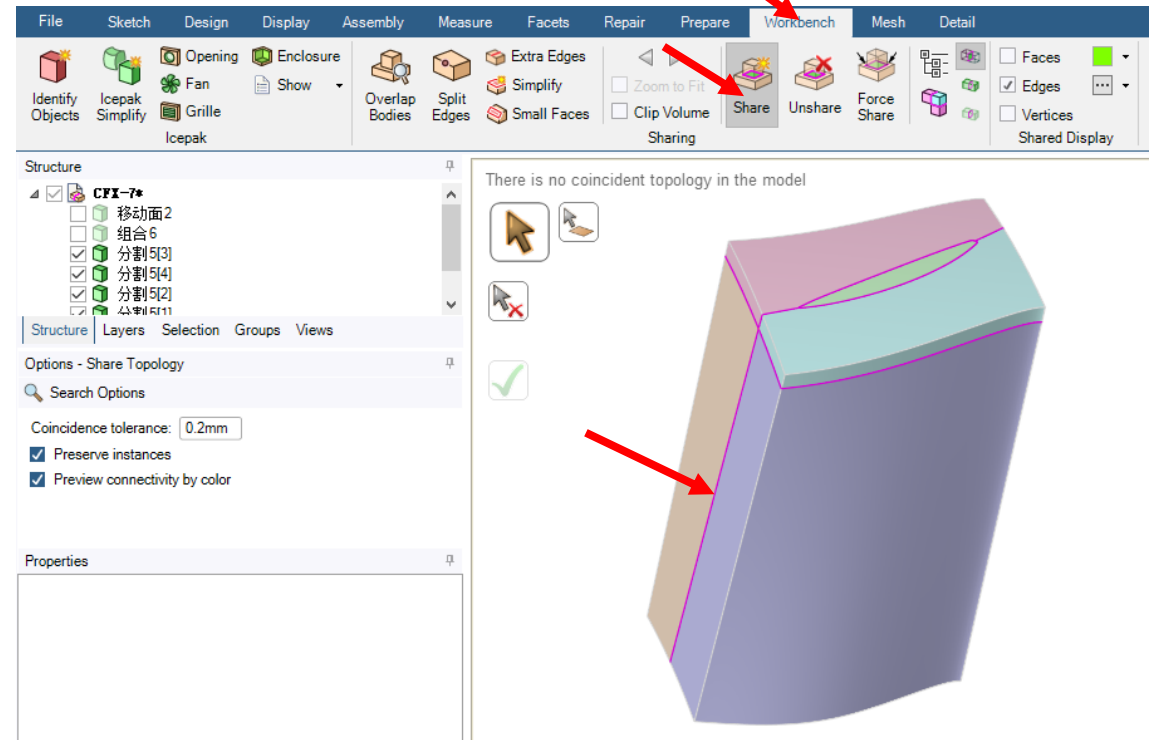
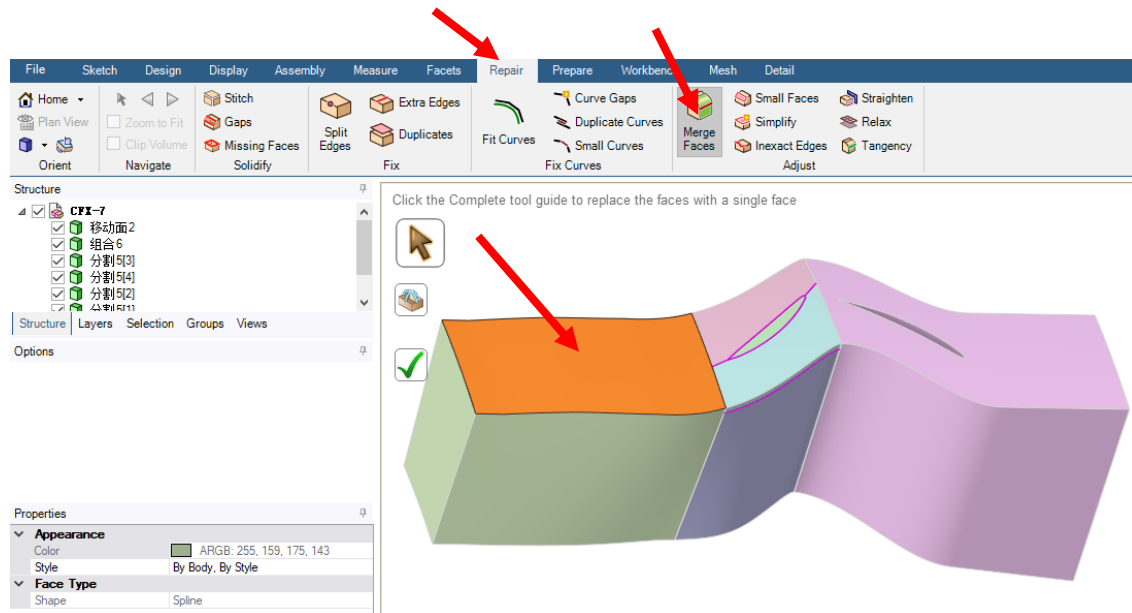


# 处理完成后的截面图



# SpaceClaim中合并面，便于做扫描网格

旋转区域共用面，连城一体



# 边界层设置 - 叶片周围

The image shows a CAD software interface with a 3D model of a blade. The 'Inflation' feature is highlighted in blue on the model. The 'Details of Inflation' panel is open, showing settings for the boundary layer. The 'Inflation Option' is set to 'First Layer Thickness', which is circled in red. Other settings include 'First Layer Height' (0.2 mm), 'Maximum Layers' (5), and 'Growth Rate' (1.2). The 'Inflation Algorithm' is set to 'Pre'.

**Details of "Inflation" - Inflation**

<b>Scope</b>	
Scoping Method	Geometry Selection
Geometry	1 Face
<b>Definition</b>	
Suppressed	No
Boundary Scoping Method	Geometry Selection
Boundary	1 Edge
<b>Inflation Option</b>	First Layer Thickness
<input type="checkbox"/> First Layer Height	0.2 mm
<input type="checkbox"/> Maximum Layers	5
<input type="checkbox"/> Growth Rate	1.2
Inflation Algorithm	Pre

Selection Information: Global Coordinate Sy, Show Individual and Summa

No Selection

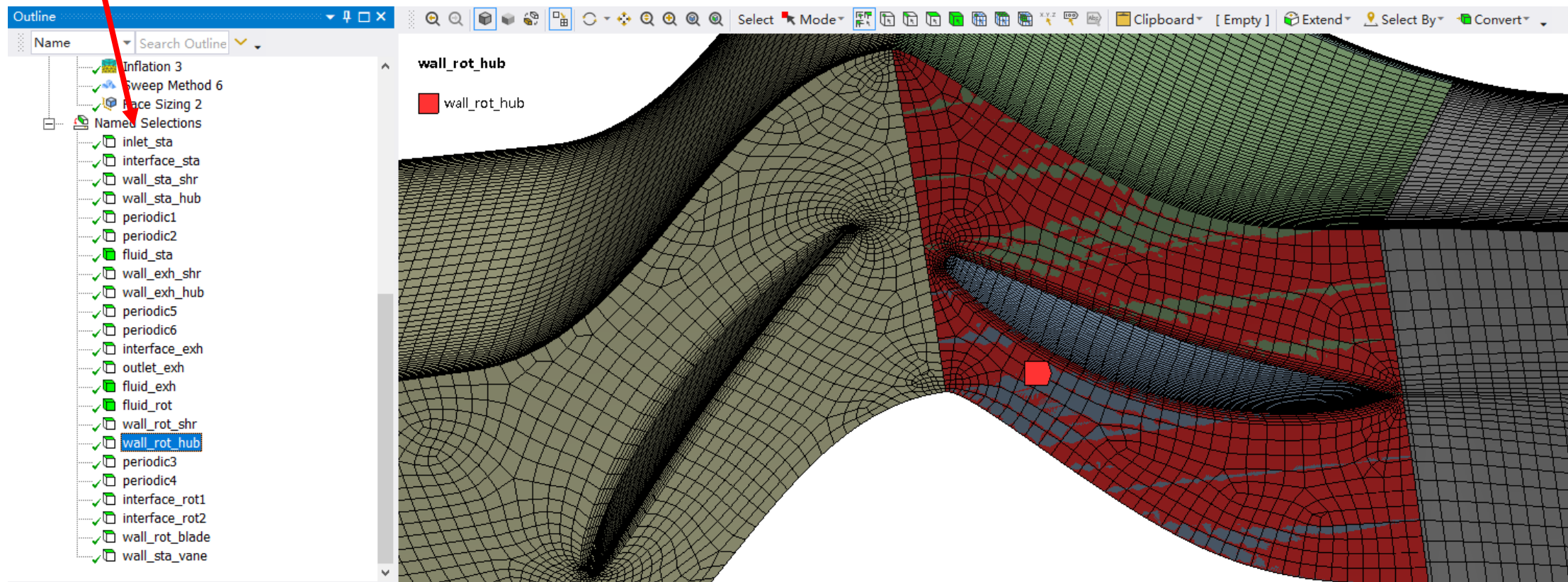
# 网格尺寸控制

The screenshot displays a CAD software interface with a 3D mesh model. The 'Outline' panel on the left shows a tree structure with 'Face Sizing 2' selected. The 'Details of "Face Sizing 2" - Sizing' panel is open, showing the following settings:

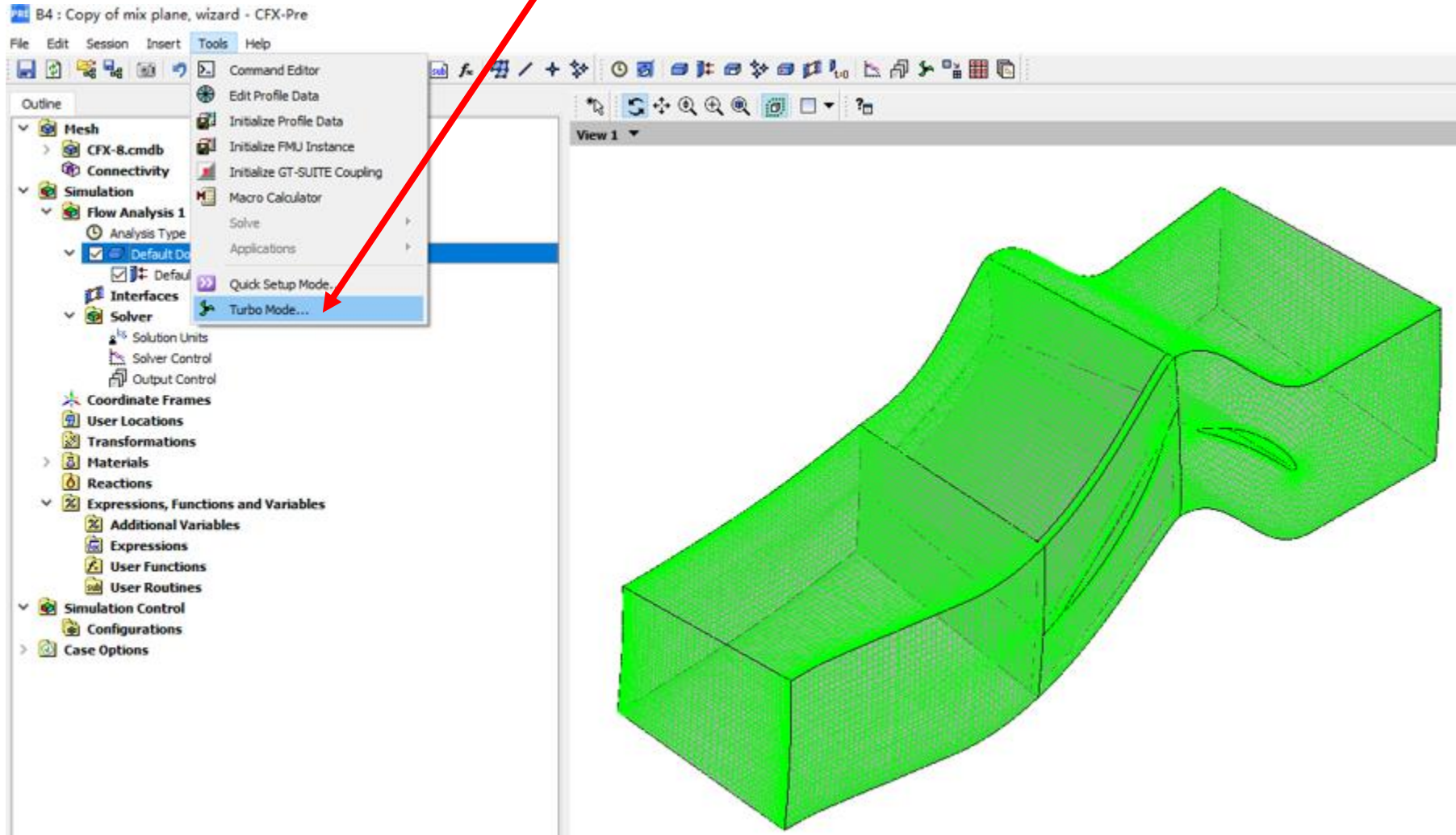
Details of "Face Sizing 2" - Sizing	
<b>Scope</b>	
Scoping Method	Geometry Selection
Geometry	1 Face
<b>Definition</b>	
Suppressed	No
Type	Element Size
<input type="checkbox"/> Element Size	Default (2.0 mm)
<b>Advanced</b>	
<input type="checkbox"/> Defeature Size	1.e-003 mm
Influence Volume	No
<input type="checkbox"/> Growth Rate	Default (1.2)
<input type="checkbox"/> Capture Curvature	Yes
<input type="checkbox"/> Curvature Normal An...	Default (18.0°)
<input checked="" type="checkbox"/> Local Min Size	0.1 mm
<input type="checkbox"/> Capture Proximity	NO

A red arrow points from the 'Local Min Size' setting in the panel to the mesh model, indicating the application of the control.

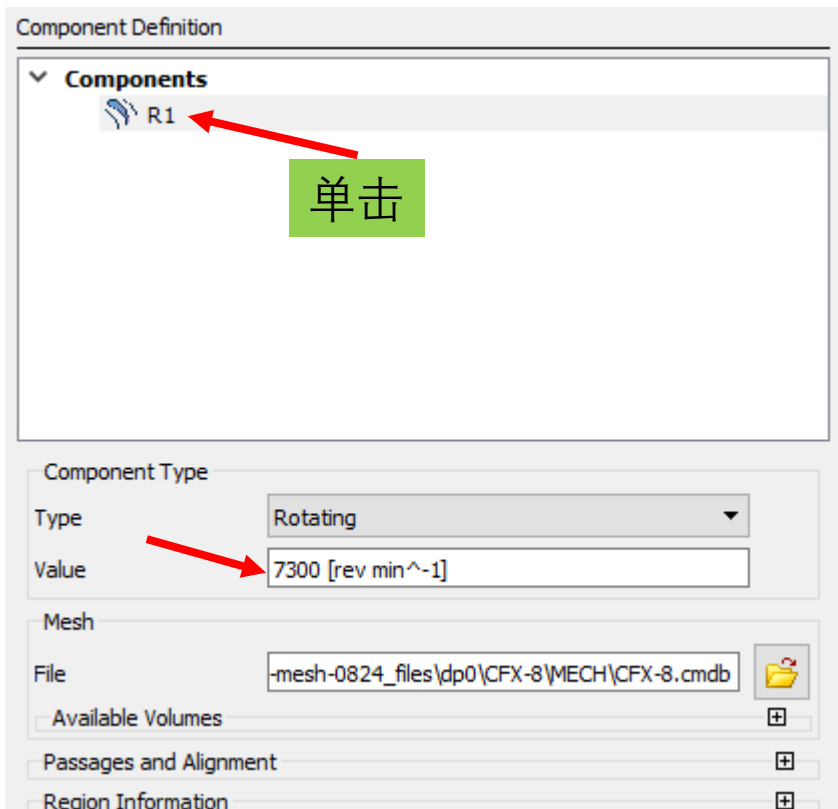
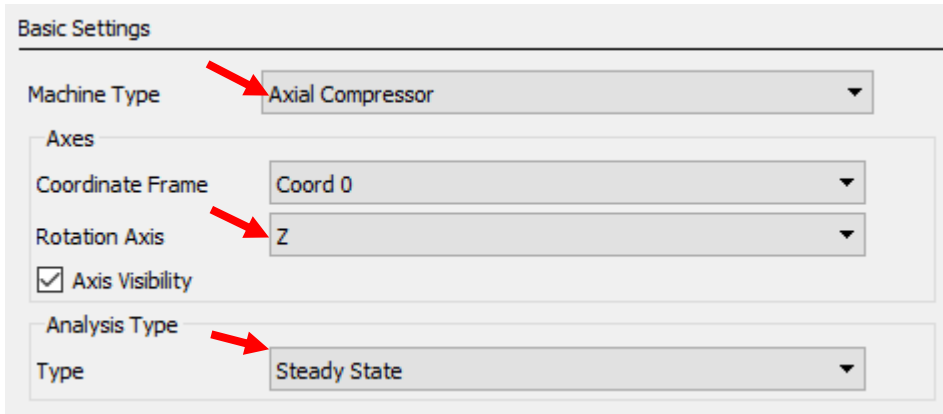
# 建立集合，便于后续选取



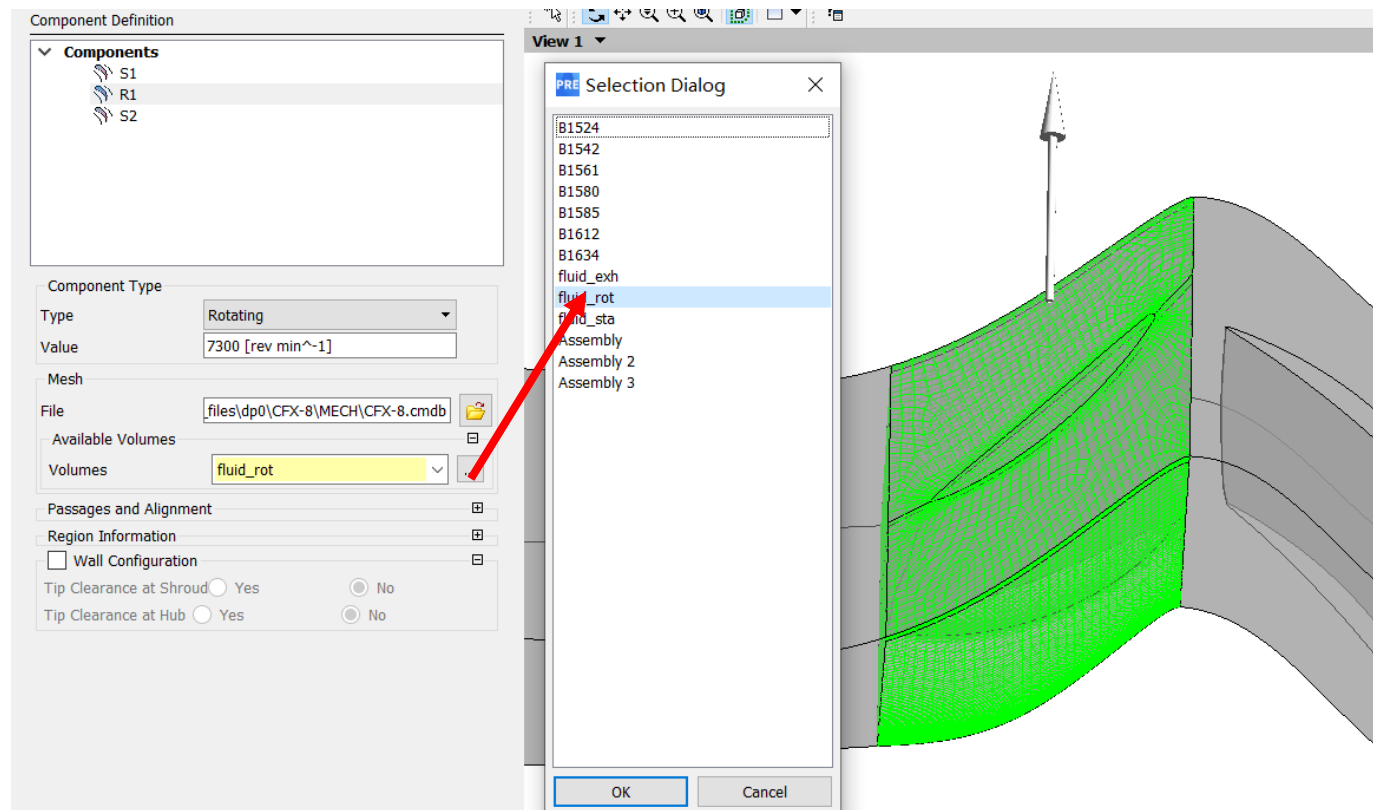
# 打开CFX: Tools > Turbo Mode



# 基本参数设置



选取旋转区域



# 流体参数设置, Interface和周期边界会自动定义

Physics Definition

Fluid: Air Ideal Gas

Model Data

Reference Pressure: 1 [atm]

Heat Transfer: Total Energy

Turbulence: Shear Stress Transport

Inflow/Outflow Boundary Templates

None

P-Total Inlet P-Static Outlet

P-Total Inlet Mass Flow Outlet

Mass Flow Inlet P-Static Outlet

Inflow

T-Total: 475 [K]

Mass Flow: Per Component

Mass Flow Rate: 1.743 [kg s<sup>-1</sup>]

Flow Direction: Normal to Boundary

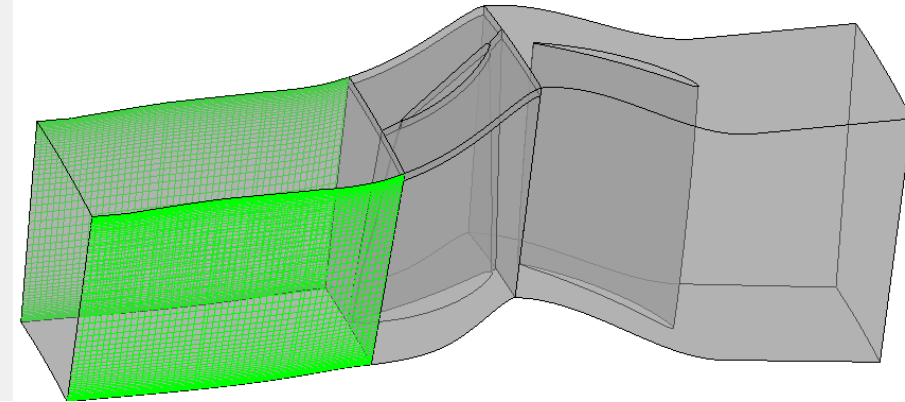
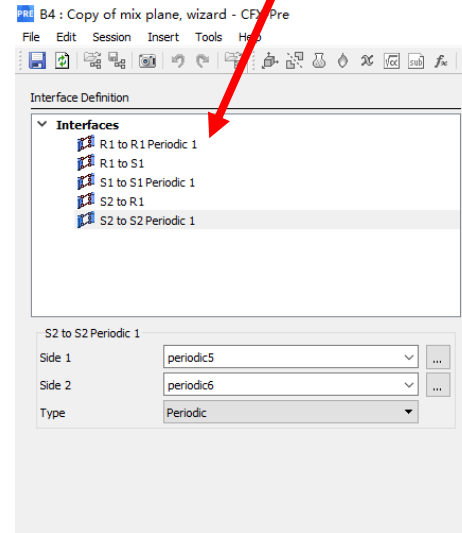
Outflow

P-Static: 334934 [Pa]

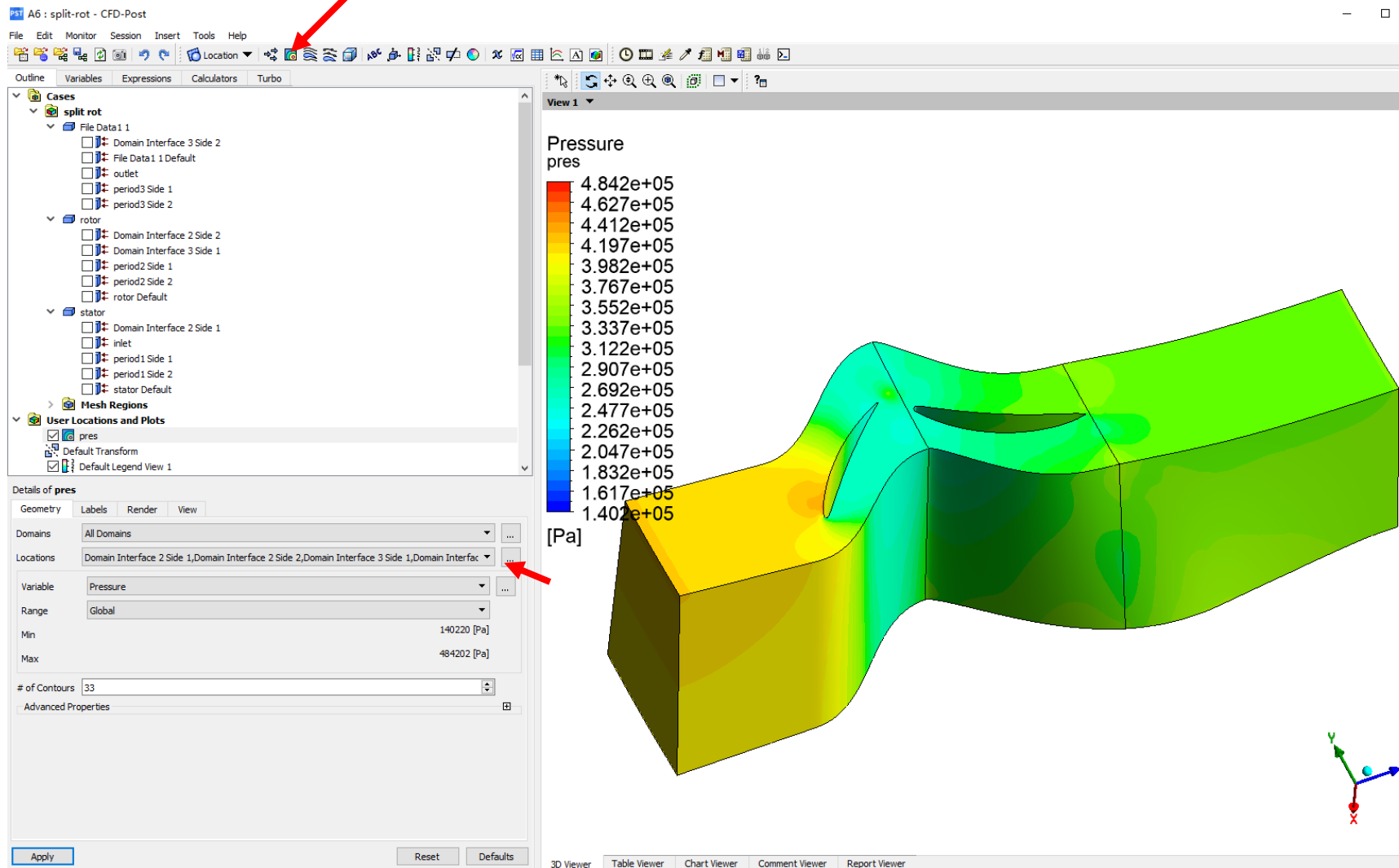
Interface

Default Type: Stage (Mixing-Plane)

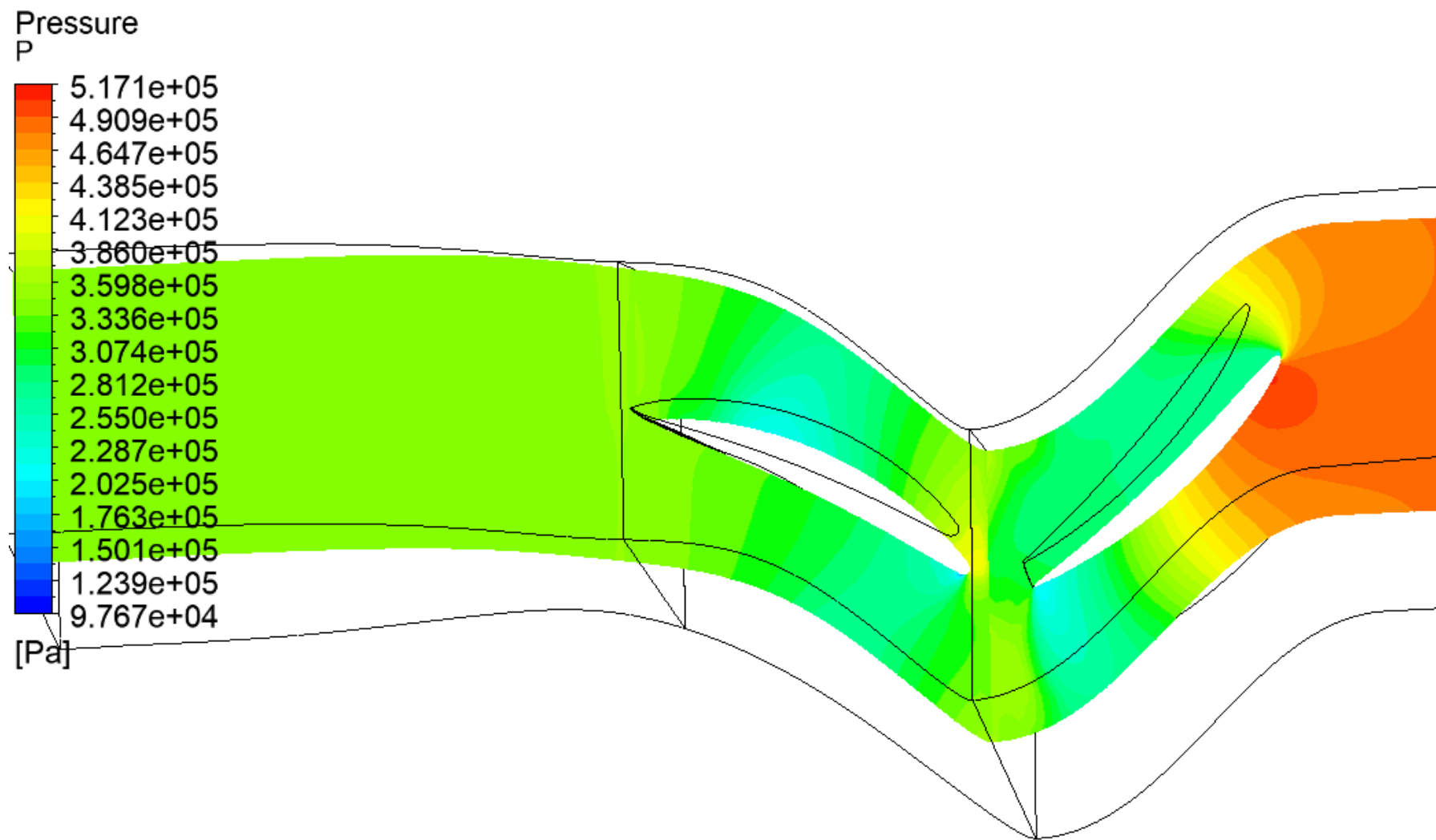
Solver Parameters



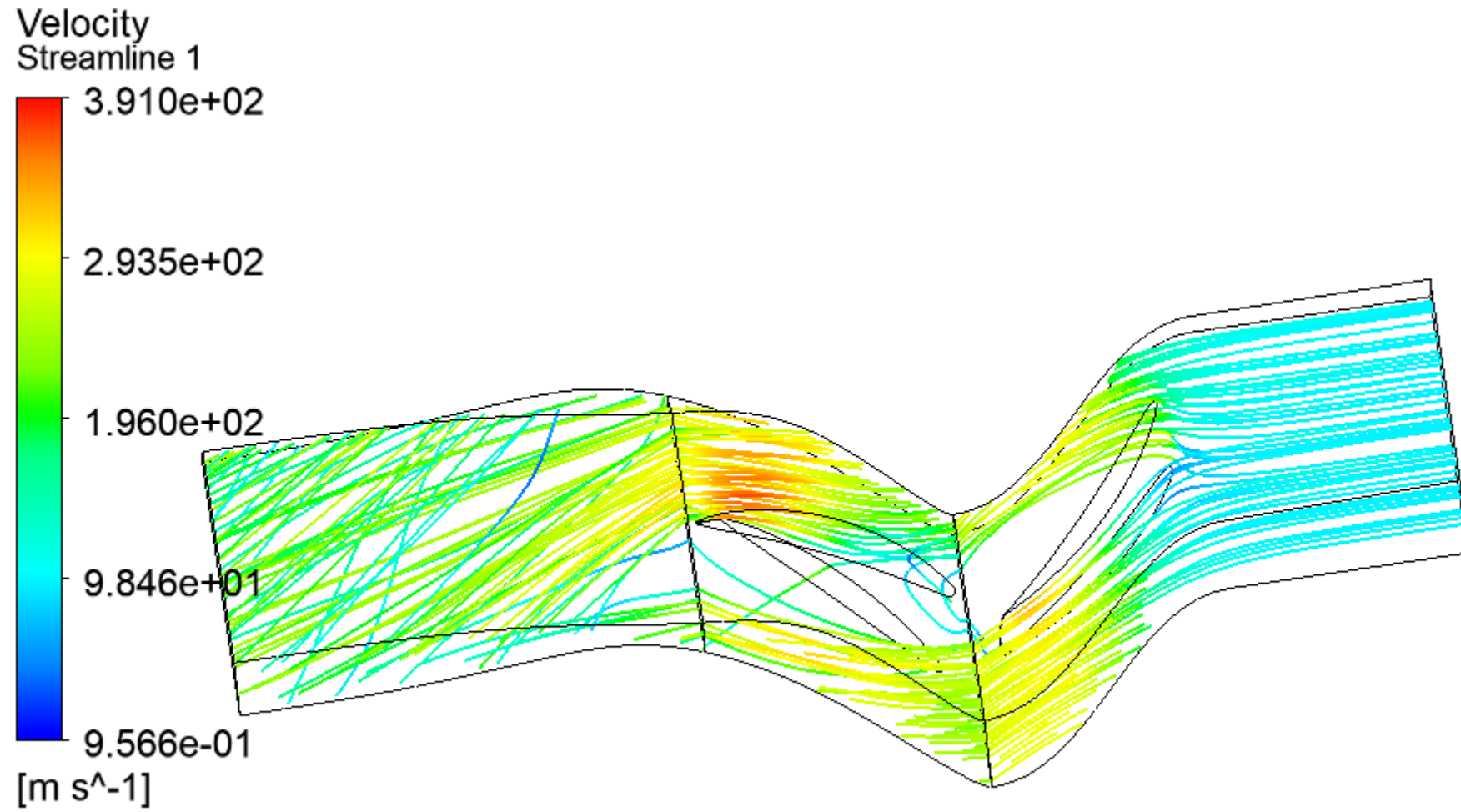
# 结果后处理：显示压力云图



# 截面云图



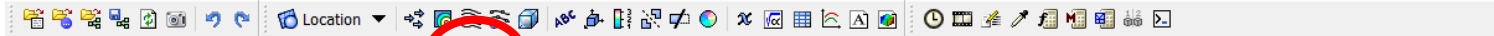
# 流线



# Turbo Mode 扩展

PS1 C6 : turbo mode - CFD-Post

File Edit Monitor Session Insert Tools Help



Outline Variables Expressions Calculators **Turbo**

- Initialization
  - turbo mode
    - Component 1 (S1)
    - Component 2 (R1)
    - Component 3 (S2)
- Plots
  - 3D View
  - Blade-to-Blade
  - Meridional
  - Turbo Charts
    - Blade Loading
    - Circumferential
    - Hub to Shroud
    - Inlet to Outlet
- Turbo Macros

Details of Component 3 (S2)

Definition Instancing Data Instancing

Number of Graphical Instances: 48

Apply Rotation

Axis Definition: From Results File

Method: Rotation Axis

From	0	0	0
To	0	0	1

Instance Definition: From Results File

Number of Passages: 48

Passages per Component: 1

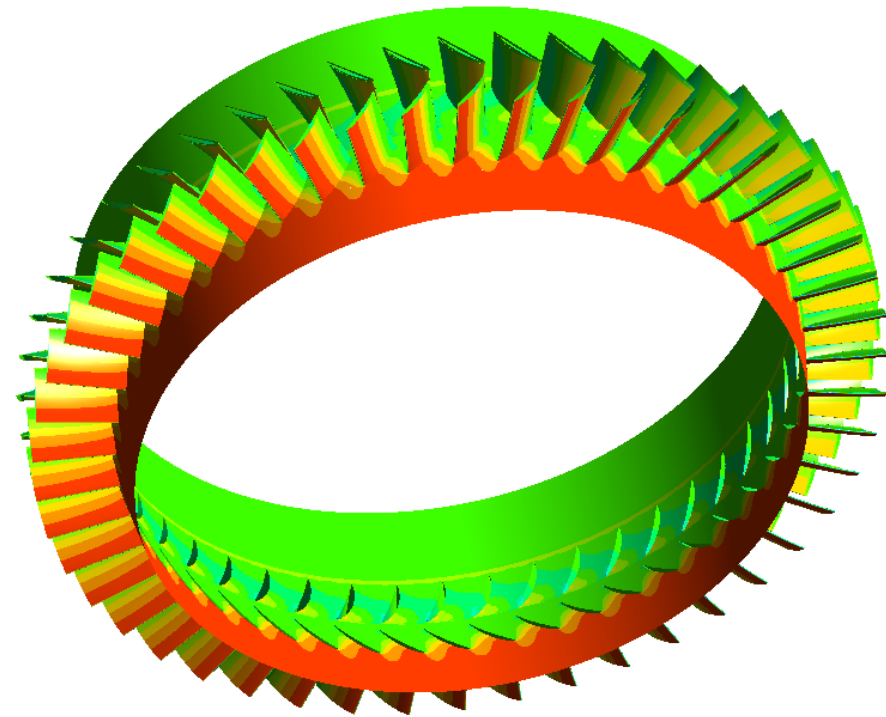
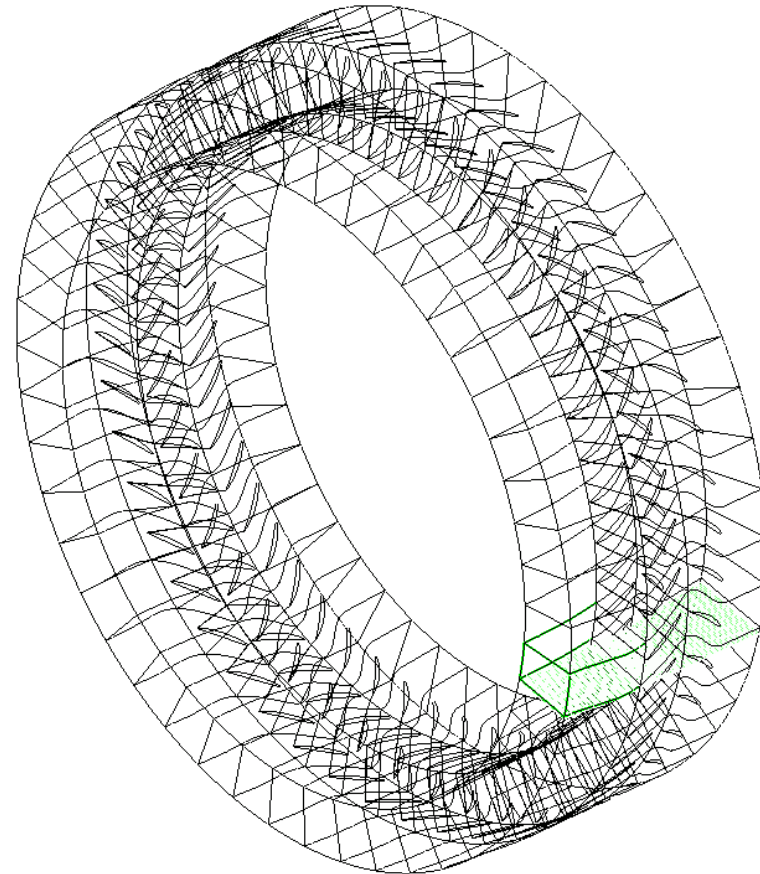
Apply Translation

Translation	0	0	0
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Apply Reflection

Method: From Plane

Plane: ...



# 摘要

- 应用 Ansys CFX 进行gas turbine燃气轮机的网格制作，以及CFD稳态流场分析。讲解了周期对称模型的几何处理，叶片处理，包括Solidworks和SpaceClaim中的几何处理, 在Workbench下制作网格，并导入到CFX进行稳态流场分析。可用于压气机，航空发动机的CFD分析。
- 基于作者的经验以及认知水平，仅供参考。
- 如需进一步讨论，请联系我司。