

Title

Axial Compressor Rotor Report

Date

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1. File Report

Table 1. File Information for Rotor 37_003

Case	Rotor 37_003
File Path	D:/ANSYS/ROTOR 37/SOLUTION/Rotor 37_003.res
File Date	03 August 2024
File Time	02:14:05 PM
File Type	CFX5
File Version	24.1

2. Mesh Report

Table 2. Mesh Information for Rotor 37_003

Domain	Nodes	Elements
R1	158309	147882

Table 3. Mesh Statistics for Rotor 37_003

Domain	Maximum Edge Length Ratio
R1	235.171

3. Physics Report

Table 4. Domain Physics for Rotor 37_003

Type Fluid Location Passage **Materials** Air Ideal Gas **Fluid Definition Material Library Morphology Continuous Fluid **Settinus** Buoyancy Model Non Buoyant Domain Motion Rotating Alternate Rotation Model true Angular Velocity 1.7189e+4 [rev min^-1] Axis Definition Coordinate Axis Rotation Axis Coord 0.1 Reference Pressure 0.0000e+0 [atm] Heat Transfer Model Total Energy Include Viscous Work Term True Turbulence Model k epsilon Turbulent Wall Functions Scalable High Speed Model Off **Domain Interface - R1 to R1 Internal Side 1 Boundary List1 R1 to R1 Internal Side 2 Interface Type Fluid Fluid **Settinus** Interface Models General Connection Mass And Momentum Conservative Interface Flux Mesh Connection GGI **Domain Interface - R1 to R1 Periodic 1 Boundary List1 R1 to R1 Periodic 1 Boundary List2 R1 to R1 Periodic 1 Boundary List3 R1 to R1 Periodic 1 Boundary List4 R1 to R1 Periodic 1 Boundary List5 R1 to R1 Periodic 1 Boundary List6 R1 to R1 Periodic 1 Boundary List7 R1 to R1 Periodic 1 Boundary List8 R1 to R1 Periodic 1 Boundary List9 R1 to R1 Periodic 1 Bo	Table 4. Domain Physics for Rotor 37_003 Domain - R1							
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Axis Definition Coordinate Axis Rotation Axis Coord 0.1	Settings							
Rotation Axis Coord 0.1	Interface Models	Rotational Periodicity						
	Axis Definition	Coordinate Axis						
Mesh Connection Automatic	Rotation Axis	Coord 0.1						
	Mesh Connection	Automatic						

Table 5. Boundary Physics for Rotor 37_003

Domain	Boundaries				
R1	Boundary - R1 Inlet				
	Туре	INLET			

A	xial Compressor Rotor Report						
Location	INFLOW						
Settings							
Flow Direction	Normal to Boundary Condition						
Flow Regime	Subsonic						
Heat Transfer	Stationary Frame Total Temperature						
Stationary Frame Total Temperature	2.8815e+2 [K]						
Mass And Momentum	Stationary Frame Total Pressure						
Relative Pressure	1.0000e+0 [atm]						
Turbulence	Medium Intensity and Eddy Viscosity Ratio						
Boundary - R1 to	R1 Internal Side 1						
Туре	INTERFACE						
Location	SHROUD TIP GGI SIDE 1						
Se	ettings						
Heat Transfer	Conservative Interface Flux						
Mass And Momentum	Conservative Interface Flux						
Turbulence	Conservative Interface Flux						
Boundary - R1 to	o R1 Internal Side 2						
Туре	INTERFACE						
Location	SHROUD TIP GGI SIDE 2						
Se	ettings						
Heat Transfer	Conservative Interface Flux						
Mass And Momentum	Conservative Interface Flux						
Turbulence	Conservative Interface Flux						
Boundary - R1 to R1 Periodic 1 Side 1							
Туре	INTERFACE						
Location	PER1						
Se	ettings						
Heat Transfer	Conservative Interface Flux						
Mass And Momentum	Conservative Interface Flux						
Turbulence	Conservative Interface Flux						
Boundary - R1 to	R1 Periodic 1 Side 2						
Туре	INTERFACE						
Location	PER2						
Se	ettings						
Heat Transfer	Conservative Interface Flux						
Mass And Momentum	Conservative Interface Flux						
Turbulence	Conservative Interface Flux						
Boundar	y - R1 Outlet						
Туре	OUTLET						
Location	OUTFLOW						
Se	ettings						
Flow Regime Subsonic							
Mass And Momentum	Average Static Pressure						
Pressure Profile Blend	5.0000e-2						
Relative Pressure	1.0000e+0 [atm]						

Pressure Averaging	Average Over Whole Outlet				
Boundary - R1 Blade					
Туре	WALL				
Location	BLADE				
	Settings				
Heat Transfer	Adiabatic				
Mass And Momentum	No Slip Wall				
Wall Roughness	Smooth Wall				
Bound	dary - R1 Hub				
Туре	WALL				
Location	HUB				
	Settings				
Heat Transfer	Adiabatic				
Mass And Momentum	No Slip Wall				
Wall Roughness	Smooth Wall				
Bounda	ary - R1 Shroud				
Туре	WALL				
Location	SHROUD				
Settings					
Heat Transfer	Adiabatic				
Mass And Momentum	No Slip Wall				
Wall Velocity	Counter Rotating Wall				
Wall Roughness	Smooth Wall				

Chart 1.

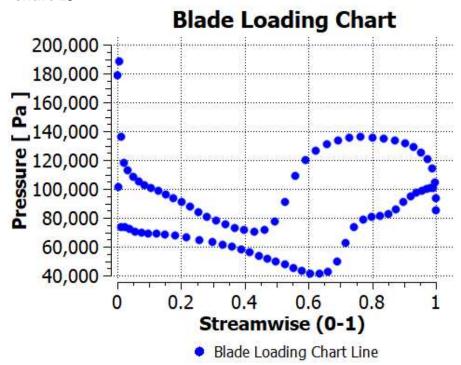
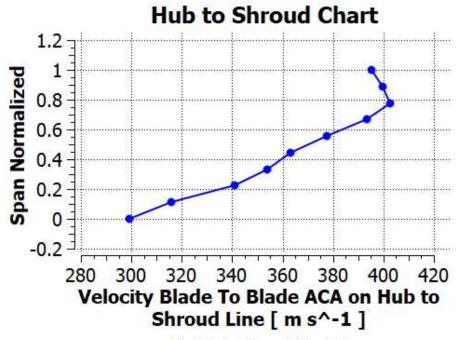


Chart 2.



- Hub to Shroud Chart Line

Chart 3.

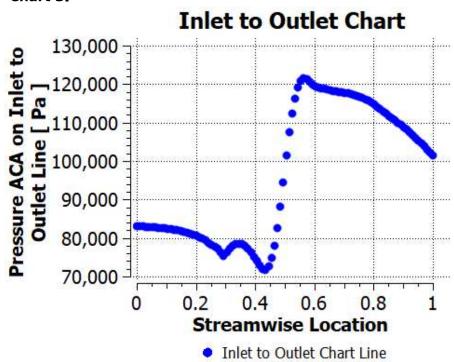
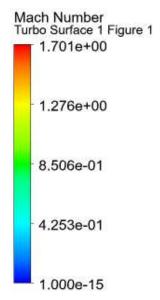


Figure 1.



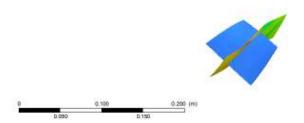




Figure 2.

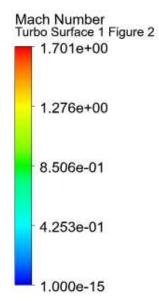






Table 6.

Mass flow rate	20.91		
Mass flow rate outlet	20.91		
PR	1.75		
TR	1.21		
Efficiency	0.82		

4. Tabulated Results

The first table below gives a summary of the performance results for the axial compressor rotor. The second table lists the mass or area averaged solution variables and derived quantities computed at the inlet, leading edge (LE Cut), trailing edge (TE Cut) and outlet locations. The flow angles Alpha and Beta are relative to the meridional plane; a positive angle implies that the tangential velocity is the same direction as the machine rotation.

Table 7. Compressor Performance Results

Table 71 Compressor refrormance Results					
1800.0300	[radian s^-1]				
20.9142	[kg s^-1]				
17.0771	[m^3 s^-1]				
1285320.0000	[W]				
0.2173	[m]				
0.4565					
0.7082					
0.4017					
0.7979					
1.7536					
1.2123					
82.3159					
83.5601					
	1800.0300 20.9142 17.0771 1285320.0000 0.2173 0.4565 0.7082 0.4017 0.7979 1.7536 1.2123 82.3159				

Table 8. Summary Data

Quantity	Inlet	LE Cut	TE Cut	Outlet	TE/LE	TE-LE	Units
Density	1.0628	0.9842	1.3311	1.1834	1.3525	0.3469	[kg m^-3]
Pstatic	83077.9000	75438.1000	120314.0000	101353.0000	1.5949	44875.6000	[Pa]
Ptotal	101318.0000	99965.5000	182630.0000	177669.0000	1.8269	82665.0000	[Pa]
Ptotal (rot)	101304.0000	99548.0000	93752.9000	90954.5000	0.9418	-5795.0700	[Pa]
Tstatic	272.2060	265.0340	311.4450	297.7990	1.1751	46.4106	[K]
Ttotal	288.1540	288.4740	349.1730	349.3420	1.2104	60.6993	[K]
Ttotal (rot)	288.1420	288.1440	288.1890	288.3900	1.0002	0.0450	[K]
Hstatic	-26057.8000	-33261.7000	13353.2000	-352.2880	-0.4015	46614.8000	[J kg^-1]
Htotal	-10039.9000	-9718.5800	51247.8000	51417.0000	-5.2732	60966.4000	[J kg^-1]
Rothalpy	-10052.3000	-10050.4000	-10005.2000	-9802.7500	0.9955	45.1992	[J kg^-1]
Entropy	-34.2325	-28.9899	-9.8718	-1.6089	0.3405	19.1181	[J kg^-1 K^-1]
Mach (abs)	0.5406	0.6635	0.7759	0.9293	1.1693	0.1123	
Mach (rel)	1.3062	1.3713	0.9151	1.0567	0.6673	-0.4562	
U	393.2390	391.3520	391.1440	391.0040	0.9995	-0.2076	[m s^-1]

,							
Cm	178.5510	213.8380	204.6510	277.3330	0.9570	-9.1873	[m s^-1]
Cu	0.0341	3.2861	173.7060	158.0940	52.8616	170.4200	[m s^-1]
С	178.5580	216.0690	279.3300	319.9940	1.2928	63.2619	[m s^-1]
Distortion Parameter	1.0058	1.0158	1.0515	1.0091	1.0351	0.0356	
Flow Angle: Alpha	0.0141	1.4587	39.7740	29.7107	27.2658	38.3153	[degree]
Wu	-393.2050	-388.0670	-217.4390	-232.9100	0.5603	170.6280	[m s^-1]
W	432.3110	443.7810	303.6650	363.8300	0.6843	-140.1150	[m s^-1]
Flow Angle: Beta	-65.3659	-60.2589	-41.0043	-39.6999	0.6805	19.2546	[degree]

5. Blade Loading Charts

Chart 4. Blade Loading at 20% Span

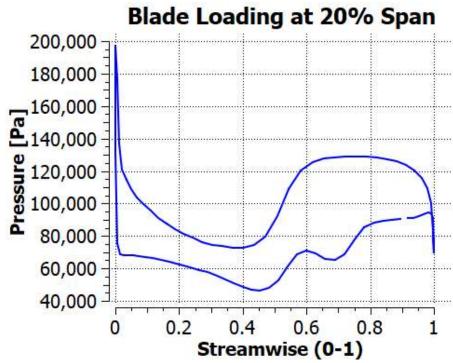


Chart 5. Blade Loading at 50% Span

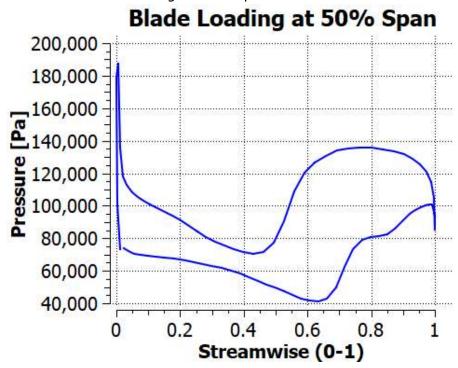
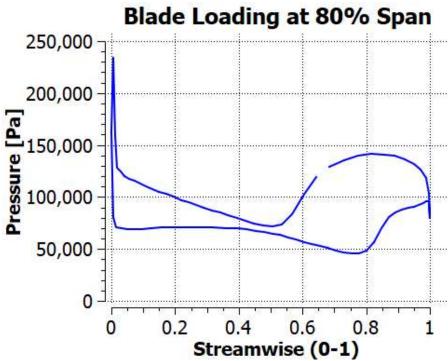


Chart 6. Blade Loading at 80% Span



6. Streamwise Charts

Chart 7. Streamwise Plot of Pt and P

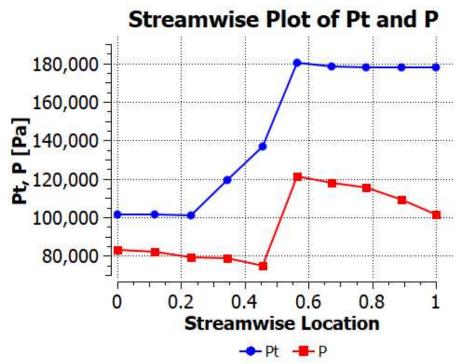


Chart 8. Streamwise Plot of Tt and T

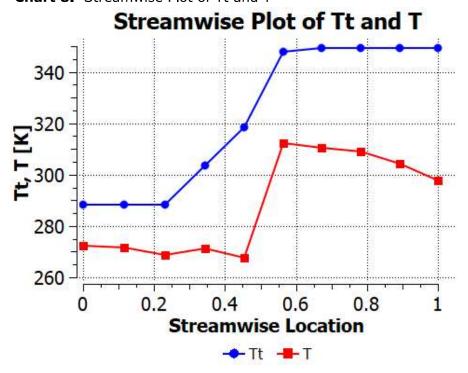


Chart 9. Streamwise Plot of Absolute and Relative Mach Number

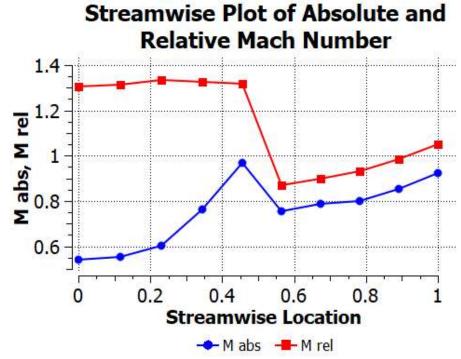
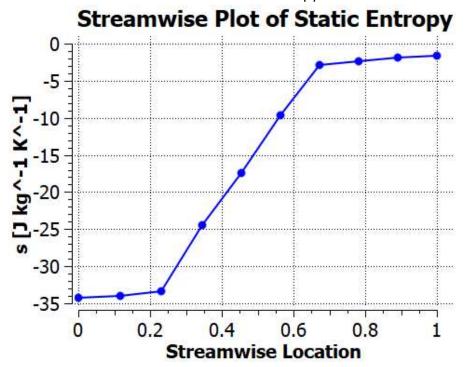


Chart 10. Streamwise Plot of Static Entropy



7. Spanwise Charts

Chart 11. Spanwise Plot of Alpha and Beta at LE

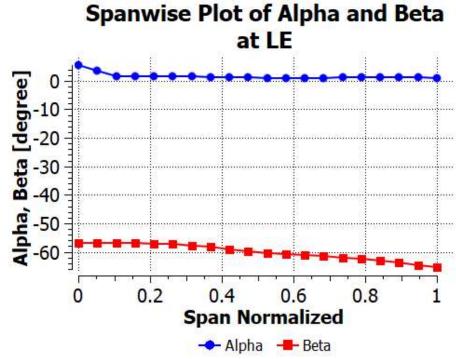


Chart 12. Spanwise Plot of Relative Mach Number at LE

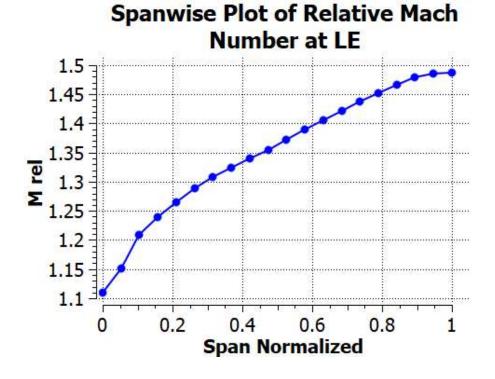


Chart 13. Spanwise Plot of Alpha and Beta at TE

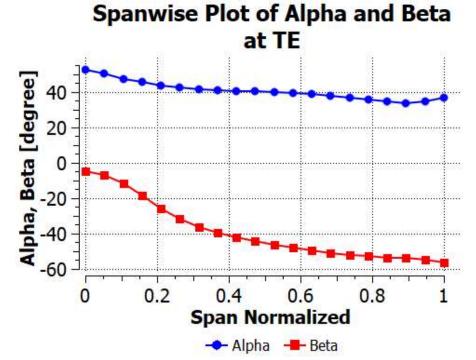


Chart 14. Spanwise Plot of Relative Mach Number at TE

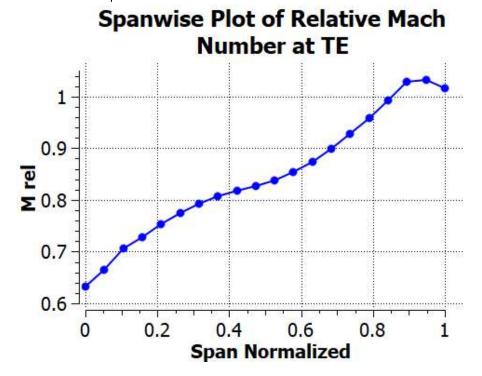


Chart 15. Spanwise Plot of Absolute Mach Number at TE

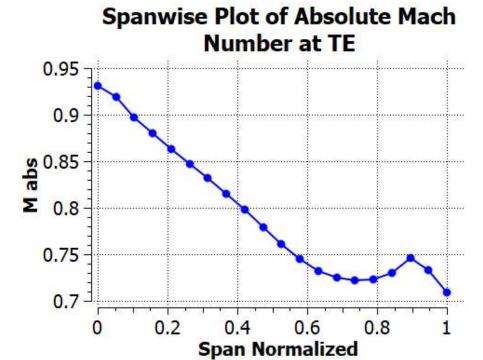
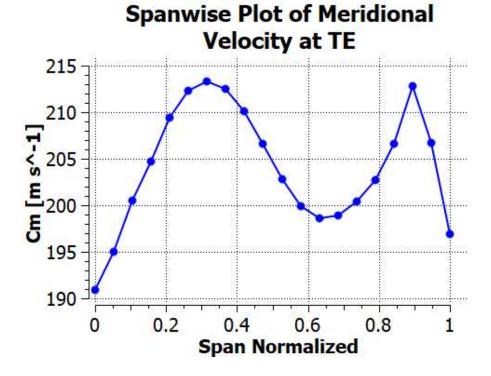


Chart 16. Spanwise Plot of Meridional Velocity at TE



8. Blade Geometry Plots

Figure 3. Isometric 3D View of the Blade, Hub and Shroud

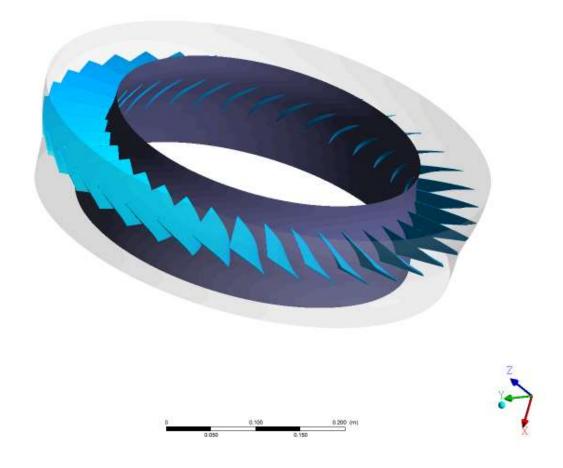
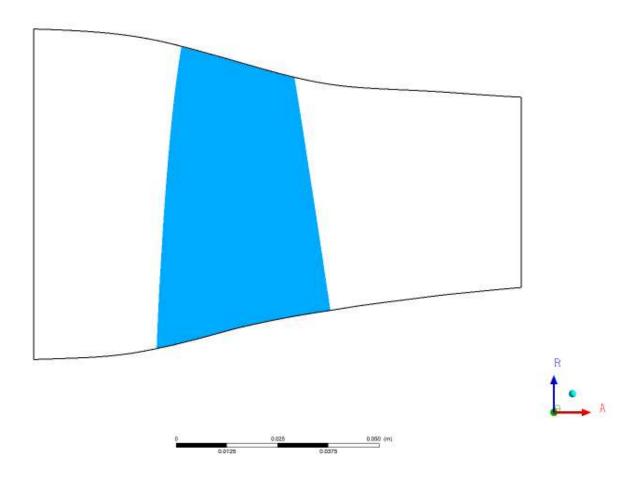
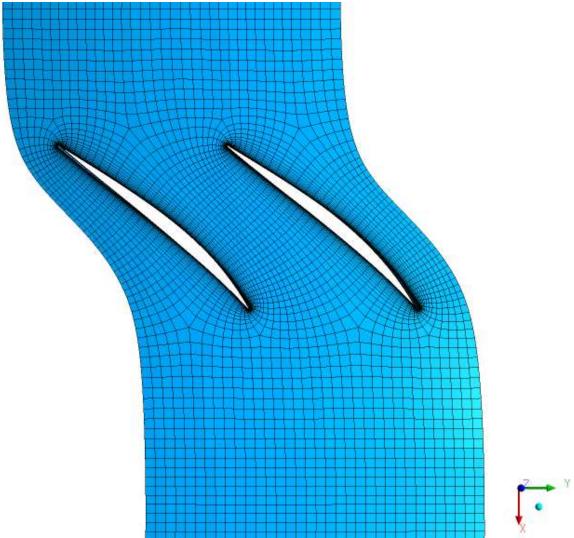


Figure 4. Meridional View of the Blade, Hub and Shroud



9. Blade Mesh Plot

Figure 5. Mesh Elements at 50% Span



10. Blade to Blade Plots

Figure 6. Contour of M rel at 20% Span

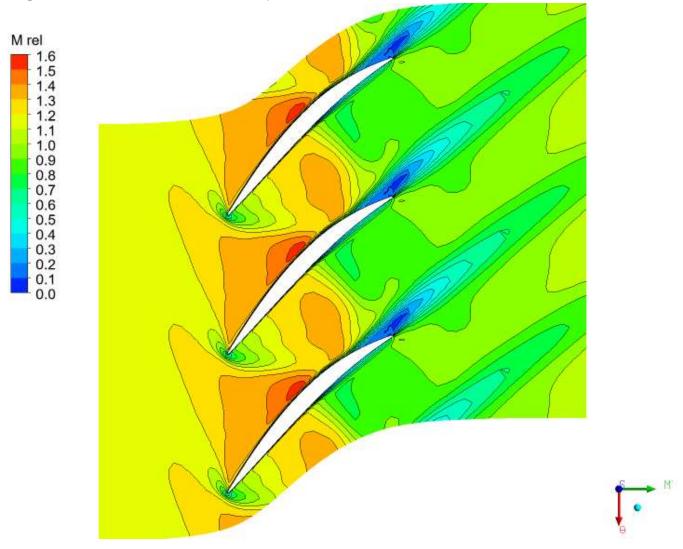


Figure 7. Contour of M rel at 50% Span

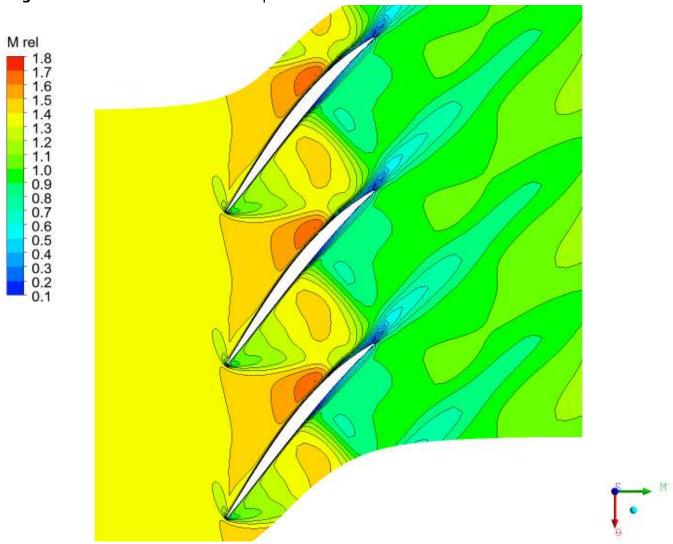


Figure 8. Contour of M rel at 80% Span

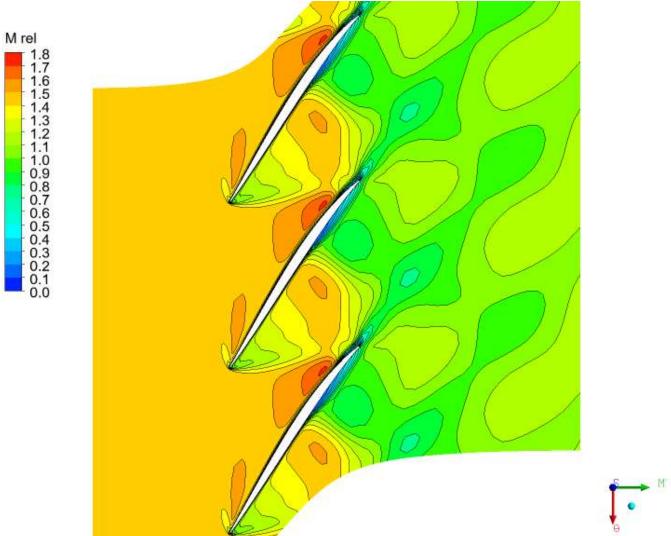


Figure 9. Velocity Vectors at 20% Span

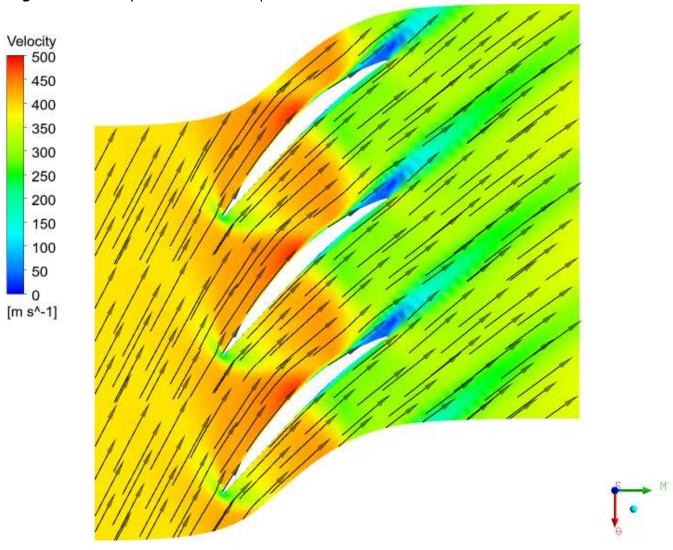


Figure 10. Velocity Vectors at 50% Span

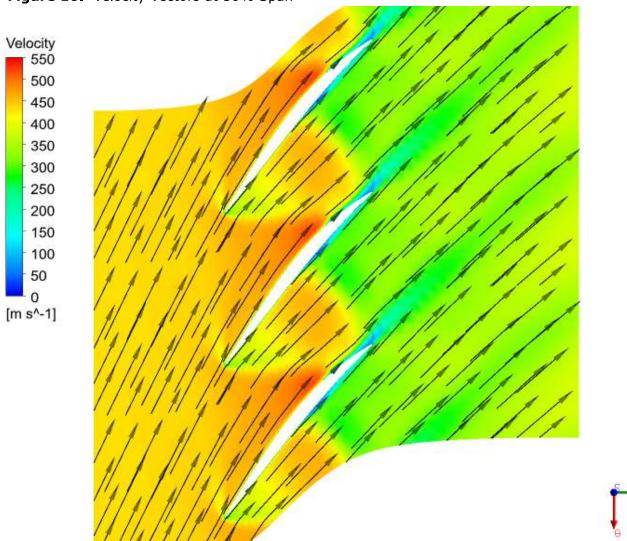


Figure 11. Velocity Vectors at 80% Span

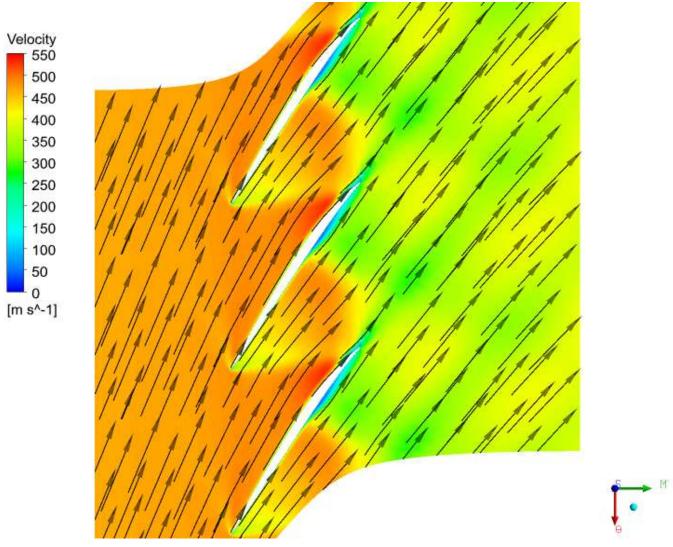


Figure 12. Contour of s at 20% Span

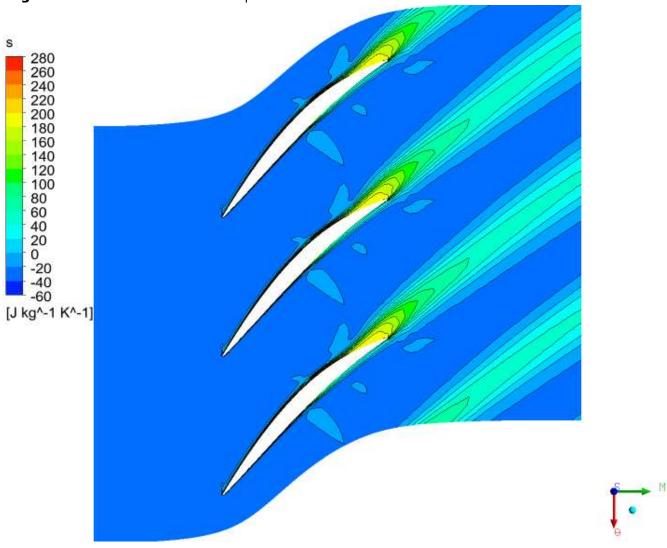


Figure 13. Contour of s at 50% Span

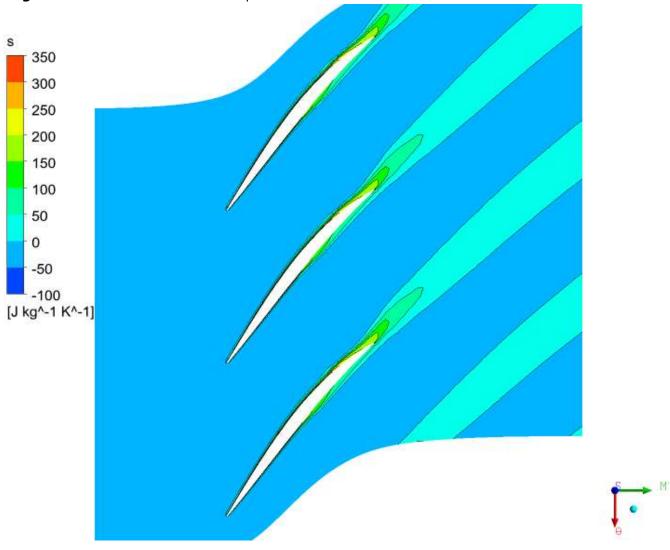
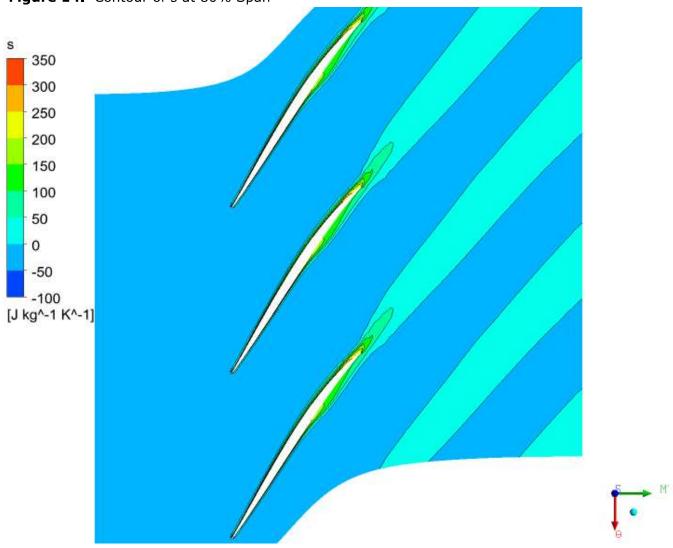


Figure 14. Contour of s at 80% Span



11. Meridional Plots

Figure 15. Contour of Mass Averaged P on Meridional Surface

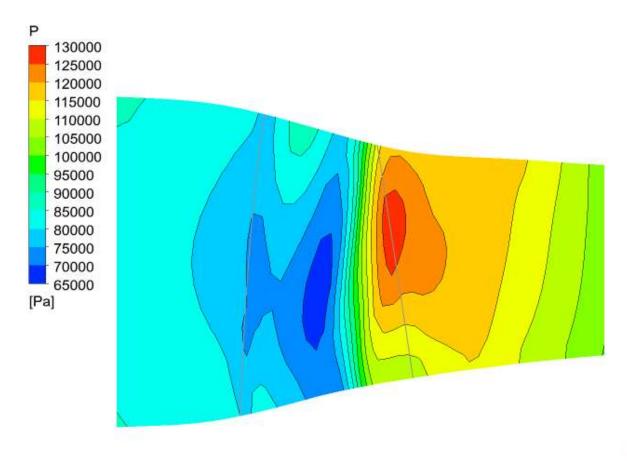




Figure 16. Contour of Mass Averaged M rel on Meridional Surface

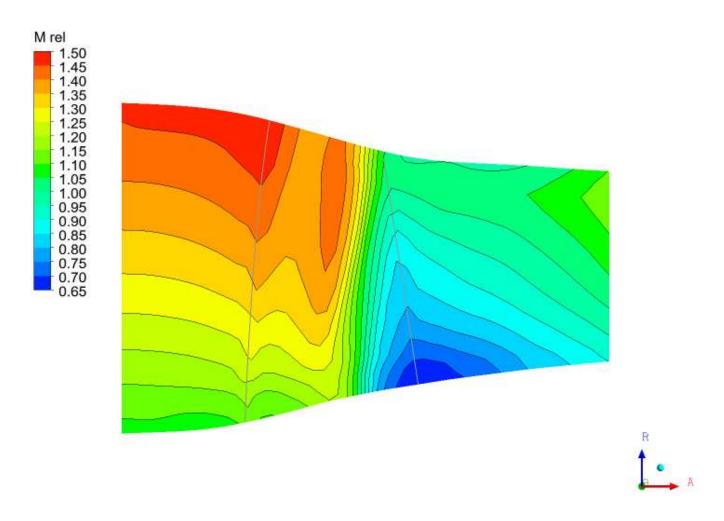
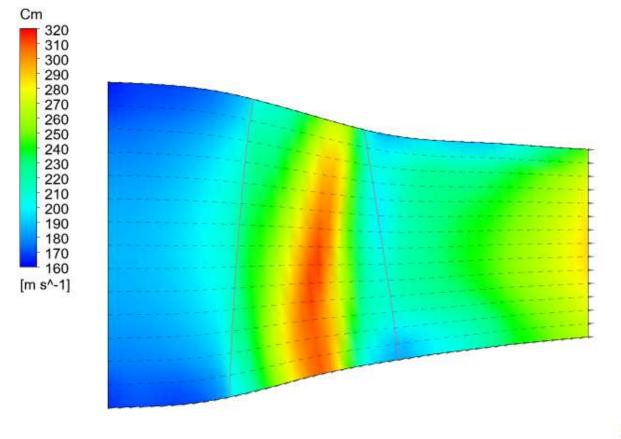


Figure 17. Vector of Area Averaged Cm on Meridional Surface





12. Circumferential Plots

Figure 18. Contour of P at Blade LE

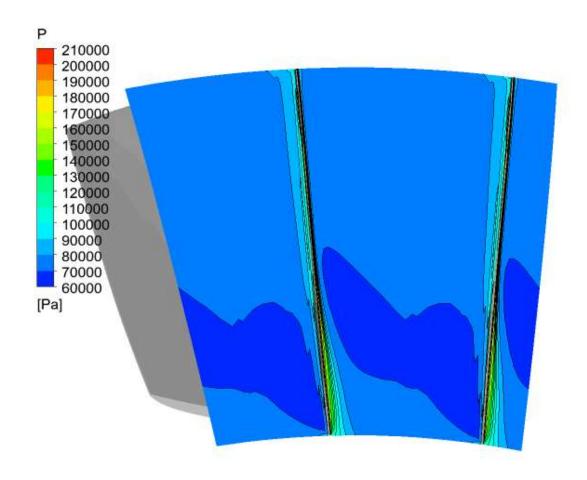




Figure 19. Contour of M rel at Blade LE

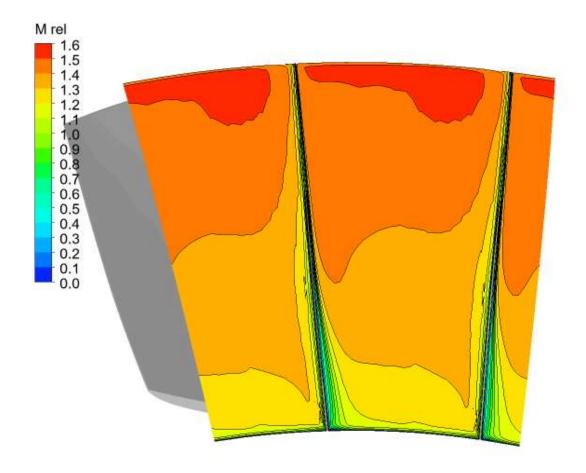




Figure 20. Contour of s at Blade LE

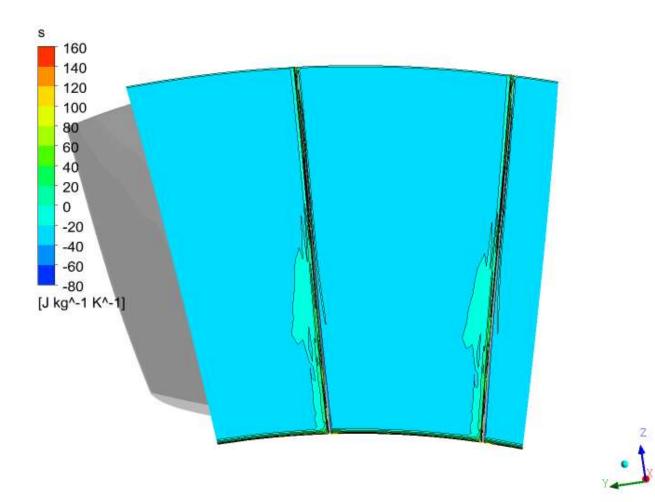




Figure 21. Contour of P at Blade TE

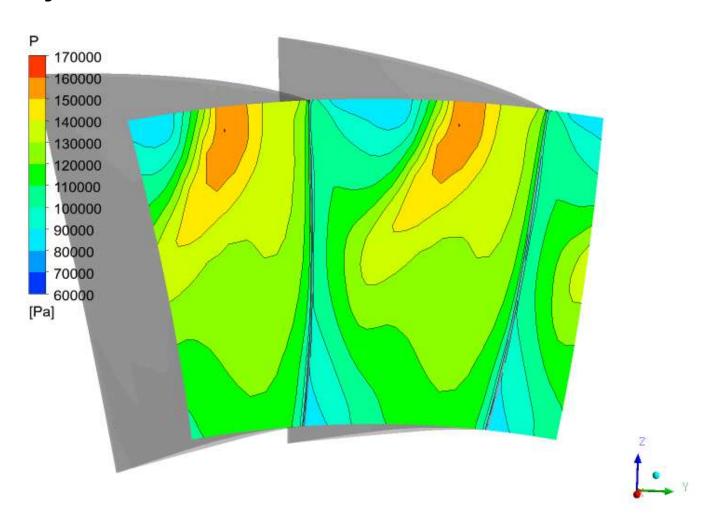


Figure 22. Contour of M rel at Blade TE

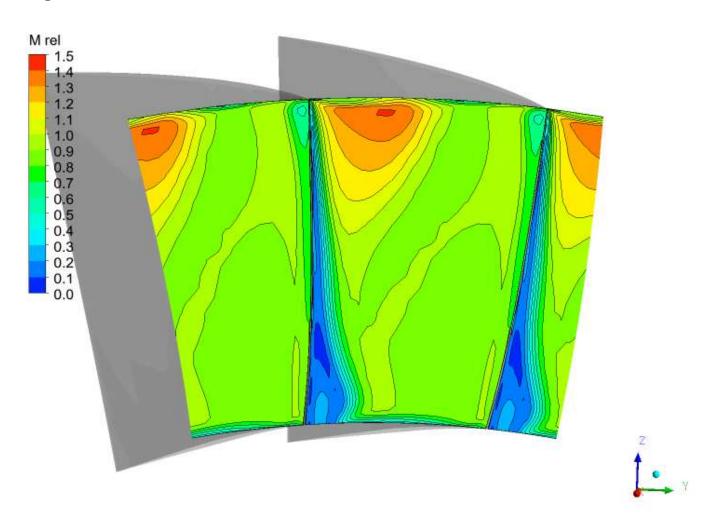
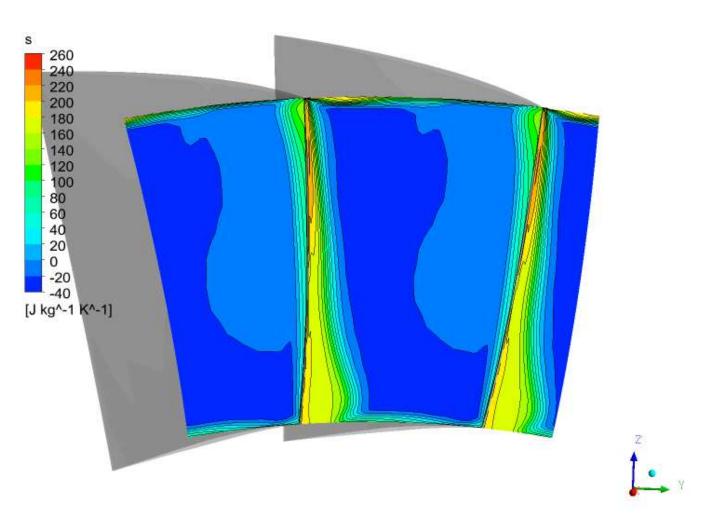


Figure 23. Contour of s at Blade TE



13. Streamline Plot

Figure 24. Velocity Streamlines at Blade TE

