Turbotopo (SAFRAN DemoSHE) – Test case as Demonstrator for ETN EXPERTISE

By SAFRAN, March 27th 2019

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1. Disclaimer:

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2. Mandatory acknowledgment text in the publication when this demonstrator is used by an academic/institution/industry:

"SAFRAN Helicopter Engines company is gratefully acknowledged for providing the model.

In this paper, there is no data representative of an actual Safran Helicopter Engines wheel."

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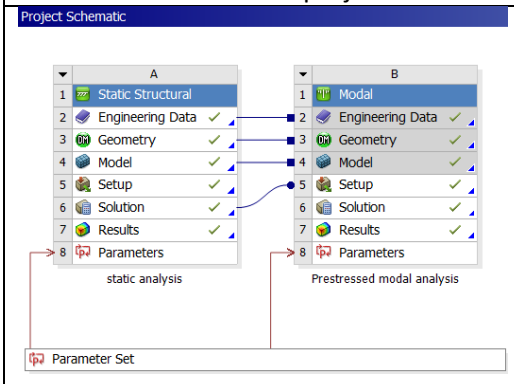
3. Parametric ANSYS WORKBENCH project : v18.0

Workbench project	Parameters



Outline of All Parameters

	A	B	C	D
1	ID	Parameter Name	Value	Unit
2	Input Parameters			
3	static analysis (A1)			
4	P1	Firtree_root_angle	20	degree
5	P2	Number_of_sectors	24	
6	P3	Mid-chord	10	mm
*	New input parameter	New name	New expression	
8	Output Parameters			
*	New output parameter		New expression	
10	Charts			

4. Model

Blade/disk contact	Blade/disk/shroud contact	Blade/disk/underplatform damper contact
		

Geometry source: Design Modeler

- TalonTopo_submodel_files\dp0\SYS\DM\SYS.agdb

Material:

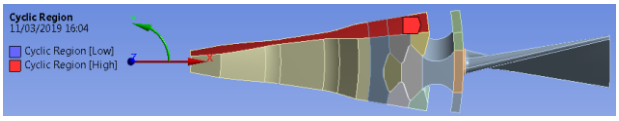
- Titanium Alloy

AWB Titanium alloy properties

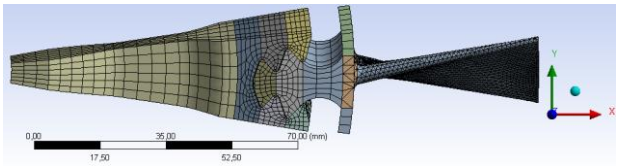
Properties of Outline Row 14: Titanium Alloy

	A	B	C
1	Property	Value	Unit
2	Density	4620	kg m^-3
3	Isotropic Secant Coefficient of Thermal Expansion		
5	Isotropic Elasticity		
6	Derive from	Young's Modulus ...	
7	Young's Modulus	9,6E+10	Pa
8	Poisson's Ratio	0,36	
9	Bulk Modulus	1,1429E+11	Pa
10	Shear Modulus	3,5294E+10	Pa
11	Tensile Yield Strength	9,3E+08	Pa
12	Compressive Yield Strength	9,3E+08	Pa
13	Tensile Ultimate Strength	1,07E+09	Pa
14	Compressive Ultimate Strength	0	Pa

Cyclic symmetry:

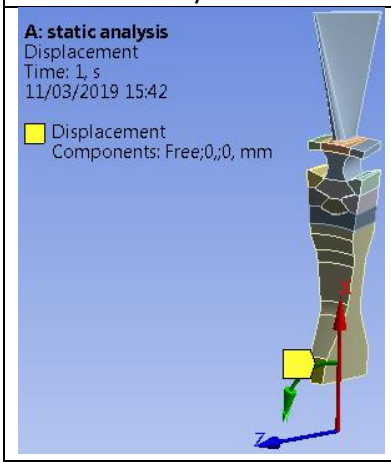
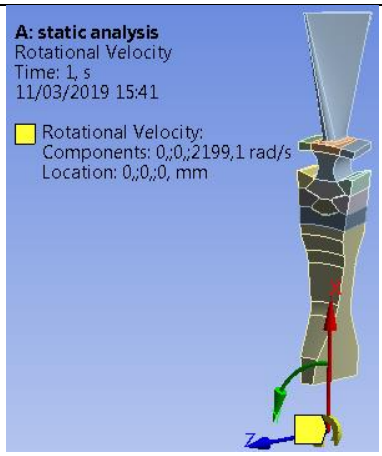


Mesh:

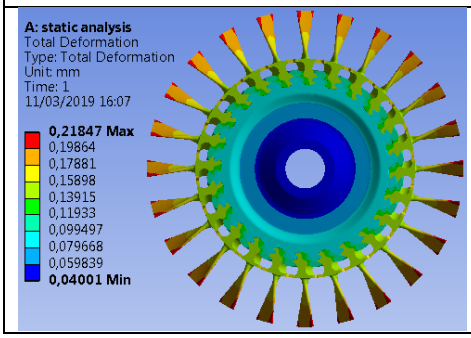
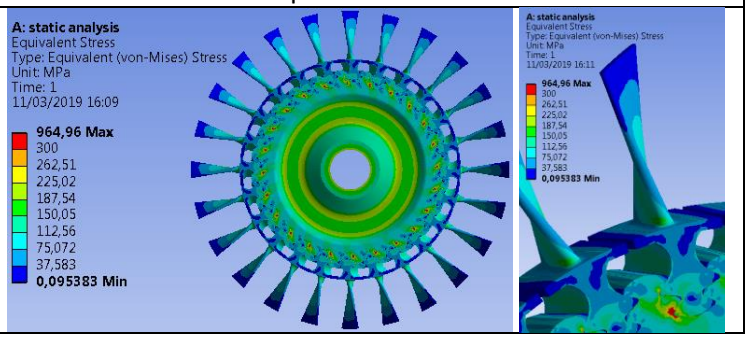


- Statistics:
  - Nodes : 37800
  - Elements : 16638

Loads and Boundary Conditions:

Boundary conditions	Loads
	

5. Static analysis: Blade/disk contact configuration

Total Deformation	Equivalent Stress
	

6. Prestressed modal analysis: Blade/disk contact configuration

Frequencies (Hz):

	Harmonic index												
Mode	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	1082	1016	1215,1	1400	1399,6	1399,3	1399,1	1399,1	1399	1399	1399	1398,9	1398,9
2	1314	1016	1215,1	1400	1399,6	1399,3	1399,1	1399,1	1399	1399	1399	1398,9	2665,6
3	2246	1393,6	1400,4	1827	2297	2492	2574,5	2615,9	2639	2652,5	2660,3	2664,4	4308
4	3215,1	1393,6	1400,4	1827	2297	2492	2574,5	2615,9	2639	2652,5	2660,3	2664,4	5214,3
5	4312,1	3018,7	3161	3463,7	4056,2	4286,1	4299,7	4303,6	4305,6	4306,7	4307,4	4307,8	7150,6

Mode shapes:

	Mode 1	Mode 2	Mode 3	Mode 4	Mode 5
Harmonic index = 12