

PERF011 – Elastic design of a Summarized

cylinder:

The purpose of this benchmark is to measure the performances of an elastic design of a bi-metallic cylinder subjected to a thermal loading.

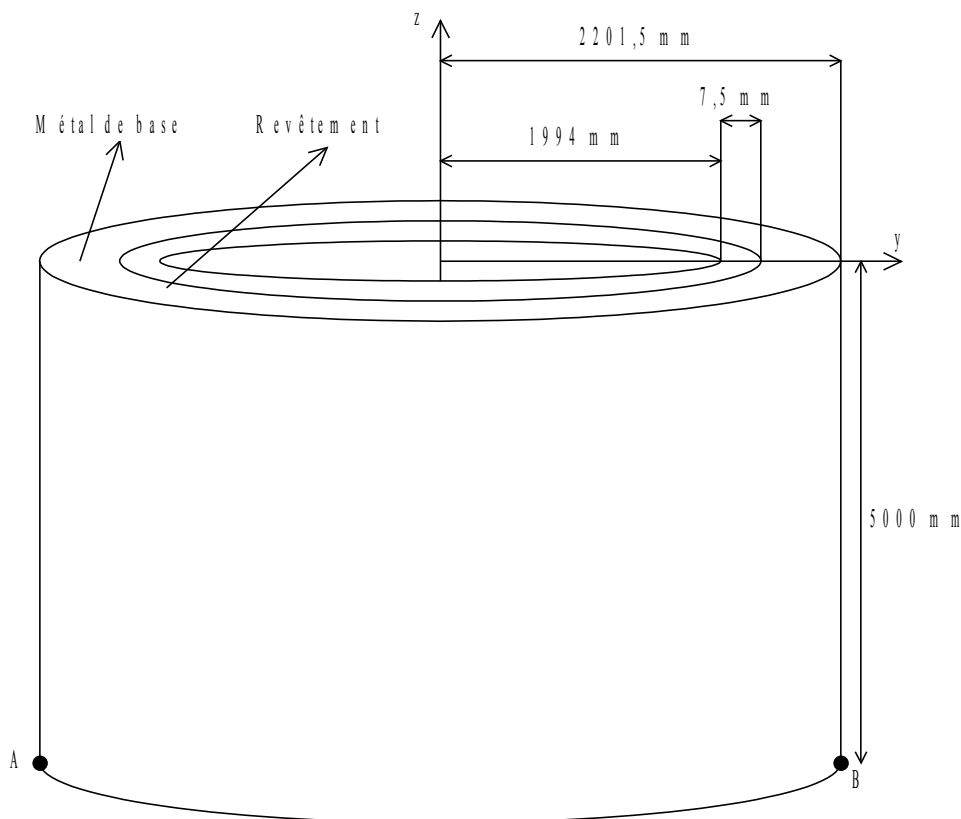
This case test is declined in 2 modelizations which are identical. The differences are related to the change of many processors:

- 1) Modelization a: solver MUMPS on 1 processor,
- 2) Modelization b: solver MUMPS on 4 processors,

1 Problem of reference

1.1 Geometry

the geometry is the following one:



1.2 Properties of the material

Four parameters are indicated, it acts of:

E : modulus Young, expressed in Pa ,
 $\nu = 0.3$ Poisson's ratio,
 isotropic a: thermal coefficient of thermal expansion, expressed in $^{\circ}C$,
 $TEMP_DEF_ALPHA = 20$: value of the temperature to which the values of thermal
 coefficient of thermal expansion $ALPHA$ were determined,
 expressed in $^{\circ}C$.

For the external part:

Temperature ($^{\circ}C$)	E
	0.1,9E+11
	350.1,7E+11
Temperature ($^{\circ}C$)	$ALPHA$
20	1.60E-005
450	1.80E-005

For the internal part:

Temperature (°C)	E
0	2,05E+11
	350.1,8E+11

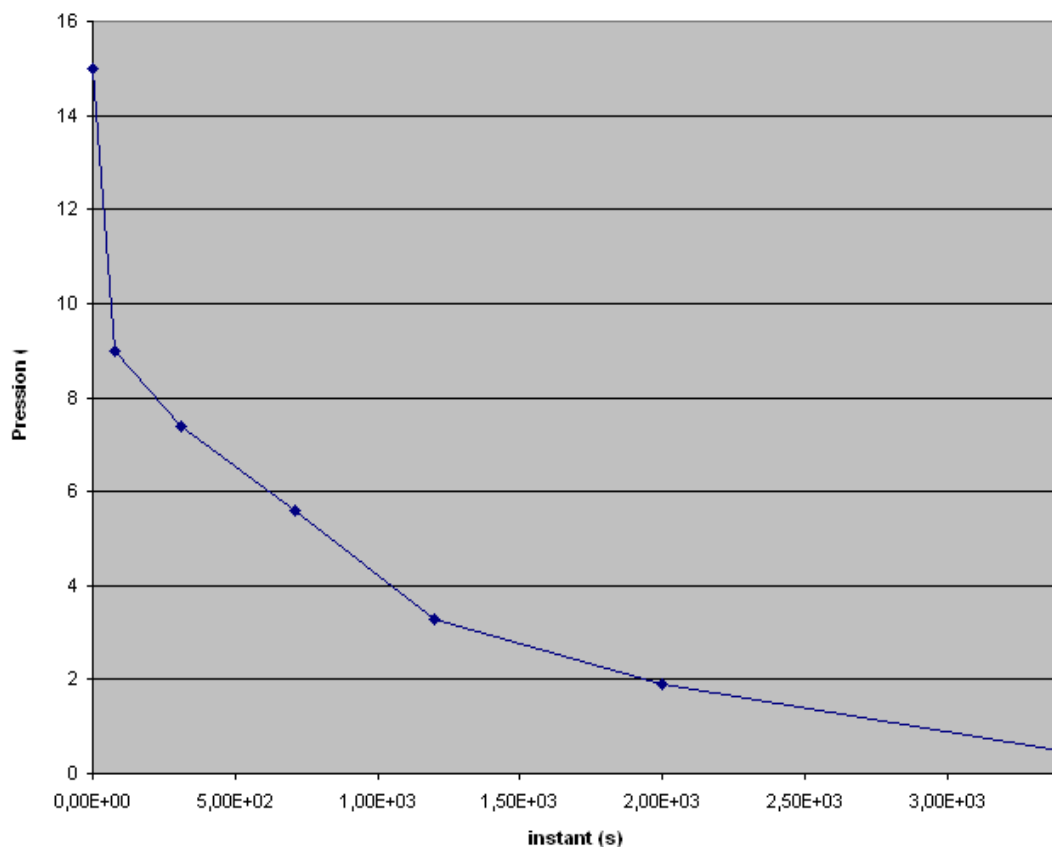
Temperature (°C)	ALPHA
20	1.10E-005
450	1.40E-005

1.3 Boundary conditions and loadings

imposed Displacement:

Lower face	: $DZ = 0$
Not a:	$DX = DY = 0$
Not b:	$DX = 0$
Upper face	: Equality of displacements along the axis Z

interior Pressure and on the sides higher and lower imposed variable according to time:



2 Reference solution

2.1 Method of calculating

the results of reference were got in version 10.2.5 of *Code_Aster*. The values tested are displacements along the axes X and Y on two nodes whose coordinates are:

The node is outside the field of definition with a right profile of the EXCLU type node: C
 $X = -1,775388$; $Y = +1,301768$; $Z = -3.100000$

The node is outside the field of definition with a right profile of the EXCLU type node: D
 $X = +1.614099$; $Y = -1.183506$; $Z = -5.054278$

2.2 Uncertainties

numerical Solution (NON-regression).

3 Modelization A

3.1 Characteristic of the modelization A

Number of processor: 1

Modelization 3D :

Many nodes	284.544				
Number of meshes	158.400	Are:			
			POI1	10.944	
			SEG3	67.392	
			QUAD8	14.400	
			HEXA20	65.664	

3.2 Results

Quantity	Reference	Tolerance (%)
DEPL DX Not C	-7.59E-004	1.e-3
DEPL DY Not C	1.531257E-03	1.e-3
DEPL DX Not D	4.0006E-04	1.e-3
DEPL DY Not D	4.0006E-04	1.e-3

3.3 Environment of execution

Machine	Version	(Mo) Memory		Number DDL	Time execution (MECA STATIQUE) (dry)			
		Allocated	Used		USER	SYSTEM	USER+SYS	ELAPSED
Linux 64 bits (ia64) "Bulls"	10.2.23	6.500	5 822,6	864.574	2 863,8	67,5	2 931,4	2 969,0

4 Modelization B

4.1 Characteristic of the modelization B

Number of processor: 4

Modelization 3D :

Many nodes	284.544			
Number of meshes	158.400	Are:		
			POI1	10.944
			SEG3	67.392
			QUAD8	14.400
			HEXA20	65.664

4.2 Results

Quantity	Reference	Tolerance (%)
DEPL DX Not C	-7.59E-004	1.e-3
DEPL DY Not C	1.531257E-03	1.e-3
DEPL DX Not D	4.0006E-04	1.e-3
DEPL DY Not D	4.0006E-04	1.e-3

4.3 Environment of execution

Machine	Version	(Mo) Memory		Number DDL	Time execution (MECA STATIQUE) (dry)			
		Allocat ed	Used		USER	SYSTE M	USER+ SYS	ELAPSE D
Linux 64 bits (ia64) "Bulls"	10.2.23	6.500	5 125,7	864.574	906,4	26,7	933,2	1 060,5

5 Summary of the results

Machine	Version	(Mo) Memory		Number DDL	Time execution (MECA_STATIQUE) (dry)			
		Allocat ed	Used		USER	SYSTEM	USER+ SYS	ELAPSED
Linux 64 bits (ia64) "Bull"	10.2.23	6.500	5 822,6	864.574	2 863,8	67,5	2 931,4	2 969,0
		6.500	5 125,7	.864 574	906,4	26,7	933,2	1 060,5