RT-DP-3510000-XX-CNES E1 R0

Modèle FEM simplifié - Cylindre composite (reference)

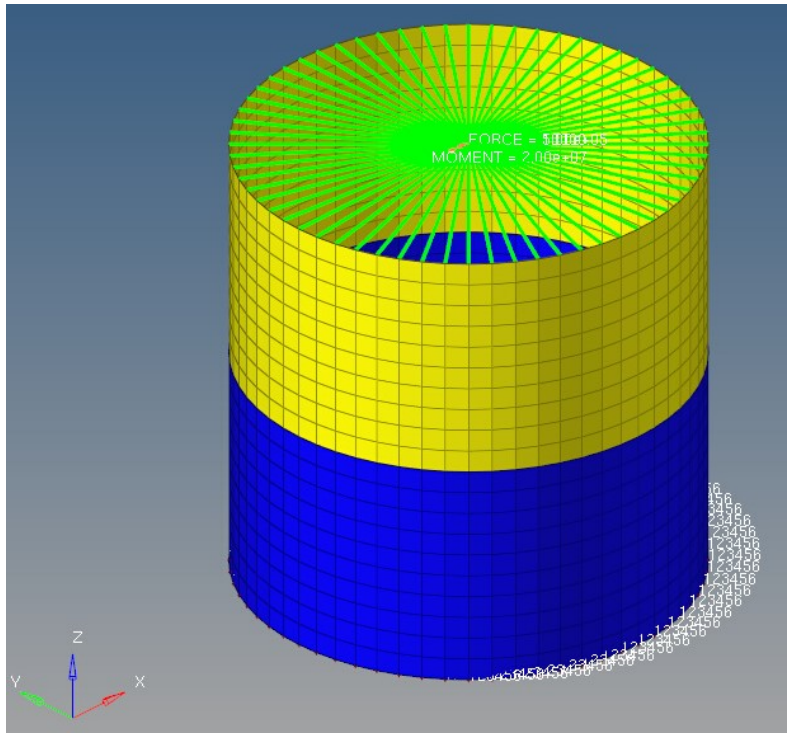
Pour étude d'optimisation probabiliste

16/06/2020

Y. GUERIN (STM)

Cylindre :

- Unités : mm/N/t
- Dimensions :
  - hauteur =1000mm
  - diamètre=1000mm
- Chargement appliqué au centre du RBE2 de l'IF supérieure (dans le repère global) :
  - Fz = -100kN
  - Fy = 50kN
  - Mx = -20kN.m
- Conditions limites :
  - encastrement 6ddl de l'IF inférieure
- Propriétés :
  - Cylindre supérieur (jaune) : coque orthotrope composite (PCOMP) avec empilement : $[0°/45°/-45°/90°]_2$ soit 8 plis de 0,1mm
  - Cylindre inférieur (bleu) : coque isotrope (PSHELL) de 5mm d'épaisseur



- Matériaux :
  - Pli UD composite :

	MID	E1	E2	NU12	[G12]	[G1Z]	[G2Z]	[RHO]
MAT8	2	1.7e+05	7500.00	0.300	5150.00	4000.00	4000.00	1.7e-09
	[A1]	[A2]	[TREF]	[Xt]	[Xc]	[Yt]	[Yc]	[S]
				1600.00	812.000	38.000	120.000	39.000
	[GE]	[F12]	[STRN]					

  - Aluminimum :

	ID	[E]	[G]	[NU]	[RHO]	[A]	[TREF]	[GE]
MAT1	1	6.7e+04		0.300	2.8e-09			
	[ST]	[SC]	[SS]	[MCSID]				

  - Sorties :
    - Champs de déplacement
    - Contraintes Von Mises (cylindre inférieur)
    - Critère de TSAI-WU (cylindre supérieur)
    - Modes de flambage
    - Flux à l'IF inférieure

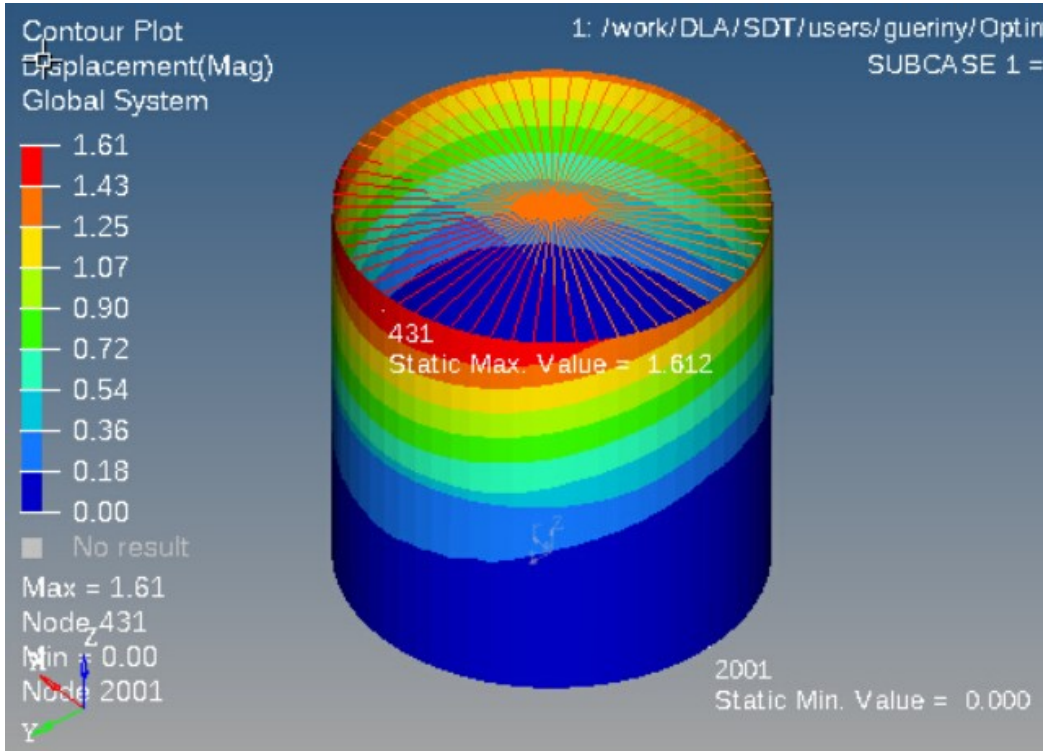
3- Masse centrage et inerties du modèle

```
    O U T P U T   F R O M   G R I D   P O I N T   W E I G H T   G E N E R A T O R
                              REFERENCE POINT =       0
                                       M O
*  2.411774E-02  2.816131E-20  0.000000E+00 -5.488747E-18  7.097148E+00  5.134781E-16 *
* -4.249710E-20  2.411774E-02  0.000000E+00 -7.097148E+00 -1.215261E-17  4.198031E-15 *
*  0.000000E+00  0.000000E+00  2.411774E-02 -6.383782E-16 -3.594347E-15  0.000000E+00 *
* -1.002922E-17 -7.097148E+00 -1.804112E-16  6.102292E+03  3.907985E-13 -1.687539E-12 *
*  7.097148E+00 -2.788804E-18 -4.489464E-15  3.623768E-13  6.102292E+03 -2.842171E-13 *
*  8.326673E-17  4.031497E-15  0.000000E+00 -1.691092E-12 -1.705303E-13  6.029436E+03 *
                                       S
                    *  1.000000E+00  0.000000E+00  0.000000E+00 *
                    *  0.000000E+00  1.000000E+00  0.000000E+00 *
                    *  0.000000E+00  0.000000E+00  1.000000E+00 *
        DIRECTION
    MASS AXIS SYSTEM (S)     MASS              X-C.G.        Y-C.G.        Z-C.G.
           X            2.411774E-02     -2.275813E-16 -2.129047E-14  2.942708E+02
           Y            2.411774E-02      1.740640E-13 -5.038868E-16  2.942708E+02
           Z            2.411774E-02      1.490333E-13 -2.646924E-14  0.000000E+00
                                       I(S)
                    *  4.013808E+03 -3.907985E-13  4.521810E-13 *
                    * -3.907985E-13  4.013808E+03  4.353187E-13 *
                    *  4.521810E-13  4.353187E-13  6.029436E+03 *
                                       I(Q)
                    *  4.013808E+03                             *
                    *                4.013808E+03               *
                    *                             6.029436E+03 *
                                       Q
                    *  1.000000E+00  0.000000E+00  0.000000E+00 *
                    *  0.000000E+00  1.000000E+00  0.000000E+00 *
                    *  0.000000E+00  0.000000E+00  1.000000E+00 *
```

```
      M O D E L   S U M M A R Y
 ENTRY NAME        NUMBER OF ENTRIES
 ----------        -----------------
     CORD2C                       1
     CQUAD4                    1280
      EIGRL                       1
      FORCE                       2
       GRID                    1345
       LOAD                       1
       MAT1                       1
       MAT8                       1
     MOMENT                       1
      PARAM                       2
      PCOMP                       1
     PSHELL                       1
       RBE2                       1
        SPC                      64
```

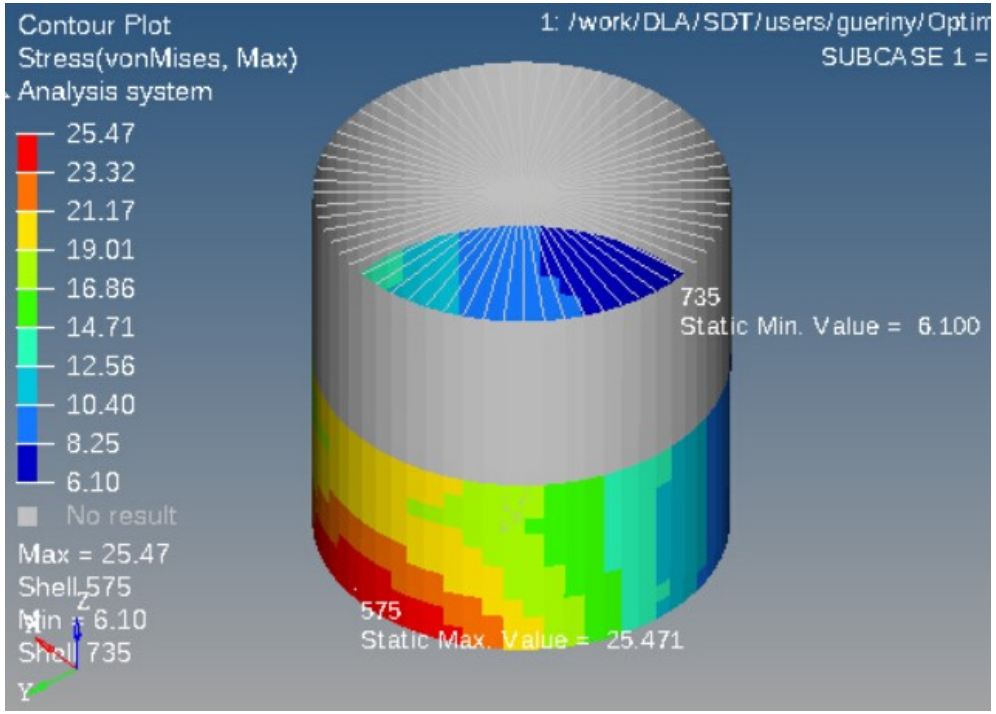
- Masse = 24,1kg
- Centrage : X=0, Y=0, Z=294,3mm
- Inerties : Ixx=Iyy=4013,8mm^4, Izz=6029,4mm^4

- Déplacements (mm)

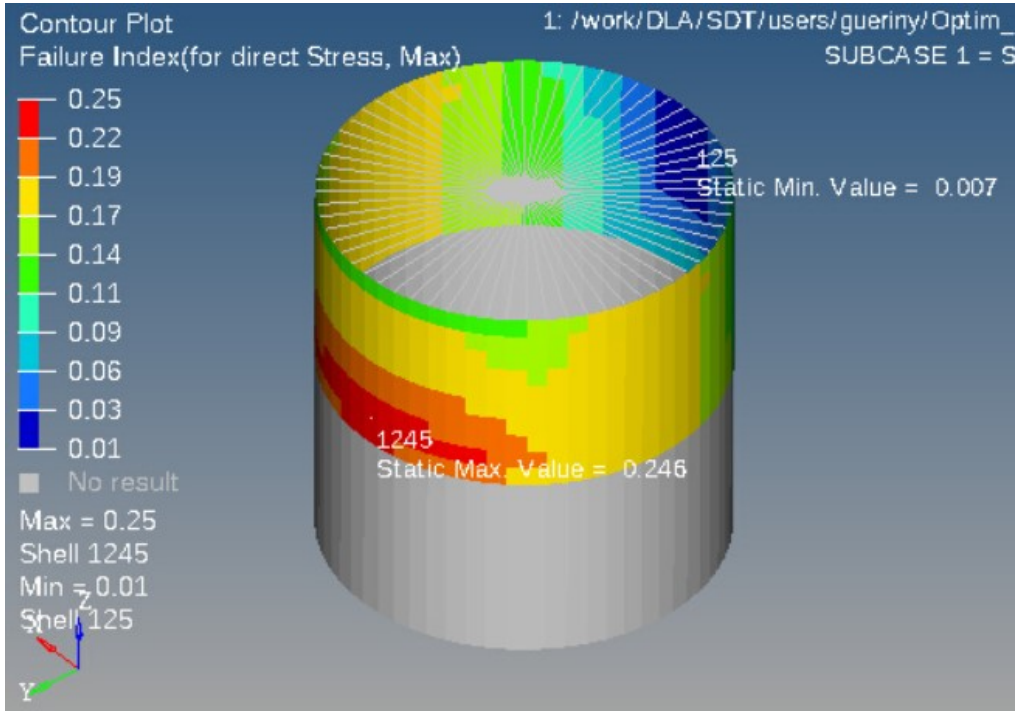


Déplacement maxi : 1.61mm

- Contraintes (MPa)

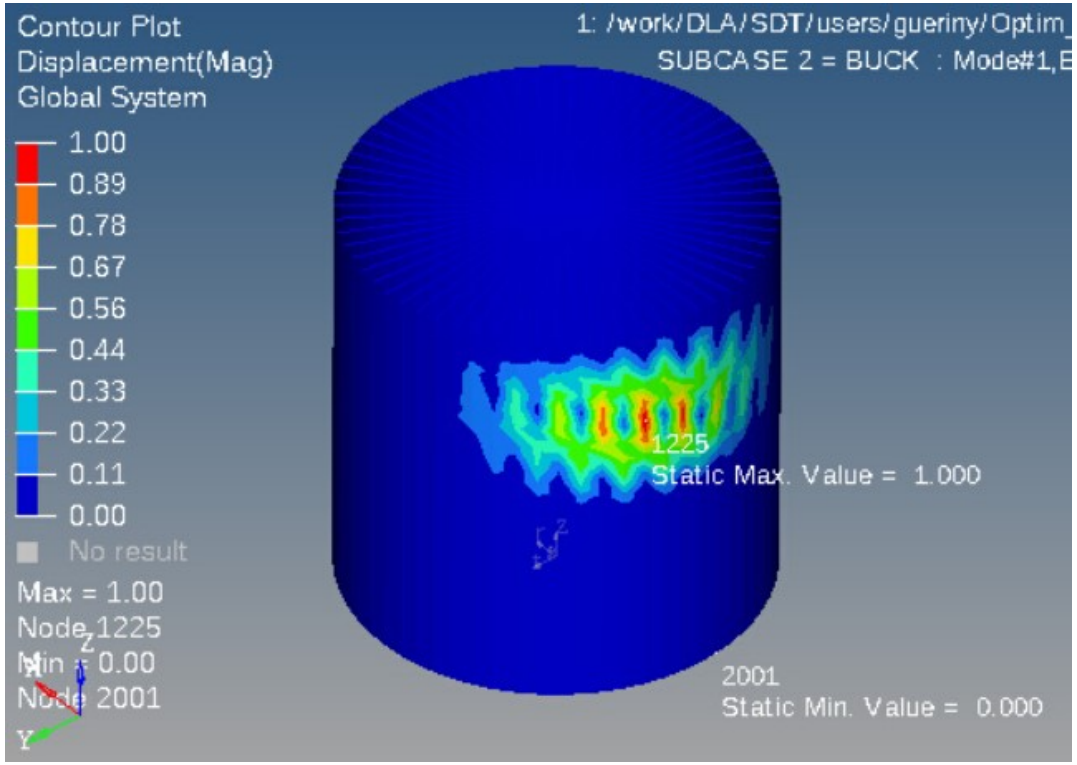


Cylindre inférieur
Contrainte Von Mises max = 25.5 MPa



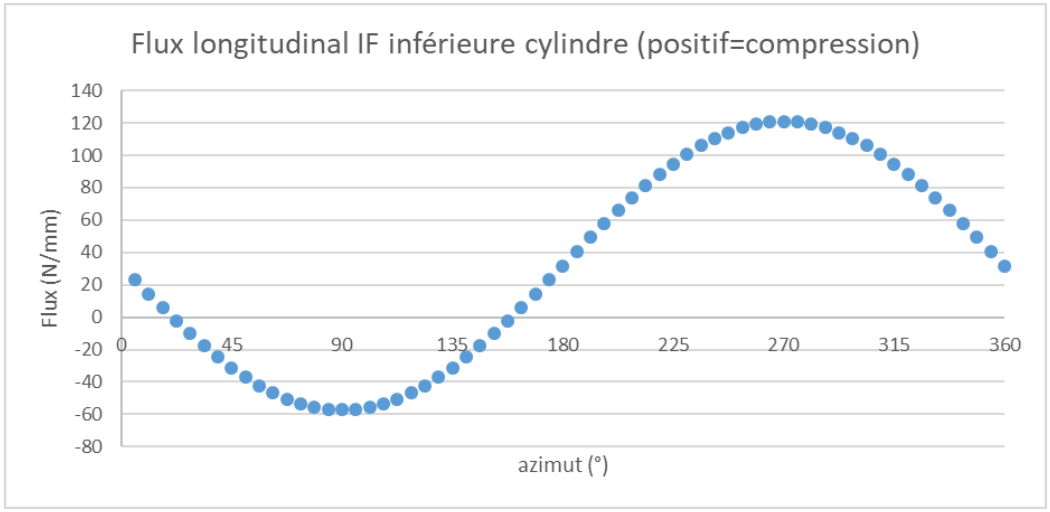
Cylindre supérieur
Critère de TSAI-WU max = 0.25

- Mode de flambage



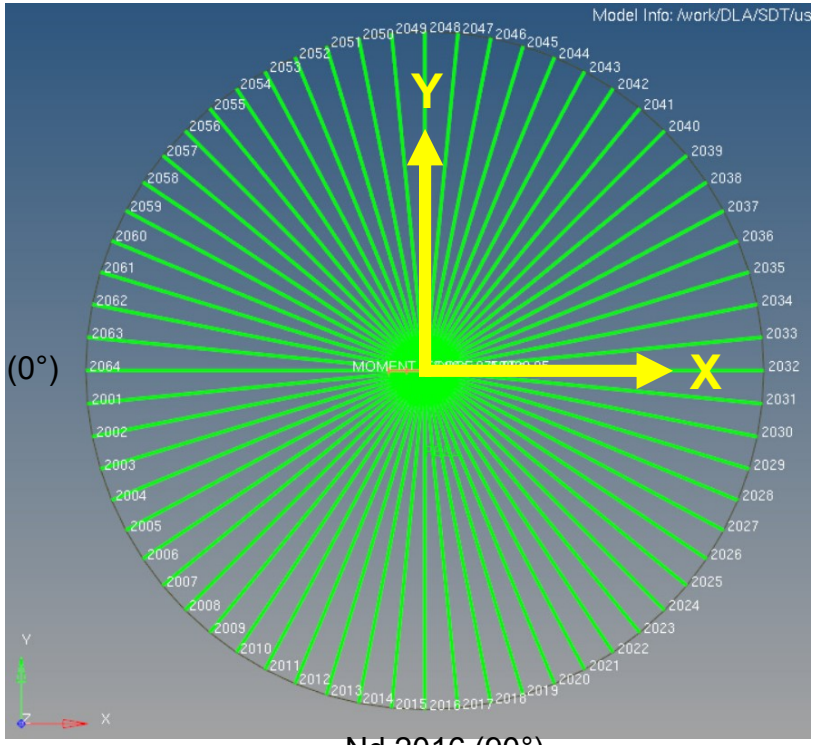
Valeur propre critique de flambage = 0.44

- Flux



Nd 2048 (270°)

Nd 2054 (0°)



Nd 2032 (180°)

Nd 2016 (90°)

Flux longi max calculé : 120.88N/mm (270°)
Flux longi théorique : 120.96N/mm

IF inférieure du cylindre