SSNV225 – Law of behavior HAYHURST : test of creep

Summary:

This document presents a test of creep in great deformations making it possible to validate the capacities of the model of behavior HAYHURST, to represent primary education, secondary and tertiary creep.

Various modelings make it possible to test all the methods of integration:

- implicit integration with analytical matrix jacobienne (modeling A).
- implicit integration with matrix jacobienne obtained by disturbance (modeling B);
- integration clarifies by Runge_Kutta (modeling B);

1 Problem of Reference

1.1 Geometry

Not material.

1.2 Property of materials

They are defined in $600°C$.

```
YOUNG = 145000. ;
FISH = 0.34;
BIGA=9.707593E-08,
H1ST=0.33,
H2ST=1.0,
K=9.691
H1=3.E4,
H2=-280.0,
SIG0=27.9317,
ALPHAD=0.5,
EPS0=5.82516E-11
```

Parameters managing the options of calculation:
`DELTA1=1.0,`
`DELTA2=0.0,`
`S_EQUI_D=0.0` (one uses the first principal constraint for the calculation of damage)
`KC=0` (account of the variable is not taken ϕ)

1.3 Boundary conditions and loadings

One applies a constant constraint of $160\mathrm{MPa}$ since the moment $0{,}2h$ until the moment $4000\mathrm{h}$.

2 Reference solution

Case test of not-regression (modeling A)

Intercomparison of modeling B with modelings A.

3 Modeling A

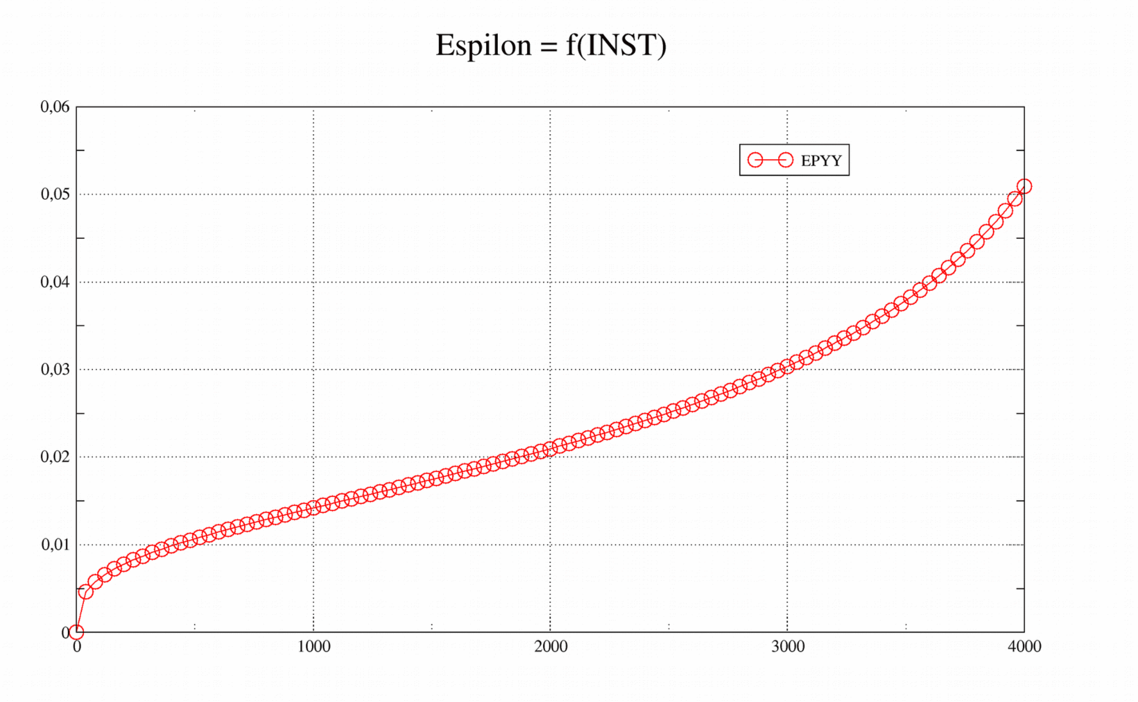
3.1 Characteristic of modeling

Modeling not material, in great deformations. `ALGO_INTE=' NEWTON'`.

3.2 Sizes tested and results

Identification	Moments (h)	Reference	Aster	Tolerance
$EPYY$	2000	not-regression	0.020895	Without object
$EPYY$	4000	not-regression	0.050575	Without object
$V11(endo)$	2000	not-regression	0.032175	Without object
$V11(endo)$	4000	not-regression	0.067927	Without object
$dEPYY/dt$	1520	not-regression	6,64091E-6	Without object

The curve of creep obtained ($\varepsilon=f(t)$) with this model is the following one:



4 Modeling B

4.1 Characteristic of modeling

Modeling not material, in great deformations, with implicit integration (ALGO_INTE=' NEWTON_PERT').

One also tests until $t=2000\mathrm{h}$: ALGO_INTE=' RUNGE_KUTTA', in great deformations.

4.2 Sizes tested and results

Comparison with modeling a:

for ALGO_INTE=' NEWTON_PERT':

Identification	Moments (h)	Reference	Tolerance
$EPYY$	2000	0.020895	0
$EPYY$	4000	0.050575	0
$V11(endo)$	2000	0.032175	0
$V11(endo)$	4000	0.067927	0
$dEPYY/dt$	1520	6,64091E-6	0

for ALGO_INTE=' RUNGE_KUTTA':

Identification	Moments (h)	Reference	Tolerance
$EPYY$	2000	0.020895	0.5 %
$V11(endo)$	2000	0.032175	0.5

5 Summary of the results

Results calculated by *Code_Aster* allow to obtain curves of creep of satisfactory pace, and a correct value the speed of creep secondary. Two modelings make it possible to validate by intercomparison the two algorithms of resolution.