HTNA100 - Welding multirun

Abstract:

This case test corresponds to the beginning of the study described in the note [bib1] and uses the methodology recommended in the note [bib2].

The study consists of a thermo-viscoplastic computation in 2 welding layers on a cylindrical tube comprising a median chamfer in which the welding layers are deposited.

This benchmark makes it possible to check the NON-regression of the study during the changes of version of *Code_Aster*.

1 Problem of reference

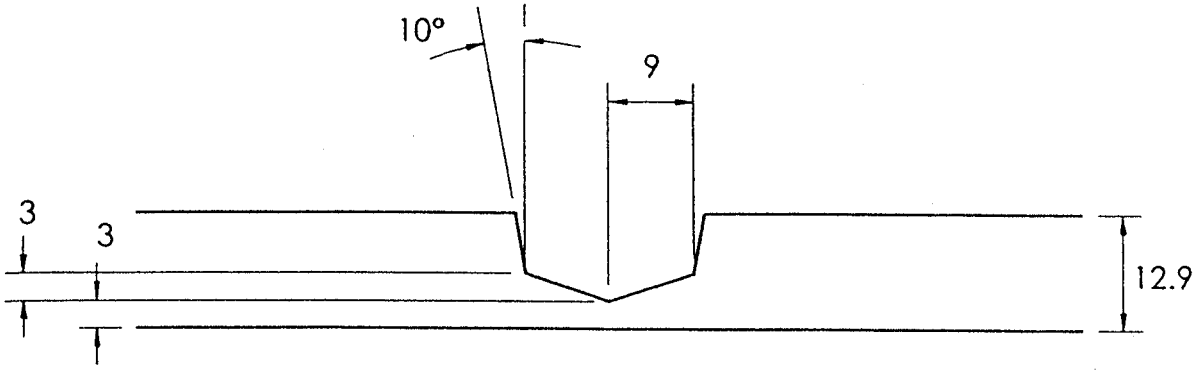
1.1 Geometry

Dimensions of the tube:

External diameter: $220\,mm$

Thickness: $12{,}9\,mm$

Overall length: $560\,mm$



1.2 Properties of the material

the tube and the weld beads are out of steel $316L$. The thermal and mechanical properties vary with the temperature and are given in [bib1]. One takes into account the latent heats of change of state liquidate-solid. The melting point of steel is taken equalizes with $1400\,°C$.

1.3 Boundary conditions and loadings

Thermal computation :

1) function heat source of time applied volumiquement in the added metal.
2) null flux at the side ends of the tube
3) radiation and convection on the other borders (chamfer, upper and lower surfaces)

Mechanical computation :

1) loading in temperature
2) axial fastening in thermal expansion at the ends of the tube by unilateral bearings

Between the master keys of welding :

1) reactualization of the geometry
2) reactualization of the position of the bearings on the deformed shape

2 Reference solution

It does not exist of solution analytical.

3 Bibliography

[1] X. DESROCHES: Note EDF DER HI-75/00/016/A. Computational simulation of a test of welding on tube on the 13 ways.

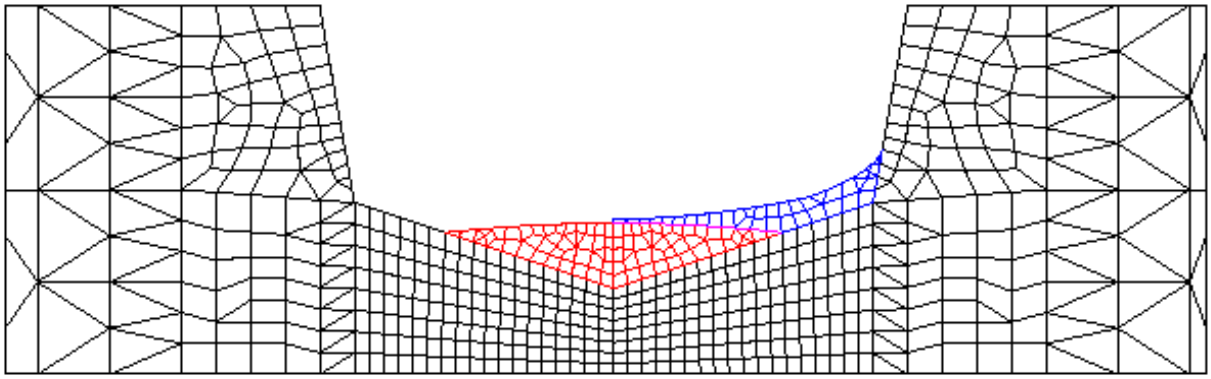
[2] X. DESROCHES: Note EDF DER HI-75/00/017/0. Methodological note on the computational simulation of welding multirun.

4 Modelization A

4.1 Characteristic of the axisymmetric

modelization Modelization

Appears 4.1-a: Total mesh of the tube



Appears 4.1-b: Enlarged mesh of the chamfer and the first 2 weld beads

During the computation of the first master key of welding, the 2nd weld bead is already present in the model but one artificially disables it by affecting a conductivity null in thermal and a very weak Young modulus to him in mechanics.

4.2 Characteristics of the mesh

Many nodes: 2370
Number of meshes and types: 1871 including 987 QUA8, 226 TRIA6, 658 SEG3
Many degrees of freedom: 4720

4.3 Quantities tested and Test

results of Standard

NON-regression	Identification of value	*Aster*
axial Displacement of left edge of the chamfer at the end of the master key 1	Uz	– 4.72590 E-04
axial Displacement of flat rim of the chamfer at the end of the master key 1	Uz	4.74855 E-04
axial Displacement of left edge of the chamfer at the end of the master key 2	Uz	– 2.03414 E-04
axial Displacement of flat rim of the chamfer at the end of the master key 2	Uz	4.65516 E-04
Von Mises at the end of the master key 1 with the lower central node of the chamfer	Von Mises	342. E+06
Von Mises at the end of the master key 2 with the lower central node of the chamfer	Von Mises	662. E+06

4.4 Remarks

command MODI_MAILLAGE makes it possible to reactualize the mesh at the end of master key 1 in substituent the deformed shape with the initial mesh. Moreover, the bearings making it possible to simulate the effect 3D are also reactualized.