

NUMERICAL ANALYSIS OF AN ACCIDENTAL SITUATION

Ruling out the pullout risk of the tubes of a steam generator

CONTEXT

The Nuclear Safety Authority (ASN) asks :

To increase the analysis level of the corrosion phenomena affecting the steam generator tubes :

- by extending the inspected zone from 25 mm to 50 mm
- by ruling out the pullout risk for any situation

Steam Generators concerned

GV 68/19 made of Inconel 600TT used in 1300MWe power plants

METHODOLOGY

Computed quantity :

The numerical simulations aim here at computing the contact pressure between the tubes and the tubesheet. Its magnitude is used to evaluate the pullout resistance.

Studied transients :

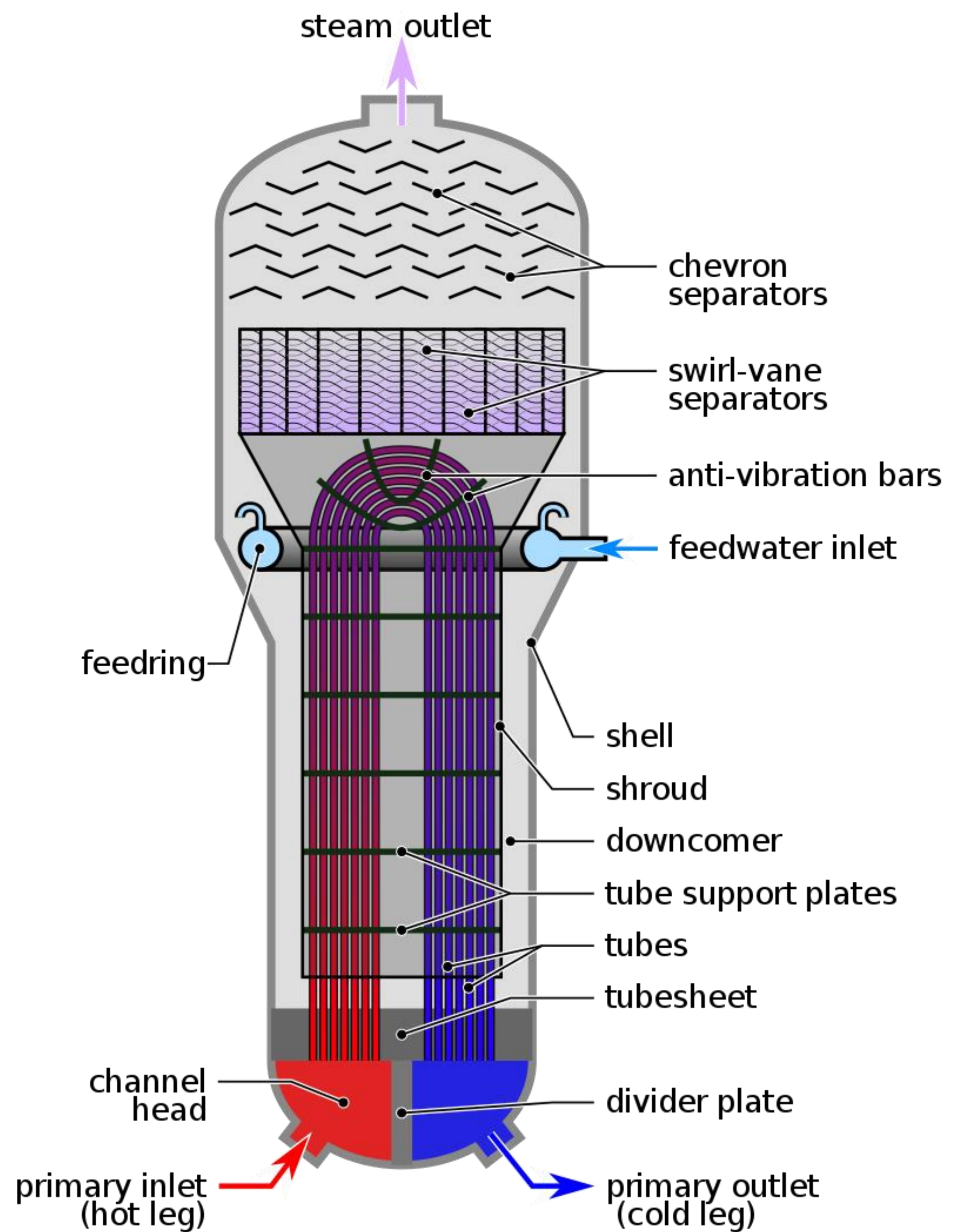
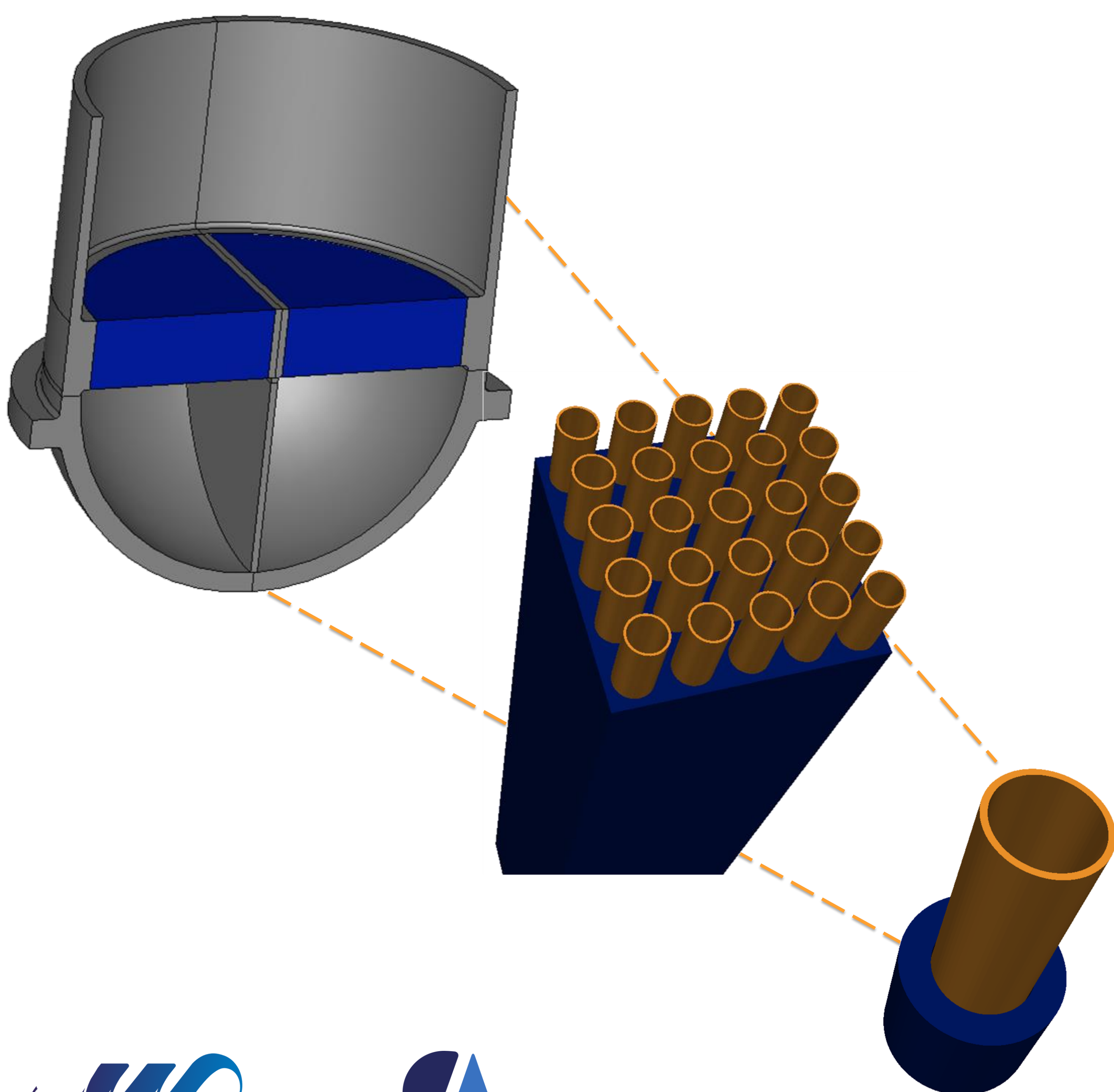
Some significant transient undergone by the steam generator:

- Tube expansion ;
 - Hydrostatic tests;
- And an accidental transient :
- Steam pipe failure (RTV).

Modeling :

Three stages modeling, to perform a structural zoom

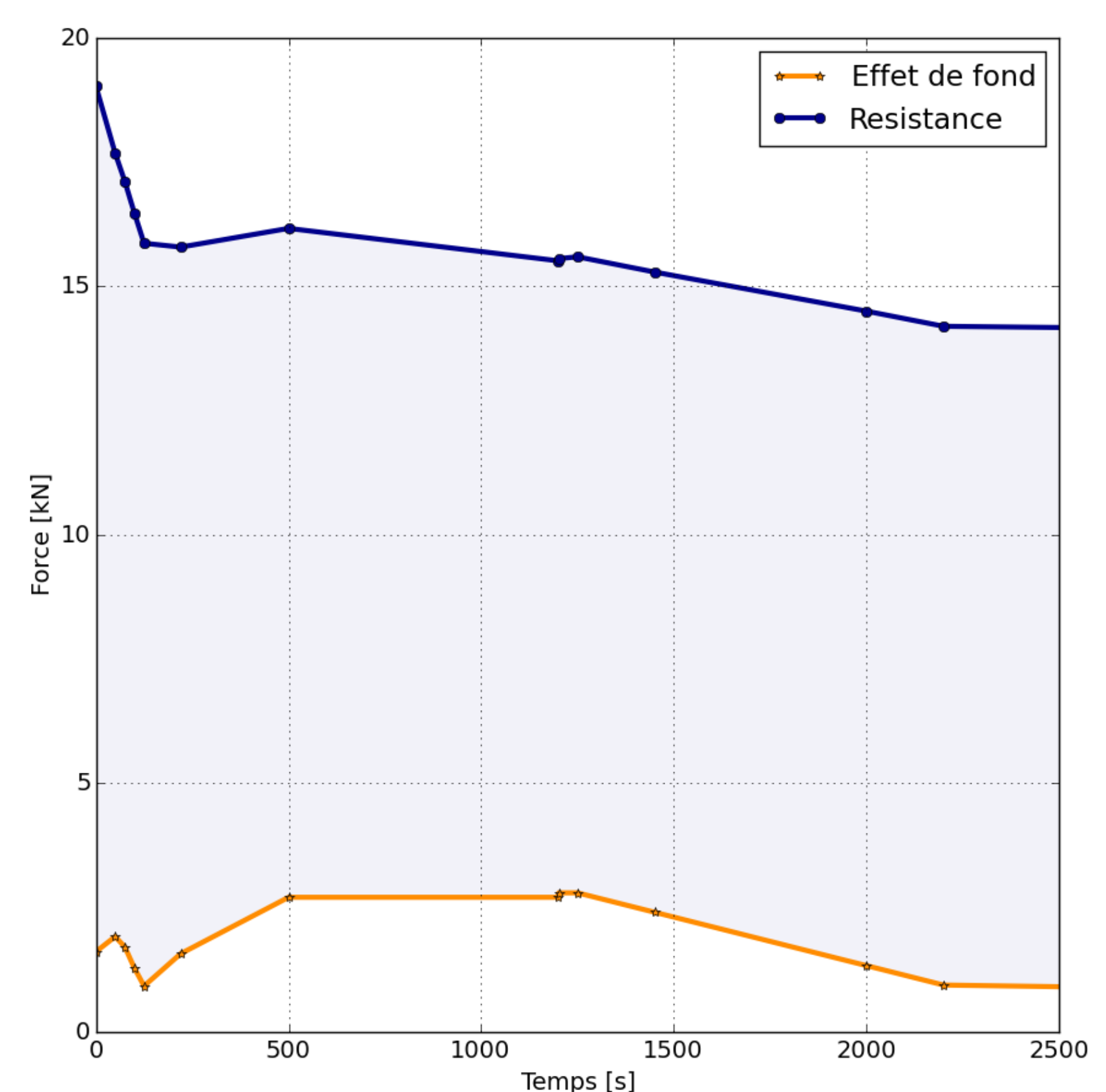
- a global model (tubesheet + channel head), with homogeneous behavior and no tubes explicitly modelled ;
- an intermediate model of a tubesheet portion with tubes explicitly modeled ;
- a local model of the inspected zone (25 mm), composed by a tubesheet portion and a single tube. A contact condition is defined between the tube and the tubesheet



Steam Generator (Wikipedia)

RESULTS

The picture shows the gap between the pullout force of the studied accident and the limit pullout resistance of the bond (tube-tubesheet), within the inspected zone (25 mm).



➤ The actual depth of inspection is sufficient to rule out the pullout risk.