

## TTNL04 – Thermics with non-linear flow in transient 2D

---

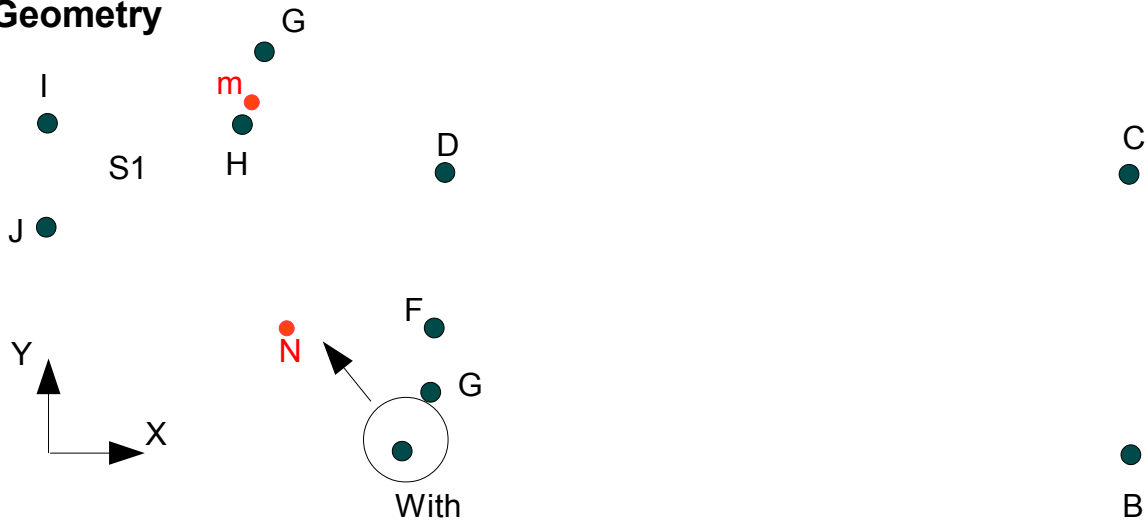
### Summary:

The objective of this test is to validate the taking into account of non-linear flow in thermics 2D. This CAS-test is inspired by the CAS-test htna100a.

A modeling PLAN is proposed.

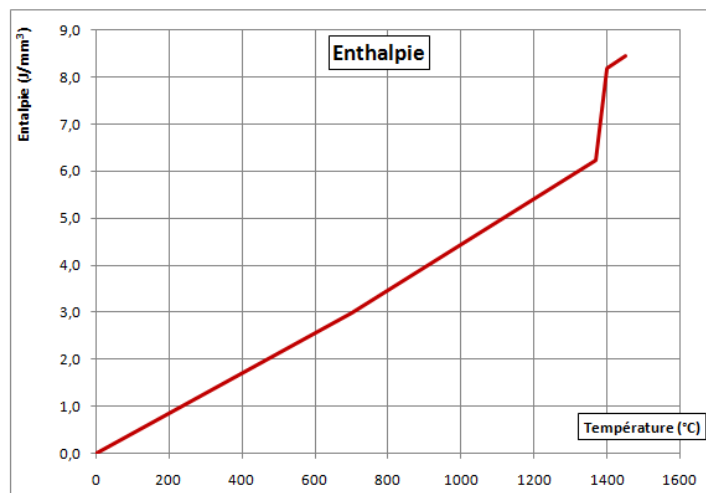
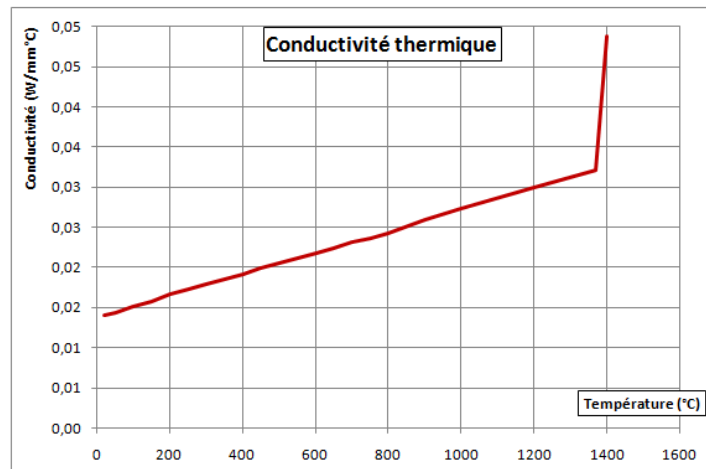
## 1 Problem of reference

### 1.1 Geometry



### 1.2 Properties of material

The thermal properties (conductivity and enthalpie) vary with the temperature and are represented on the figures below.



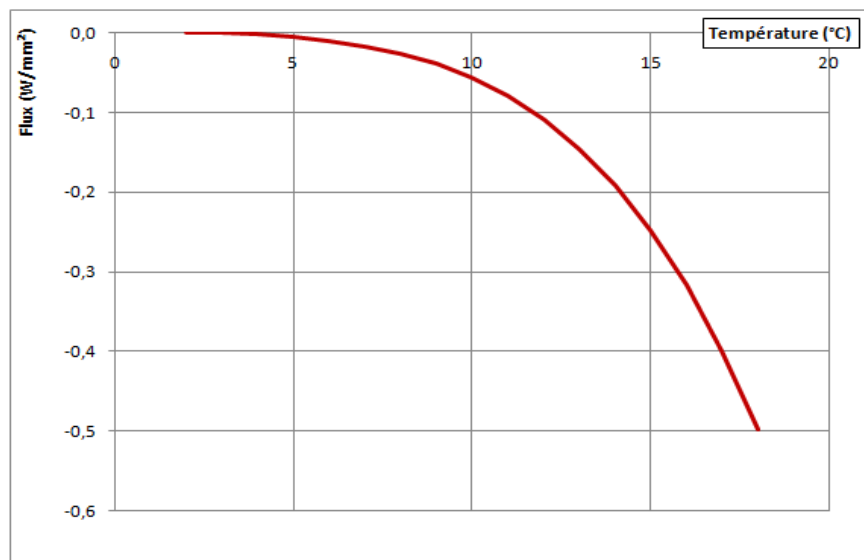
## 1.3 Boundary conditions and loadings

### 1.3.1 Stage 1: time interval $0 \leq t \leq 3.2s$

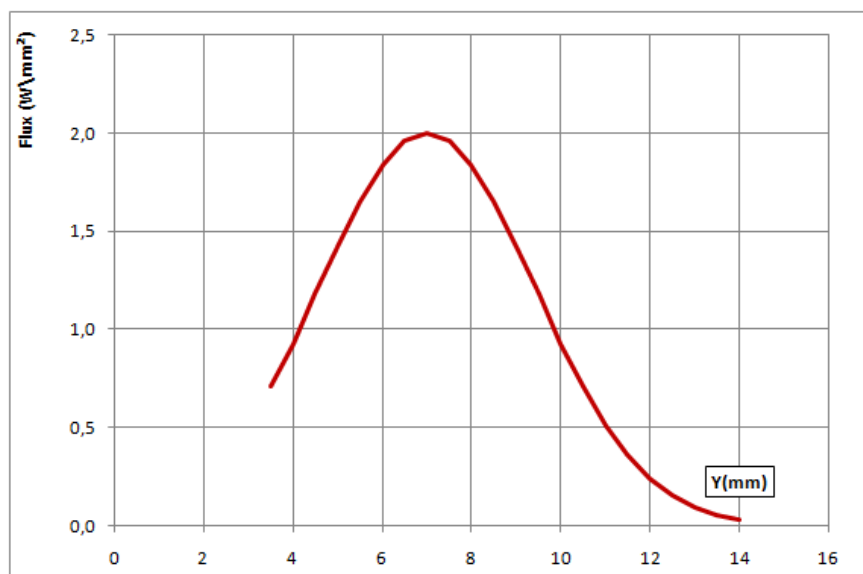
- Temperature imposed on surface  $SI$

Time (S)	Temperature (°C)
0.0	20.
1.0	1700.
3.2	1700

- Non-linear flow imposed on with dimensions ones  $AB, CD, DF$

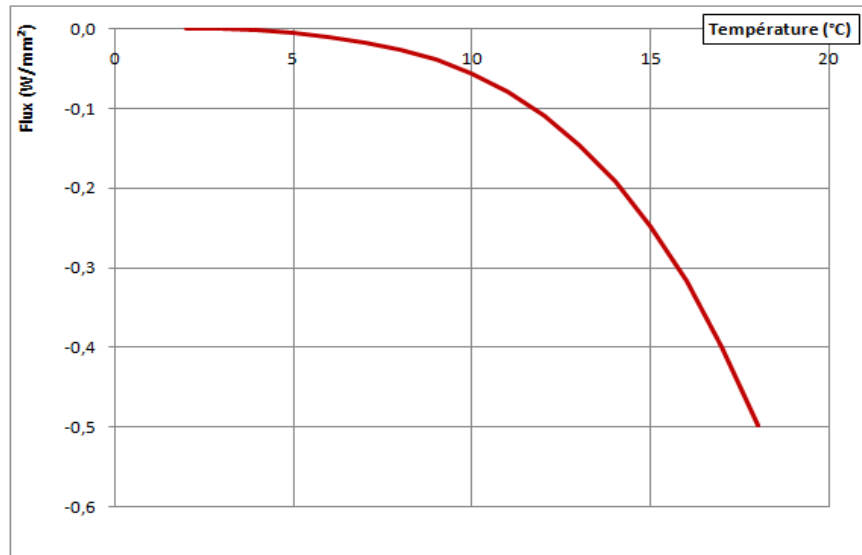


- Flow imposed on with dimensions ones  $FG, GH, HI$ .



## 1.3.2 Stage 2 time interval: $3.2s < t \leq 600.s$

- Non-linear flow imposed on with dimensions ones  $AB$ ,  $CD$ ,  $DF$ ,  $FG$ ,  $GH$ ,  $HI$



## 1.4 Initial conditions

Initial temperature = 20°C

## 2 Reference solution

---

### 2.1 Method of calculating

The reference solution corresponds to a solution of not-regression

### 2.2 Sizes and results of reference

The temperature is tested.

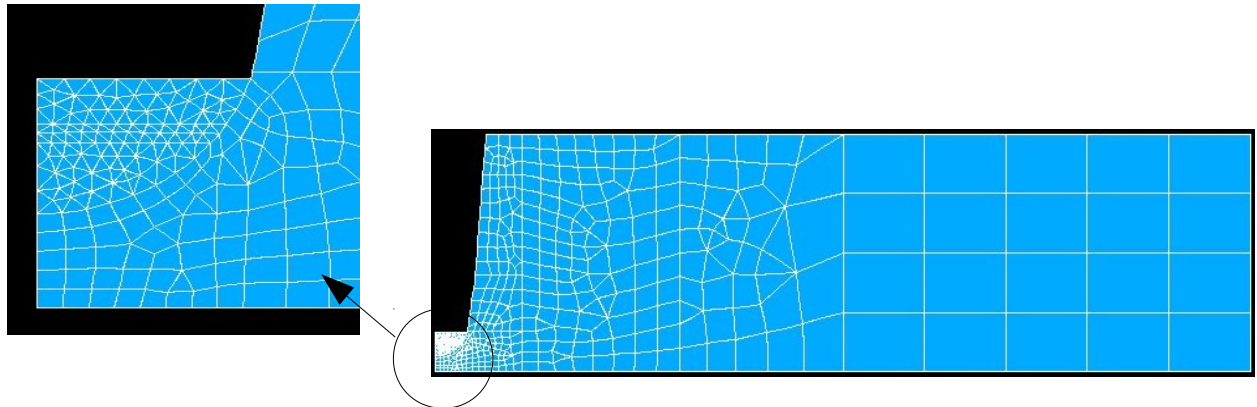
### 2.3 Uncertainties on the solution

Digital solution

## 3 Modeling A

### 3.1 Characteristics of modeling

A modeling is used PLAN.



### 3.2 Characteristics of the grid

The grid contains 1643 nodes and 836 meshes of which:

- 282 SEG3
- 210 meshes of the type TRIA6,
- 344 meshes of the type QUAD8.

### 3.3 Sizes tested and results

Identification			Type of reference	Value of reference (°C)
Node	Size	Moment (S)		
N939 (8.1, 24.6)	TEMP	3.	'NON_REGRESSION'	20,016
		64.	'NON_REGRESSION'	79,290
		290.	'NON_REGRESSION'	49,603
N1334 (8.3, 12.0)	TEMP	3.	'NON_REGRESSION'	60,950
		64.	'NON_REGRESSION'	96,810
		290.	'NON_REGRESSION'	49,912
N1498 (6,5,5,0)	TEMP	3.	'NON_REGRESSION'	526,990
		64.	'NON_REGRESSION'	108,008
		290.	'NON_REGRESSION'	49,920

## 4 Summary of the results

---

This CAS-test makes it possible to validate the taking into account of a non-linear flow in thermics 2D, and to check the not-regression of the results.