LMC 2

Achievements to date :

- Overview of the company (WP1)
- AM process familiarisation (WP1)
- Report on AM Business Model (WP1)
- OpenFoam familiarisation (WP2)
- Conjugate heat transfer in OpenFoam (WP2)
- Heat exchanger design training (WP3)

Achievements to date :

CFD of a circular to rectangular nozzle (WP2)

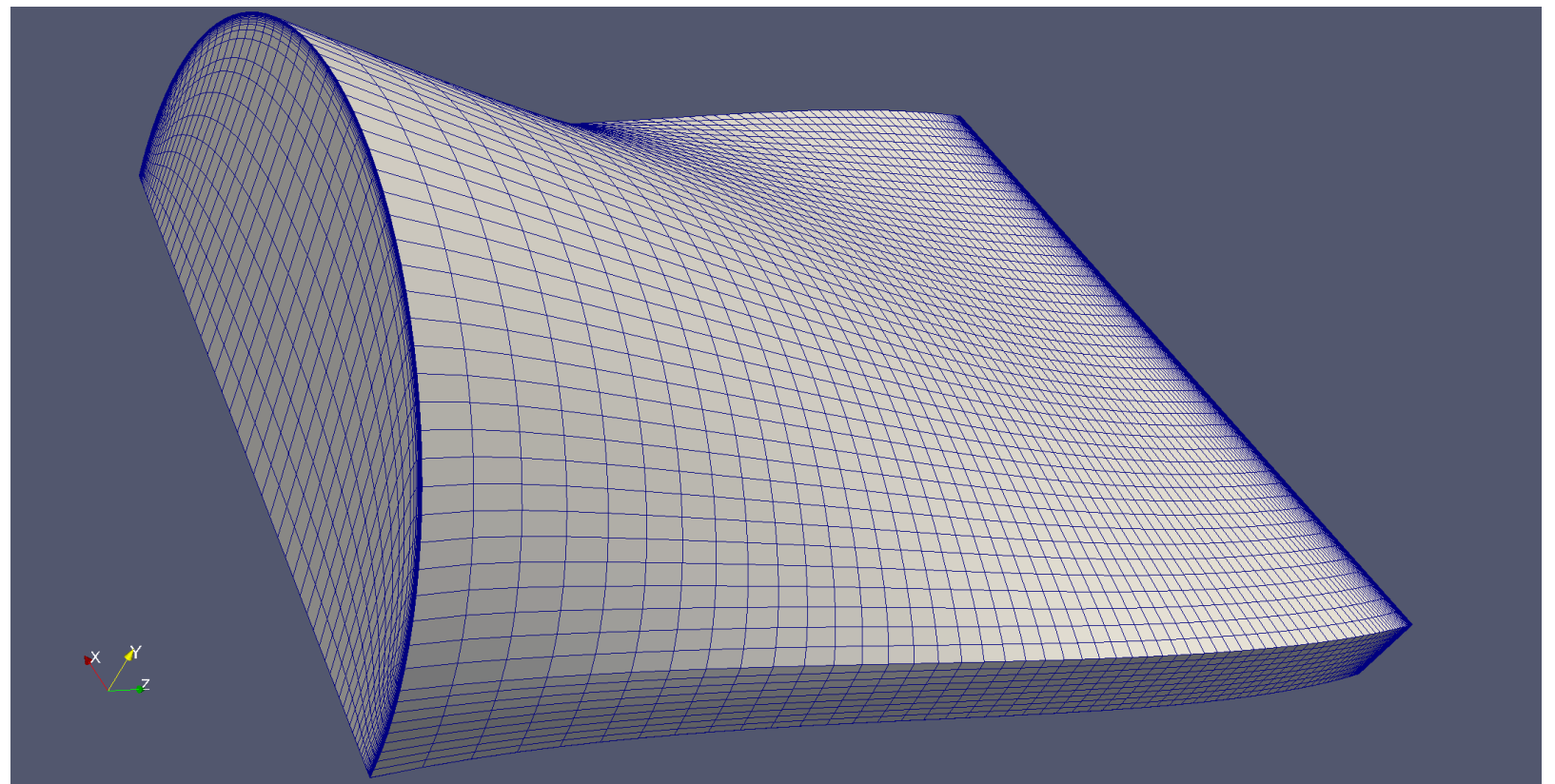Solver : **SonicFoam**, density based compressible solver
Turbulent simulation using k-epsilon model
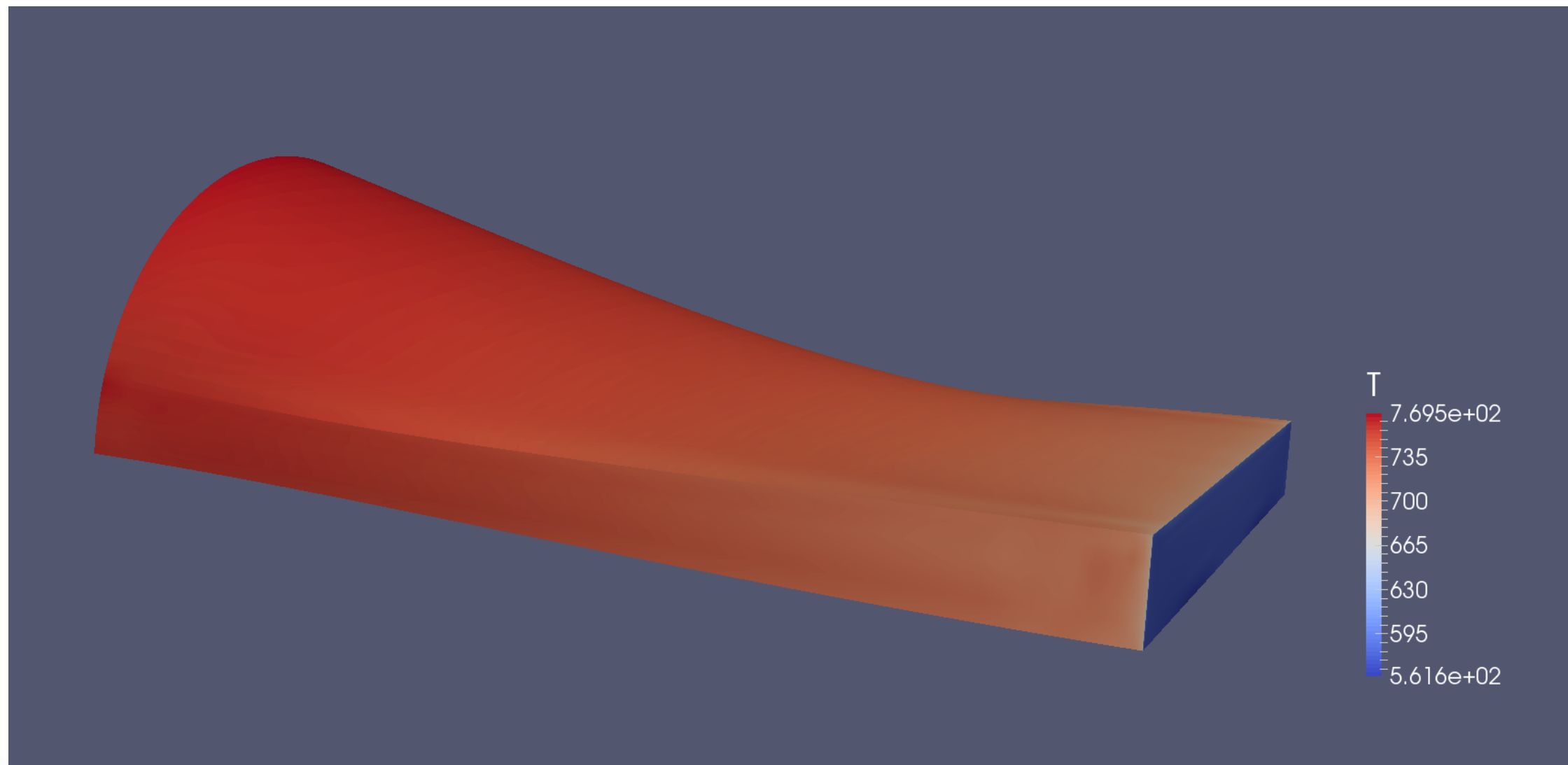Boundary conditions : Inlet total pressure 3 bar
Outlet static pressure 1 bar

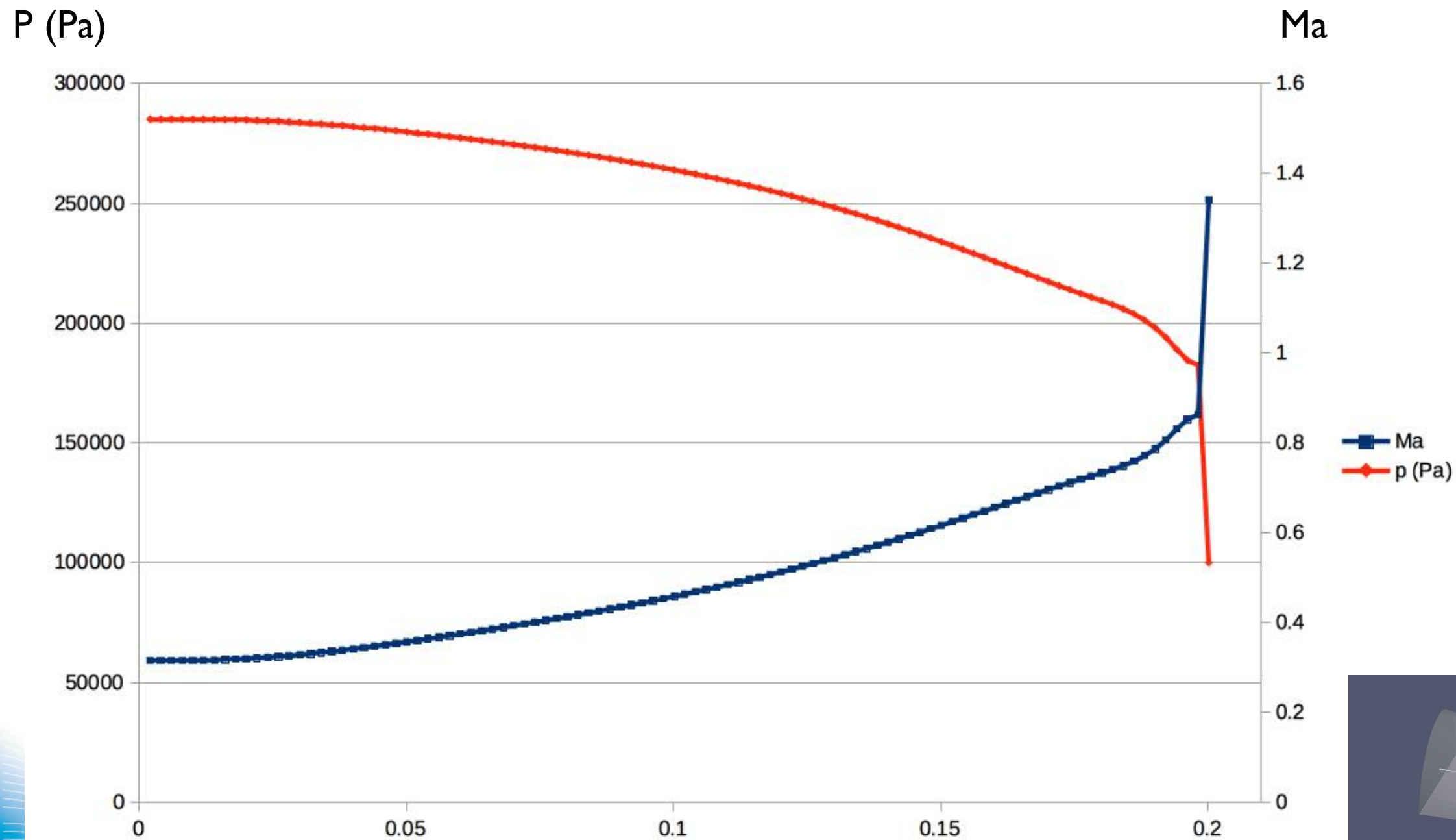Transient simulation
time step : 1.e-07 s

Mesh c. 130000 cells

Achievements to date :
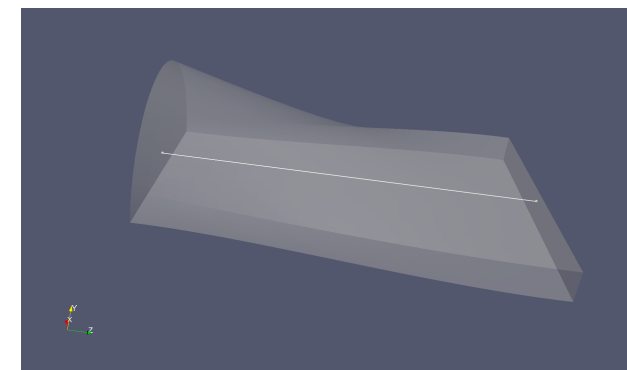## CFD of a circular to rectangular nozzle (WP2)

Achievements to date :
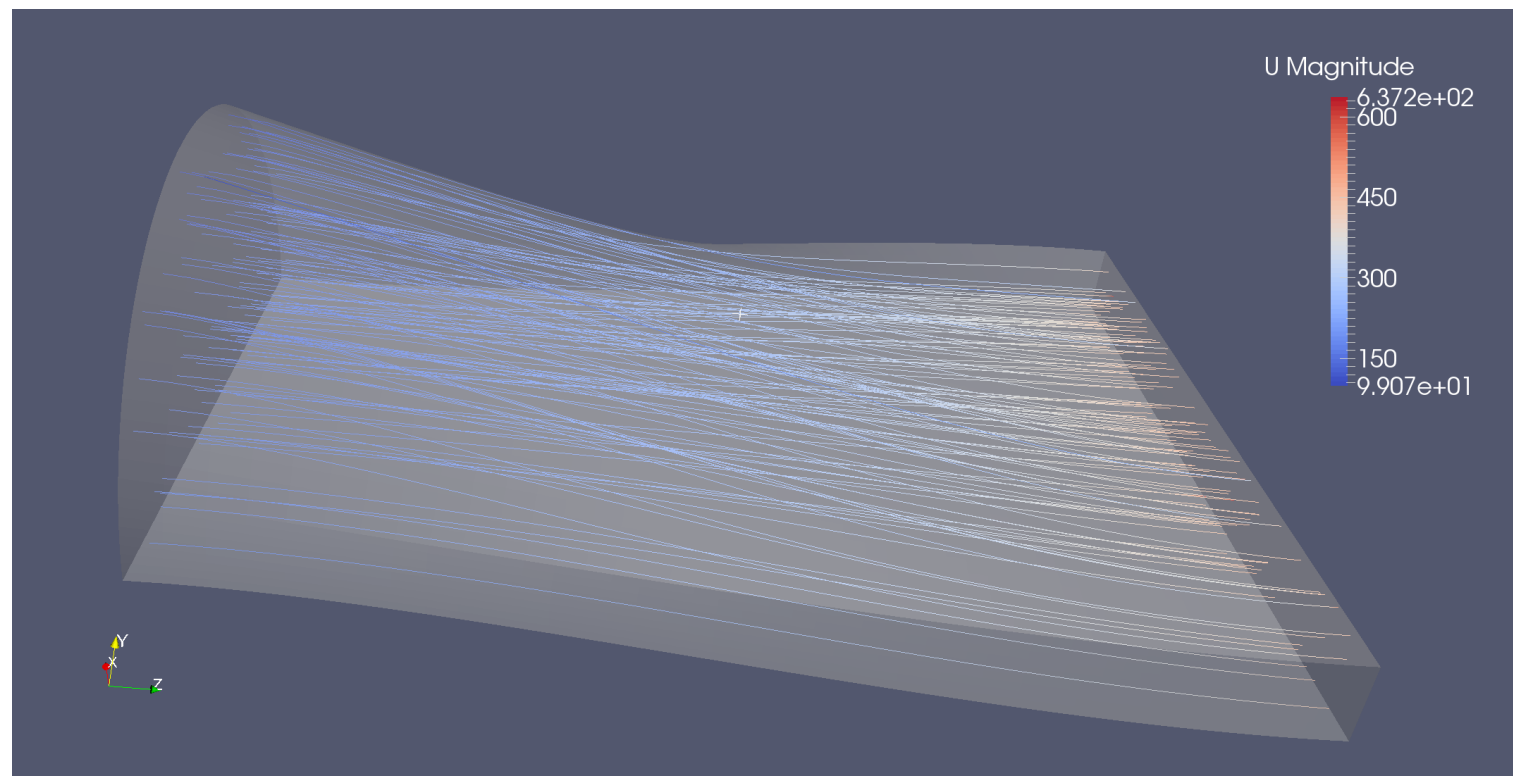## CFD of a circular to rectangular nozzle (WP2)

Pressure and Mach number over a line

Achievements to date :
CFD of a circular to rectangular nozzle (WP2)

	Theory	Mesh 1	Mesh 2	Mesh 3	Mesh 4
T shock (K)	**657**	2.2	1.4	1.4	0.6
P shock (Pa)	**163149**	37.6	29.9	13.8	14.1
U shock (m/s)	**504**	1.2	0.6	0.1	0.1

25/11/2015

Achievements to date :

CFD of a circular to rectangular nozzle (WP2)

<u>Benefits from the study :</u>

Compressible flow theory

Mesh: Structured meshing process with Pointwise
              Adding a boundary layer to the mesh

OpenFoam: General OpenFoam familiarisation
                  CFD in compressible flow

Proposal for future actions :

Unit Cell Model Analysis (WP4):
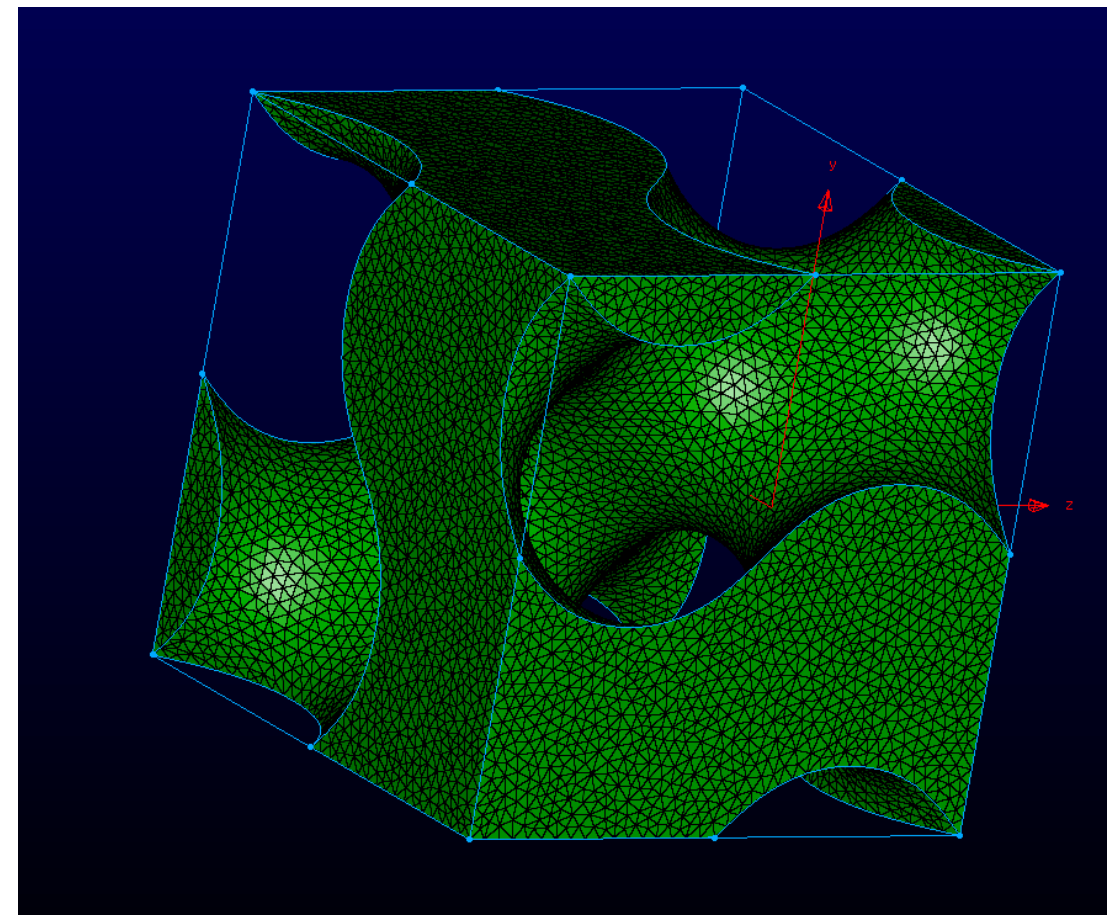
1- Generation of the surfaces

2- CFD study on a Unit Cell:

Characterisation of the heat transfer and pressure drop in the

lattice structure

3- Lattices builds and CT scans

4- CFD on the CT scans

5- Testing

Proposal for future actions :

- OpenFoam course and tutorials (WP2)
  until 20/12/15

- Technical challenges and competition analysis (WP3)
  02/11/15 - 31/12/15

- Analysis of the AM value chain (WP1)
  01/12/15 - 1/02/16

- Introduction of a code to automate the simulations
  from 01/01/16

Training achieved :

- CFD conference
- Paraview event day
- 3 days training on Pointwise
- 3rd UK and Ireland OpenFoam User meeting
- First KTP Module
- CFD classes at University of Exeter

Proposal for training/personal development :

Simpleware training

CMI Certificate (1200 £)

English Course, Cambridge certificate (CAE Higher) (c. 500 £)

Overall benefits :

- Heat Exchanger design knowledge
- Pointwise knowledge
- OpenFoam knowledge
- General CFD knowledge
- Additive Manufacturing familiarisation
- Attendance of the 3rd UK and Ireland OpenFoam User meeting
- Attendance of the first KTP Module