

Atmos'Fair

CFD for ventilation and dispersion

September 24th 2014



Introduction

- CFD-Numerics specialises in Computational Fluid Dynamics :
 - Thermic, thermo-hydraulics, aerodynamics
 - Combustion
 - Multiphase (Free surface, Particles or Droplets)
 - Uncertainty Quantification
 - Optimisation
- CFD-Numerics provides engineering services
 - to develop better products
 - to optimise manufacturing process
 - to improve and validate bench tests

Introduction

- Organisation
 - 5 experienced engineers and PhD CFD specialists
 - 575 k€ of turn-over in 2013 (350k€ of internal capital)
 - 750 k€ reached for 2014
 - In-house Quality Management System for engineering services
- Location
 - On Axel'One PPI collaborative platform in Solaize
- Research activities
 - 3-year in-house R&D project on Uncertainty Quantification supported by Rhone-Alpes Region
 - Member of Association Société de Recherche sous Contrat (ASRC)
 - Member of Axelera
 - CIR approved for 2014, 2015 and 2016

References

- Multi-sectors activities : from OEM to SMI
 - Automotive, Marine, Trains, Nuclear, Manufacturing, Chemistry, Building, Processing



Ressources

- Software:
 - Fluent, Gambit, WorkBench, Tgrid (ANSYS)
 - EDF certification for ventilation
 - STAR-CD, STAR-CCM+ (CD-adapco)
 - OpenFOAM, Paraview (OpenCFD)
 - CATIA V5 (Dassault Systèmes)
 - Matlab (Mathworks)
- Hardware:
 - In-hours capabilities
 - Cluster of 128 cores
 - Preferred access to 2048 cores on ENER110





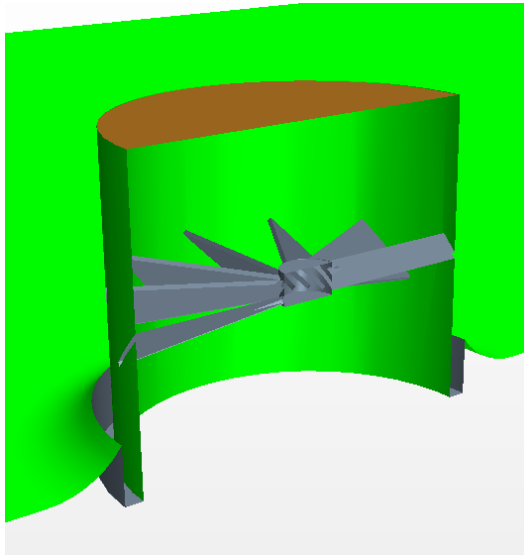
Examples

- Ventilation and atmospheric dispersion
 - Vent simulation
 - Particle dispersion in atmosphere
 - Smoke dispersion in atmosphere
 - Hazardous gas dispersion in a workshop

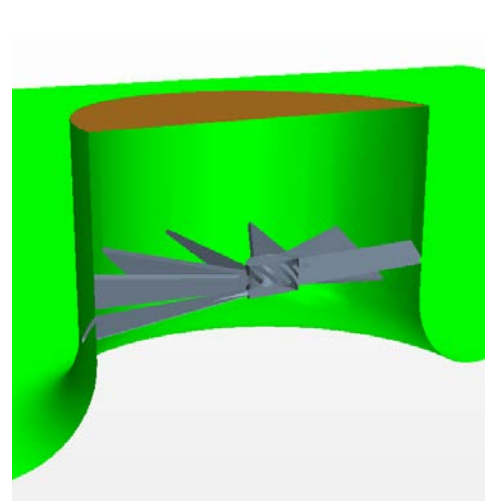
Vent simulation (1)

- Validation of vent simulation for different flow configurations
 - Case with swirling effect and compact flow – heating
 - Case with swirling effect and radial flow – cooling

Compact



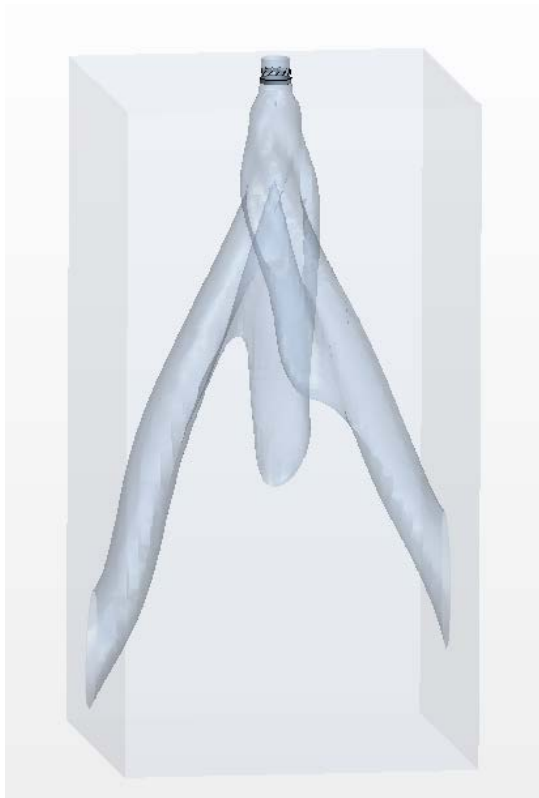
Radial



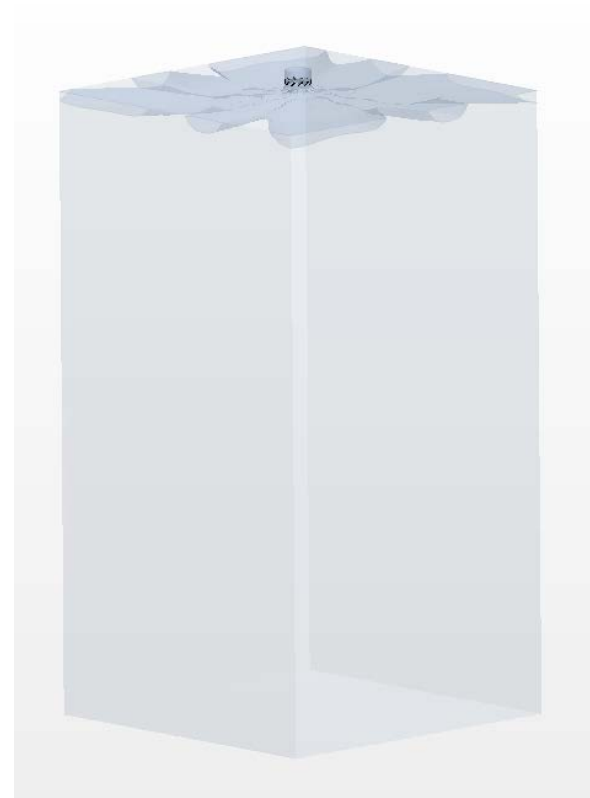
Vent simulation (2)

- Isothermal simulations

Compact

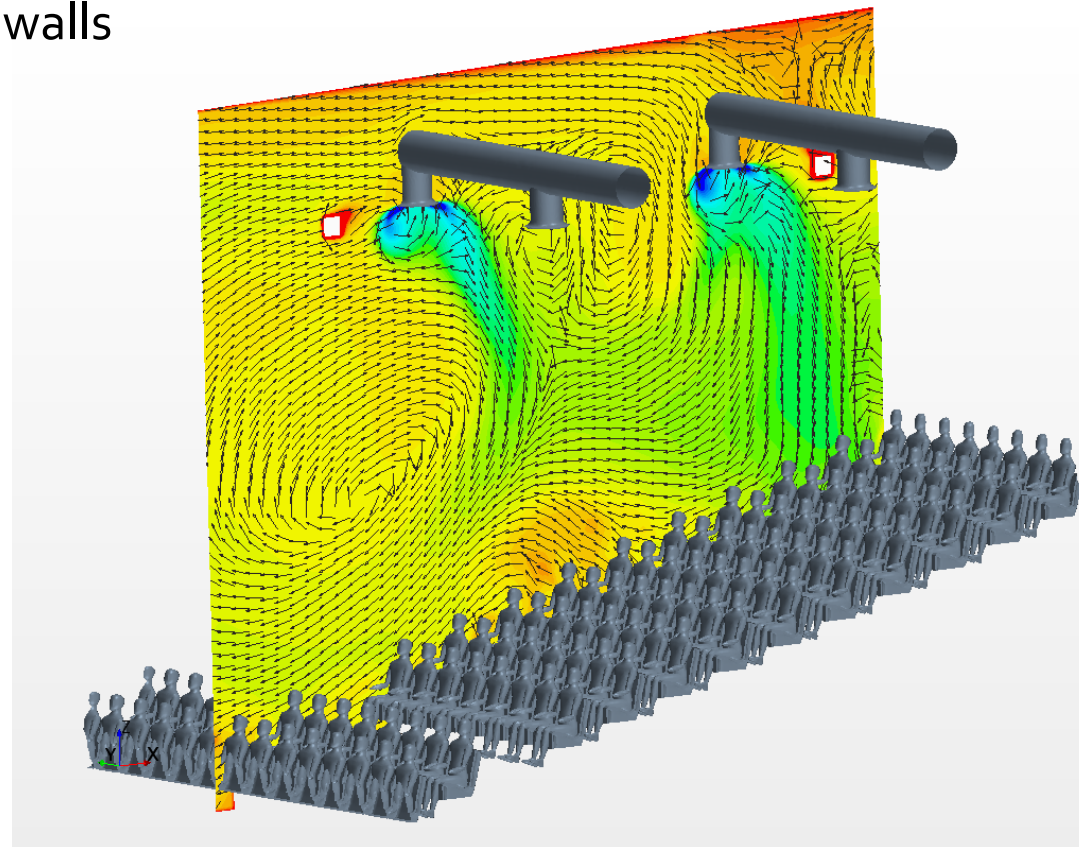


Radial



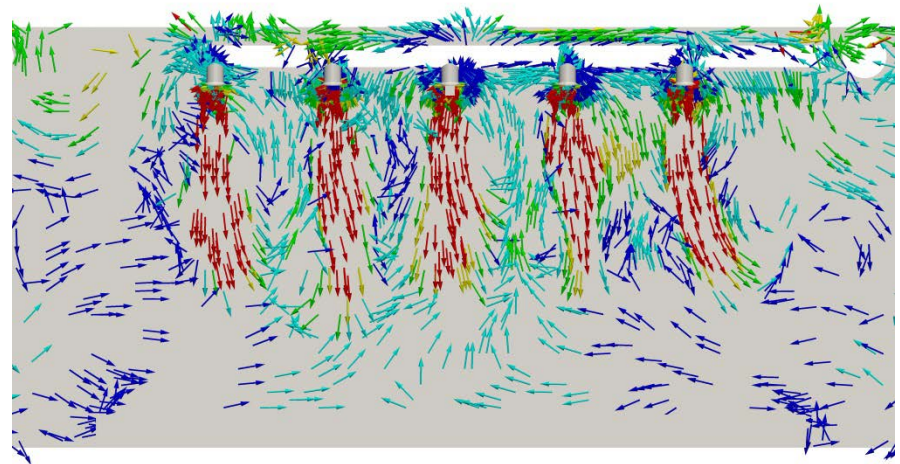
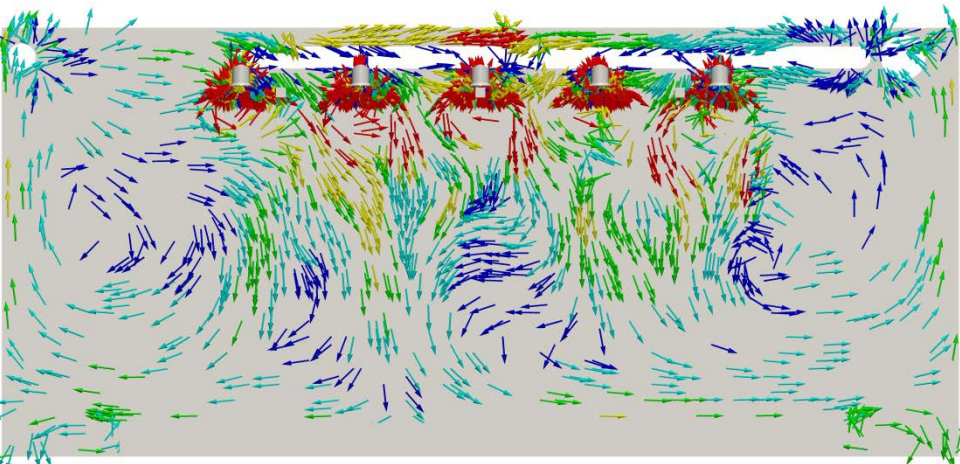
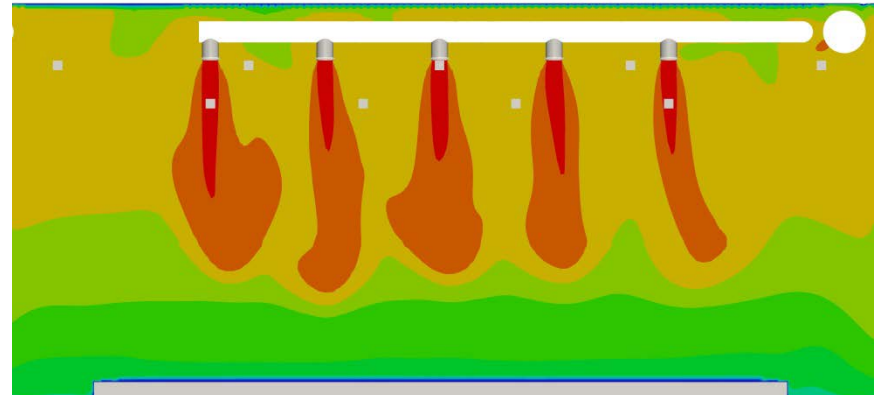
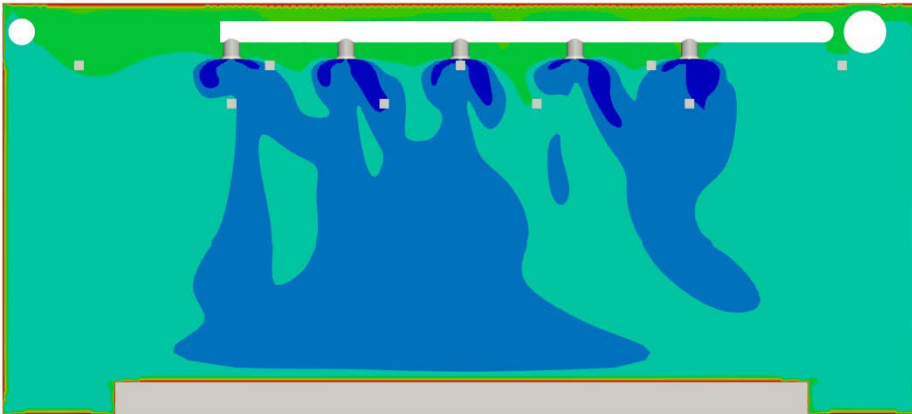
Vent simulation (3)

- Application in a theatre with 1200 spectators
 - Radial and compact configuration for cooling and heating mode
 - People and lighting heating
 - Imposed temperature on walls
 - Natural convection
- Outputs
 - Temperature gradients
 - Local velocity



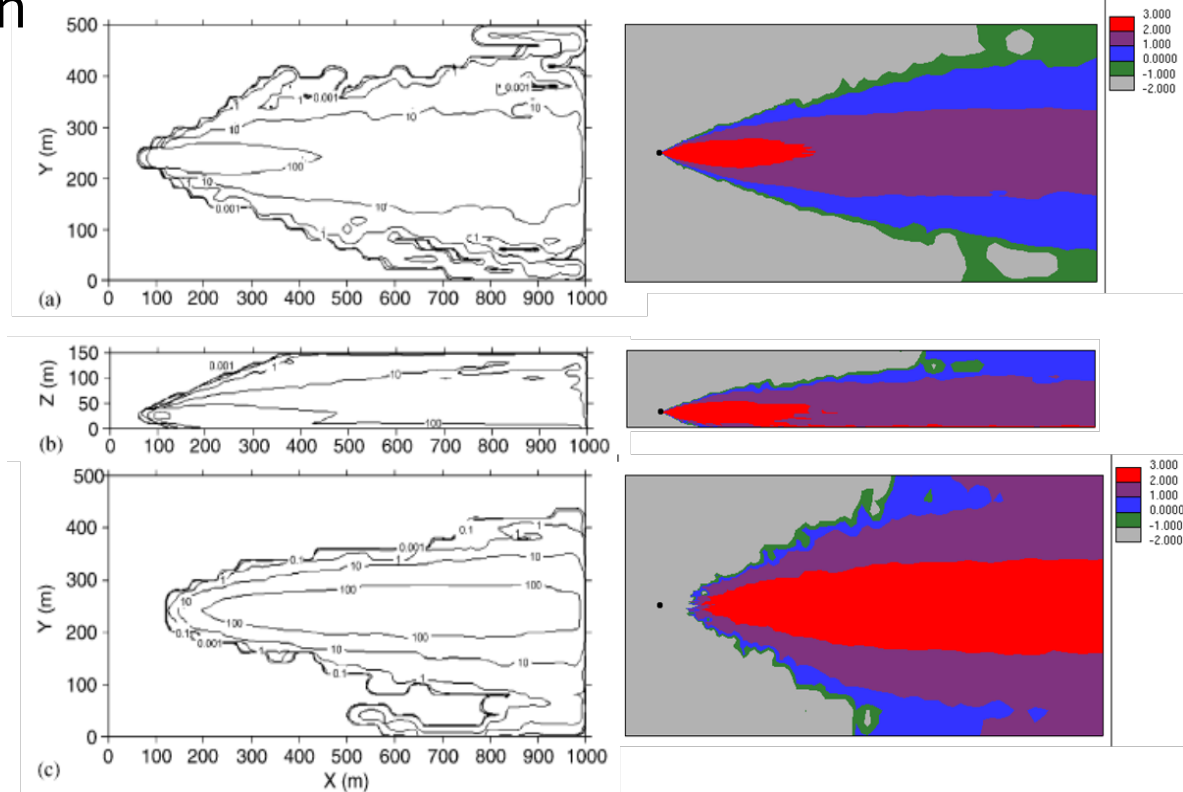
Vent simulation (4)

- Results on temperature and velocity for cooling and heating



Particle dispersion in atmosphere

- Particle tracking with atmospheric boundary layer
 - Consideration of turbulence anisotropy
- Comparison with Gaussian modelling approach for large field application



Contact



edgar.cortey@cf-d-numerics.com

+33 (0)6 45 16 24 95

+33 (0)4 37 70 30 80