

## Computational Fluid Dynamics (CFD) Calculations

### Framatome's Expertise in Computational Fluid Dynamics

With significant computational capabilities, Framatome makes its expertise available to non-nuclear industries

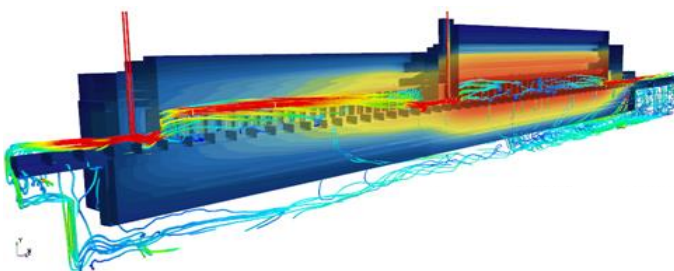
#### Challenge

- You aim to improve the quality of your products while reducing energy consumption
- You seek to optimize the performance of products and manufacturing processes (temperature homogeneity, concentrations, velocities, pressure drops, mixing)
- You must ensure the safety of your operations in terms of fire prevention, management of pollutant gases, and transport safety
- You validate your designs experimentally and wish to add simulation
- You validate your designs only with analytical methods and wish to bring more precision to your processes
- You are faced with computational limitations

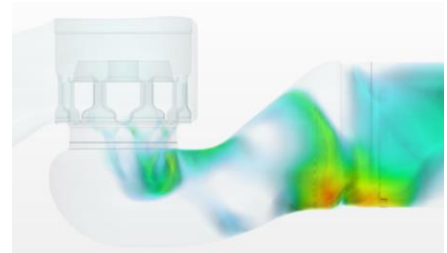
#### Solution

Framatome offers a comprehensive solution to address your challenges through Computational Fluid Dynamics (CFD):

- Secure computing and specialized engineers, ensuring the accuracy and reliability of your simulations
- Advanced numerical modeling that allows representing phenomena in all their complexity
- Comprehensive analysis to identify the best solutions
- HPC (High Power Computing) resources for complex and large-scale simulations



Change in temperature and velocity inside a sintering furnace



Flow in a high-pressure steam valve

#### Software

Ansys Fluent, Simcenter Star-CCM+, Openfoam, Ansys CFX

#### Key figures

**60** dedicated and passionate specialists

Over **30** years of experience

**6** teams across **3** sites in France, grouped within a dedicated competence center

**30k** CPUs and large **V100** GPUs

#### Customer benefits

- Reduction in energy consumption of your processes and loading
- Increased lifespan of your equipment
- Quality and compliance of simulations with obtained results
- Adaptation of the "simulation" solution to industrial needs
- Quick response time

**Your performance**  
is **our** everyday **commitment**

## Examples of achievements

### Stationary calculations:

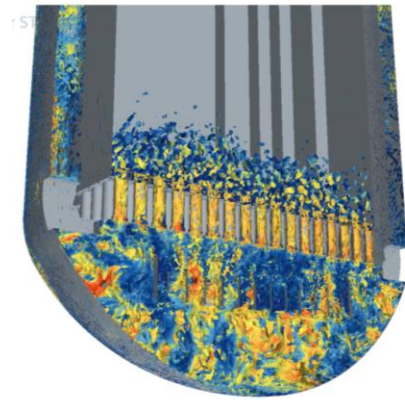
- **Loads on structures:**
  - Thermal loads (conduction, convection, radiation)
  - Pressure loads (pressure drop, acoustics)
- **Process optimization:**
  - Flow distribution in collectors
  - Heat exchanger performance
- **Performance calculations:**
  - « Choked » flow rates in valves
  - Pressure drops
  - Energy consumption of furnaces

### Transient calculations:

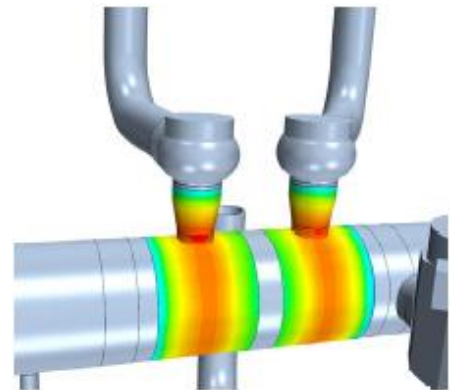
- **Thermal loads on structures:**
  - Building design for fire safety
  - Thermal transients (conduction, convection, radiation)
  - Single-phase or two-phase flows
- **Gas and particle dispersion:**
  - Atmospheric
  - Internal
- **Sprays:**
  - Pipe rinsing
  - Cooling by spraying

### Unstationary calculations:

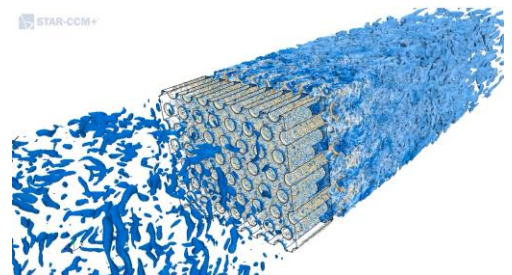
- **Fluid/structure interaction:**
  - Vibration calculations
  - Small displacements (decoupled method)
  - Large displacements (coupled method)
- **Thermal cracking:**
  - Vortex rise
  - Mixing zone



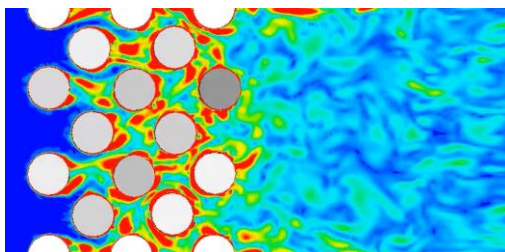
Unsteady flow in a flow collector



Support for the manufacturing of complex fluid circuits for energy production



Development of turbulence downstream of a grid



Unsteady flow through a tube bundle

## References

- Compteur
- EDF Hydro
- CEA
- Baker Hughes
- TechnicAtome
- Orano
- China General Nuclear Power Group

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