

# CAE & FEA TOOL INTRODUCTION



Salome-Meca & Code\_Aster  
Since 1988 @EDF R&D



Key words: *open-source, HPC, industrially-proved code, detailed physical module*

## I. BRIEF DESCRIPTION

The open-source software *Salome-Meca* with user-friendly graphical interface is the integration of the *Code\_Aster* solver in the *Salome* platform, which are developed by EDF R&D based on the theory of finite element method, covering a large range of applications for 3D thermo-mechanical analyses in linear and non-linear statics and dynamics. Therein, *Code\_Aster* is a “stand-alone” thermo-mechanical solver with study data prepared in text file, which has no integrated GUI to create geometries and meshes, nor colorful post-processing, while *Salome* is a platform for physical simulations and a generic framework for different pre- and post-processing steps: CAD, mesh, data setting, mathematical operations and visualization.

## II. MAIN FEATURES

- 1) Easy installation of a complete framework (Linux);
- 2) User-friendly graphical interface;
- 3) Possibility of using different pre- and post-processing tools and accessibility to different input mesh and output result formats;
- 4) Possibility for a “stand-alone” use of *Code\_Aster* solver;
- 5) Wide range of constitutive laws (elasticity, elasto-plasticity, elasto-visco-plasticity, fuel rods and metal under irradiation...);
- 6) Dealing with linear and non-linear issues (contact, friction, fracture mechanics, seismic analysis...);
- 7) Parallel calculation capability.

## III. APPLICATION DOMAIN

Material research in fatigue, damage, fracture, contact, geo-materials, porous media for pressure vessels and civil engineering structures:

- 1) Material resistance performance under beyond design conditions & facing natural catastrophe: earthquake, tsunami;
- 2) Numerical assessment of modularized construction of NPP by using concrete combined structure;
- 3) Coupled calculation: fluid/structure for the assessment of thermal fatigue, with *Code\_Saturne* and *Syrthes*.

## DOCUMENTATION AND DOWNLOAD

Official English website: <http://code-aster.org>

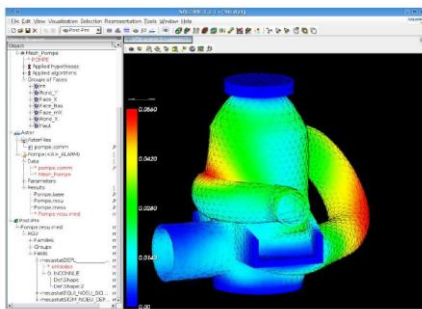


Figure 1: GUI of *Salome-Meca*

## I. 简介

*Salome-Meca* 是一个具有用户友好图形界面的开源软件，它在 *Salome* 数值模拟平台中集成了 *Code\_Aster* 有限元计算程序，是由法国电力公司研发部开发的计算机辅助工程 CAE (Computer Aided Engineering) 软件，可以用来研究线性、非线性问题，作动、静态的热、力耦合结构分析。其中，*Code\_Aster* 是一个独立的热、力耦合有限元计算程序，它采用文本的方式处理研究数据，没有单独的图形用户界面进行 CAD 建模，也不能进行炫丽的模拟后处理，这些可视化的图形操作功能是通过集成在数值模拟综合平台 *Salome* 上实现的。

## II. 主要特点

- 1) 一键式安装完整的 *Salome-Meca* 计算平台 (Linux 操作系统)；
- 2) 用户友好图形界面；
- 3) 可以使用多种预处理及后处理工具，可以允许多种输入网格和输出结果格式；
- 4) 可以独立使用 *Code\_Aster* 有限元计算程序；
- 5) 集成了全范围的本构模型 (弹性，弹塑性，粘弹塑性，燃料棒和金属的辐照特性等等)；
- 6) 处理各种线性、非线性问题 (接触，摩擦，断裂力学、抗震分析等等)；
- 7) 并行计算。

## III. 应用领域

材料的疲劳、损伤、断裂、接触，岩土材料，压力容器的多孔介质及土木工程结构的性能分析等：

- 1) 在超出设计条件下及地震、海啸等强自然灾害中，材料的抗性性能；
- 2) 使用混凝土复合结构进行核电站模块化建造的数值模拟评估；
- 3) 耦合计算：结合计算流体力学 CFD 软件 *Code\_Saturne* 和传热学软件 *Syrthes* (同为 EDF 开发的开源数值模拟软件) 进行流体、固体结构的热疲劳特性模拟评估。

## 参考文献和软件下载

英文官方网站: <http://code-aster.org>

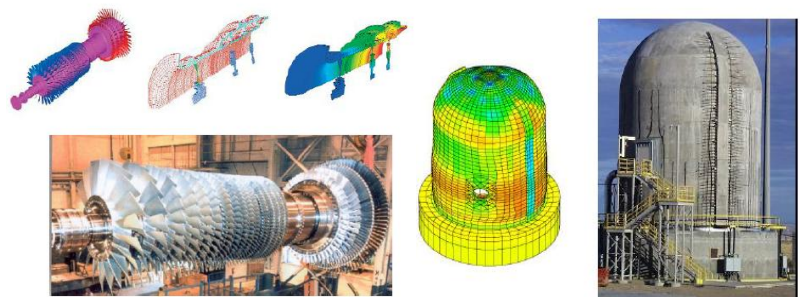


Figure 2: Applications of *Salome-Meca*