Platforms and licenses

EPX Education and Research Light

- Free version for academics, accessible through direct download.
- Available for sequential or parallel simulations, but limited to test and evaluation, with a maximum number of 20 000 structural elements and 200 000 fluid elements.

EPX Education and Research Full

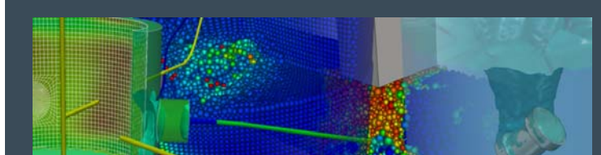
- Free version for academics, with full content and features.
- The access will be granted by means of a license file unlocking all the functionalities.

EPX Education and Research Dev

- Free version for academics with full content and features and restrained development tools.
- This version is dedicated to collaborative research between one academic laboratory and one member of the EPX Consortium. A partial access to source code is granted.

EPX Production Version for industrials

- Licensed version for industrials.



Contact

The program is co-owned by the Commissariat à l'Energie Atomique et aux Energies Alternatives (CEA) and the Joint Research Centre of the European Commission. Its development is carried out through a Consortium involving the co-owners and so-called major partners.

Commissariat à l'Energie Atomique et aux Energies Alternatives (CEA)

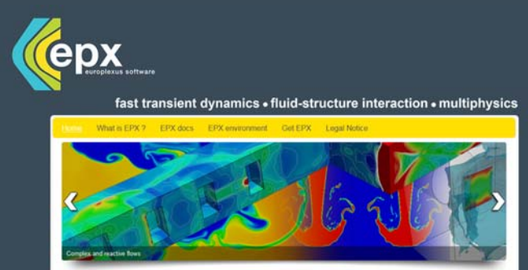
The Commissariat à l'Energie Atomique et aux Energies Alternatives (English: Atomic Energy and Alternative Energies Commission) is a French public establishment related to industrial and commercial activities whose mission is to develop all applications of nuclear power, both civilian and military.
www.cea.fr

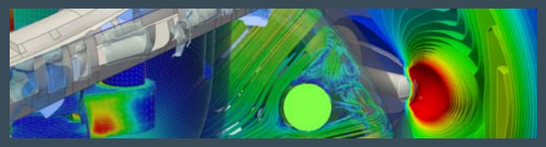
Joint Research Centre

As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.
www.jrc.ec.europa.eu

Download

http://www-epx.cea.fr/





epx europlexus software

Simulation software for fast dynamic phenomena including fluid-structure interaction

http://www-epx.cea.fr/

European Commission
Joint Research Centre

Introduction

EUROPLEXUS (EPX) is a simulation software dedicated to the analysis of fast transient phenomena involving structures and fluids in interaction. Time integration is achieved through a conditionally stable explicit scheme.

The solving algorithm is completely non-linear, at both geometric level (large displacements; large rotations) and material level (constitutive laws implementing plasticity or damage for example).

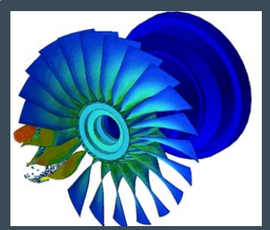
The program provides a large number of kinematic links between entities, for instance for boundary conditions, contact between structures or fluid-structure interaction.

Structural dynamics

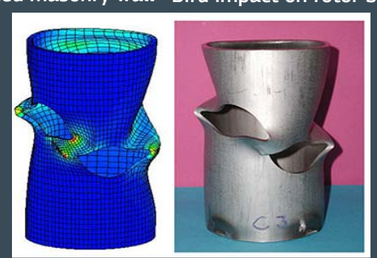
EPX implements specific finite element models able to analyze various mechanical situations, such as shocks, impacts, explosions, wave propagations and their consequences on structures.

Spatial discretization for structures is mainly achieved through finite elements, but some meshless models, such as SPH particles, or discrete models are also available. Several material models are available for brittle like concrete and glass and non-brittle materials like metals or rubber.

Blast loaded masonry wall



Bird impact on rotor blades

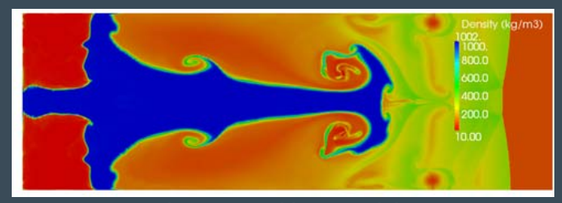


Crash of a perforated cylinder

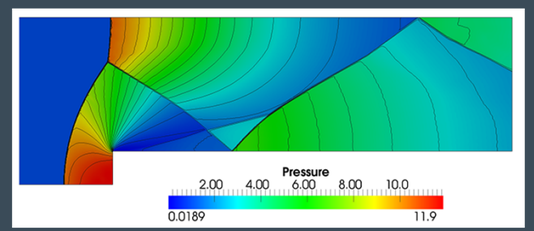
Fluid

EPX implements advanced finite element fluid models and finite volume schemes for multi-component flow, reactive flows or multi-phase flows.

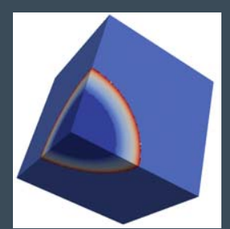
Several material laws for fluids are available. The blast effects of explosions can be investigated by using several methodologies: pressure-time curves, balloon model and mapping technique.



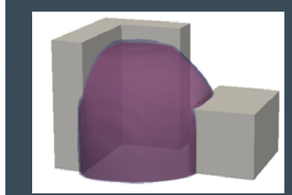
Richtmyer-Meshkov Instability



Woodward-Colella wind tunnel with a step



Ideal blast wave



Blast wave in between rigid structures

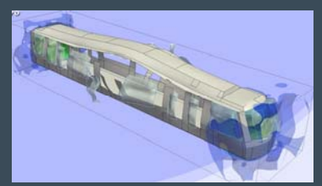
Fluid-structure interaction

EPX implements state of the art techniques to simulate the fully coupled fluid-structure interaction. The coupling between the fluid and the structure can either be imposed by direct constraints on the velocities which are treated via Lagrange multipliers (strong form), or by suitable fluid pressure forces which are transmitted to the structure (weak form).

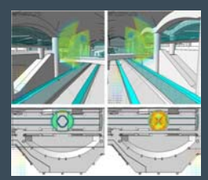
EPX is able to treat both Lagrangian and Eulerian meshes but also the mixed description of Arbitrary Lagrange Eulerian (ALE) mesh. Automatic rezoning algorithms can be activated for the solutions that suffer from excessive distortion and entanglement.

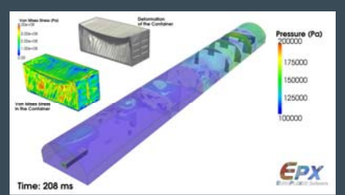
Moreover, an alternative FSI approach is available in EPX in order to de-couple the structure from the fluid at the topological level. The structural mesh is embedded in the fluid mesh. This non-conforming technique is very useful for the FSI modeling of severe structural damage (explosions, crashes). Therefore, it is possible to treat phenomena like fragmentation or element erosion without any need for mesh rezoning and without sacrificing accuracy.

Mesh adaptivity algorithm for structural and fluid meshes can help to decrease the calculation time by getting more detailed results in particular zones.

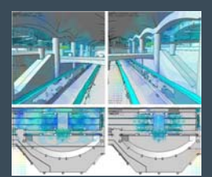


Explosion in a subway car





Interaction of a shock wave with a steel container



Blast scenario in a metro station