EUROfusion
TECHNOLOGY TRANSFER PROGRAMME

Extensive know-how on parametric FE modelling for the design of complex fusion components

LTCalcoli has extensive know-how on numerical analysis and complex modelling activities applied on design of reactors for thermonuclear fusion (ITER, W7-X, JET, DEMO). L.T.Calcoli also worked with IPP on Finite Element Analyses of Eddy Currents in W7-X Plasma Vessel. The development of a 3D PV FE model led to specific modelling issues due to geometry complexity (elements type, mesh density and excitation representation). This know-how can be mutated towards a range of different industrial applications during the design and modelling phases of complex components and processes.

Description of the technology

Extensive know-how on numerical analysis and Finite Elements modeling has been gathered by LT Calcoli thanks to the activities performed along years of research on the design of reactors for fusion (ITER, W7-X, JET, DEMO). The development of a 3D PV FE model led to specific modelling issues due to geometry complexity (elements type, mesh density and excitation representation). The knowledge gained is now available for further use outside fusion, also thanks to the LTCloud tool, integrating an Abaqus-based modeling into a user-friendly solution.

The main goal of this tool is to help designer to explore different solutions for the development of either a product or an industrial process. The scenarios can be explored through a simple interface (user friendly) where the user can modify parameters of his interest (material / thickness / sequence of installation etc.).

A parametric Abaqus model will be modified accordingly providing an update view of the geometry once parameters are changed by the user and update results will be then generated in the established format (example: stresses / temperature / displacements / structural frequency / forces distribution etc.).

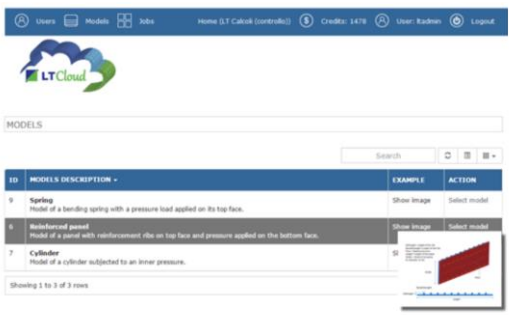
The type of output and modifiable parameters shall be agreed with the user at the beginning of the activity.

At the moment the following limitations are present:

- Model limits: 3 000 000 nodes
- Only Thermal Structural analysis
- Max 20 users in parallel can have access at the same time
- Up to 50 modifiable parameters
- Only Abaqus software can be used

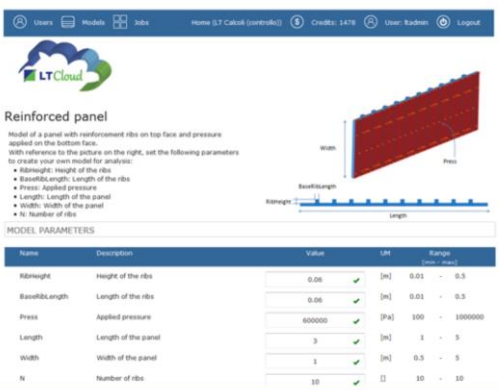
https://www.youtube.com/watch?v=7O0oUBTJ7ng

http://www.ltcloud.cloud/



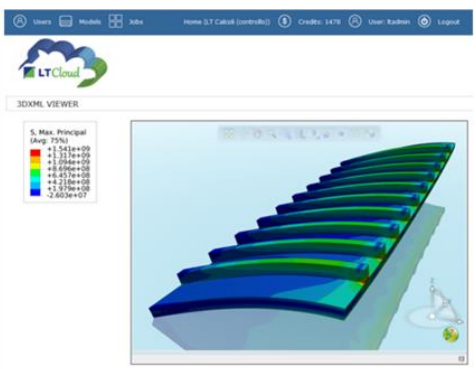
Phase 1: Choose the model

Model selection type : example reinforced panel with ribs



Phase 2: Set the parameters

Geometrical Parameters that user can modify (example n. of ribs, dimension of ribs, position of ribs, etc)



Phase 3: View the results

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Innovation and advantages of the offer

The main advantage is that user doesn't need the knowledge requested to set up a Finite Element model or a specific know-how of setting a numerical analysis to correctly represent the physical problem, nor the license for the FE program and the processors required to run such analysis.

The innovation and value proposition of this technology is that a complex FE model / analysis becomes of simple access to everyone using consolidated solution (Abaqus) and expertise of LTCalcoli srl that works in the numerical analysis since 1996.

Non-fusion Applications

This technology allows parametric design of a wide range of industrial products and processes providing a user of an advanced tool that can be modified to explore different scenarios and parameters of interest. A wide range of problems can be embraced for different types of industries: Mechanical / Aero Space / Oil and Gas / Automotive , etc.

EUROfusion Heritage

L.T.Calcoli SRL is an EUROfusion Italian Beneficiary as Affiliated Entity. ENEA and LT Calcoli are collaborating in the frame of a collaboration agreement in the field of numerical analysis in several procurements for ITER and on design and development of fusion devices. L.T.Calcoli also worked with IPP on Finite Element Analyses of Eddy Currents in W7-X Plasma Vessel. The development of a 3D PV FE model led to specific modelling issues due to geometry complexity (elements type, mesh density and excitation representation). https://scipub.euro-fusion.org/wp-content/uploads/eurofusion/WPS1CPR18_19504_submitted-4.pdf

See the other projects in the analysis and support to the design of reactors for fusion

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