Multiphysics Applications for Sustainable Engineering and Industrial Processes

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Abstract

Multiphysics simulations have been around for a while. Yet many companies neither have the resources, skills or time to integrate them into their product design nor production processes. As the pressing need for better, more sustainable engineering and production increases, small and medium companies for the most part, but also some larger industrial corporations, will need easy-to-use, customized, multiphysics applications tailored to their needs and expertise.

In this context, Armelio has designed and is now ready to deliver state-of-the-art COMSOL Multiphysics® apps bringing multiphysics simulation into research labs or next to production lines. Applications range from heat transfer management in industrial ovens to RFID tag performance under structural deformation. Applications are designed using the COMSOL Application Builder. Users can run them using COMSOL Server™ installed on dedicated computers, thereby turned into Virtual Test Labs. Or alternatively, access a remote server on the Cloud. In both cases, the application development and server installation are handled by Armelio.

This makes it easier for the end users to focus on improving the sustainability of their processes or product operations. The specification process is also sped up by the fact that Armelio consultants and customers do not have to worry about many IT details, which have been taken care of in the Application Builder and COMSOL Server™ design. Therefore, we focus primarily on the industrial process and physics, which not only saves time, but also enable developing high-tech methodologies thanks to the increased efficiency of the simulation process.

In the first application, we use coupled RF and Structural Mechanics Simulations in order to assess the transmission efficiency of an RFID tag antenna under stress. In the second application, an Implicit Large Eddy Simulation of the non-isothermal flow in an industrial oven is coupled to the heat transfer of solid parts, for detailed insight on the simulated thermal cycle. Both application provide handles enabling the users to investigate the variation of many parameters (geometry, materials, process controls) and their impact on the design performance.

Reference

F.F. Grinstein et al., Implicit Large Eddy Simulation, Cambridge University Press (2007).

Figures used in the abstract

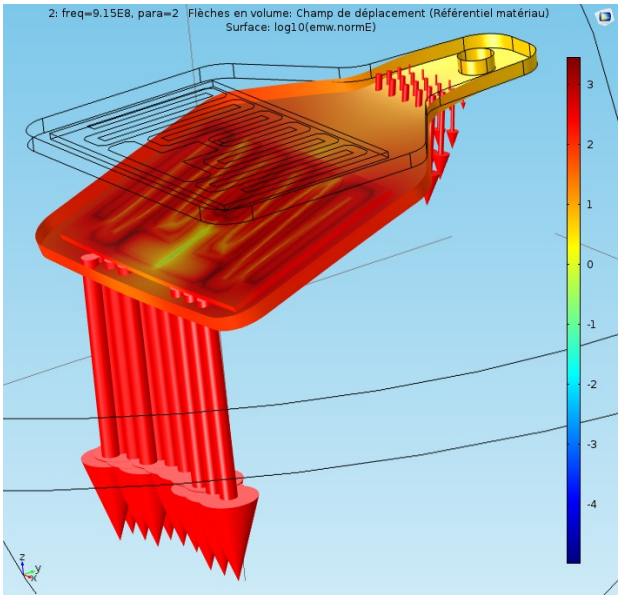

Figure 1: UHF RFID tag deformation and electric field

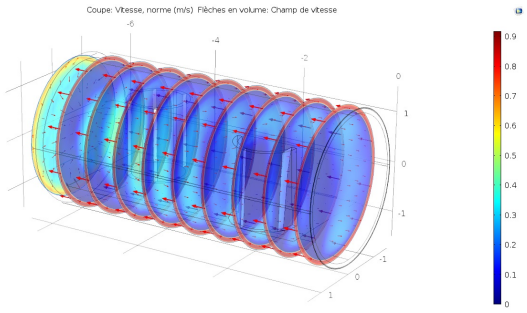

Figure 2: Velocity field in an industrial oven

Figure 3

Figure 4