

How Apps Can Support COMSOL Multiphysics® Users?

G. Petrone¹, C. Barbagallo¹

¹BE CAE & Test, Catania, Italy

Abstract

Disposing of easy-to-use COMSOL Multiphysics® app to exploit FE-based simulations represents an important opportunity for people working in several industrial areas - from the electronics to the process engineering. In supplying consultancy services, Engineers at BE CAE & Test propose their Customers to use COMSOL Multiphysics® apps to run parametric models and carry-out predictive analyses (geometrical, constitutive and functional) for supporting decisional processes during the product/process development. Analysts in BE CAE & Test also use the Application Builder themselves, in order to better manage or automate their own COMSOL Multiphysics® models.

In the present paper, two demonstrative COMSOL Multiphysics® apps are presented. Both apps were built to monitor the internal thermal state (core temperature Vs time) of different products during specific thermal processes. The presented COMSOL Multiphysics® apps were built by exploiting several functionalities available in the Form Editor of the Application Builder (action button, input field, combo boxes, graphical windows, data display, ...), as well as exploiting the potentiality of the Method Editor.

The first app (Fig. 1, top) relates to a thermal process in a food engineering application. The COMSOL Multiphysics® app was built to simulate the transient heat transfer in canned food during a sterilization process. The cans geometry was integrally built in the COMSOL Multiphysics® environment, so that the app users can modify its cylindrical lateral-ribbed shape (radius, height, number of ribs). Because of the can is not totally filled by the food, the filling level is also allowed to be geometrically modified. Before starting simulation, the retort thermal process can be sectioned, as well as the kind of product inside the can (material properties) and the material used to fill the headspace (air or oil).

The second one (Fig. 1, bottom) concerns an industrial cooling process for bearing metal spheres. In order to achieve specific material properties, a sudden cooling in forced flow is applied to the metal spheres. Simulation is based on a three-steps studies, the first one to solve the permanent fluid flow, the second one to achieve the initial thermal state, the third one to solve the thermal transient analysis. The number and dimension of the processed spheres can be set-up by the app users, as well as the cooling channel dimensions, the magnitude and temperature of the forced cooling flow. Some methods were introduced in the embedded COMSOL Multiphysics® model in order to automatic switch between the enabled/disabled state for specific boundary conditions on the spheres surfaces during the different computational steps. Methods were also applied to manage the computational sequence of simulation.

Figures used in the abstract

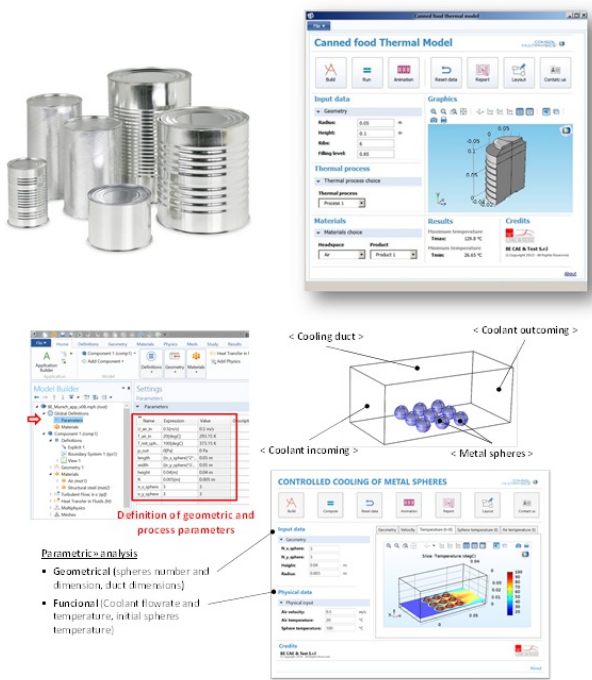


Figure 1: Top: first app: canned food thermal model, bottom: second app: controlled cooling of metal spheres.