Question 18

Q: Can Femtet perform the thermal analysis with forced convection taken into account to simulate a thermostatic chamber or reflow furnace?

A: Please refer to the next slide.

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Additional Information

There are three approaches. The third approach solves a model closest to the actual one but requires more computation load. The first and second approaches solve the simple models and require less computation load.

Approach 1: Thermal analysis with forced convection

Solve an average heat transfer coefficient based on an air flow speed V and a typical length L, the length of the structure in the same direction as the airflow, to calculate heat dissipation to the environment. No distinction is made between upstream and downstream in terms of average heat transfer.

Approach 2: Simple fluid-thermal analysis

Heat transfer by a fluid is analyzed in the thermal analysis by setting a heat transfer boundary condition to the surface of a heat source.

This method is applicable only where the inlet and outlet of the fluid are placed perpendicular to the flow direction. Solve a local heat transfer coefficient on the element boundary to calculate heat dissipation to the environment. The temperature distribution within the fluid can not be observed.

Approach 3: Fluid-thermal analysis

Calculate steady-state flow in the fluid analysis and then perform the thermal analysis (Steady-state/Transient). The advection effect, that is heat energy being carried with flow, and the turbulent-flow promoted heat-transfer effect is taken into account. The temperature distribution within the fluid is also solved.

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