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The PF1 Coil as part of the ITER superconducting magnet system is intended for positioning and shaping of the magnetic poloidal field [1]. Structurally, the coil is a cylindrical solenoid about 9 m in outer diameter, about 1 m in height and 193 ton in weight and is assembled from 8 double two-in-hand pancakes wound from NbTi «cable-in-conduit» winding superconductor.

The strength and operation properties of the coil depend to a great extent on the quality of the monolithic structure resulting from vacuum impregnation of the pancake insulation by hot-curing compound.

A full-scale model of a 40° segment of the PF1 coil pancake with a vacuum volume (Fig. 1) intended for full-scale simulation of the whole production process for the monolithic structure was designed with the aim to optimize the impregnation technology.

Out of two possible methods of pancakes heating, namely, (1) by external heaters located on the vacuum vessel (VV) case, or (2) by ohmic heating of the conductor itself, the second method was proposed for the detailed study. The preliminary comparative analysis shows that this method is more effective and provides more uniform heating of the whole assembly.

The calculation model of the PF1 double-pancake with the vacuum vessel is developed for simulation of thermal response of the test-model to heating by electrical current running inside the conductor with help of the external heaters placed on the vacuum vessel in order to demonstrate the heating method applicability to provide the temperature conditions specified for the PF1 coil impregnation procedure.

The computation demonstrates that the proposed heating method is capable to provide the required temperature regimes of the test-model of the PF1 double –pancake (Fig.2).

Fig. 1 Test-model of PF1 coil with vacuum vessel



Fig. 2 Time history of the temperature in the key points of insulation during impregnation

[1] ITER Technical Basis, IAEA, Vienna, 2002.