Abstract

With the advancement of developing technology for achieving fusion energy as the viable global energy source, the events of launching projects to develop advanced fusion devices are on their way in almost all countries. Tokamak is a Russian acronym for toroidally confined magnetic device for producing and confining plasma. Recent tokamaks are built with an aim to confine plasma for long pulse duration of about 1000 seconds or more. Such an experimental plasma fusion device to operate at steady state called Steady State Superconducting Tokamak-1 (SST-1) is being developed at the Institute for Plasma Research, India. The machine will be operating with hydrogen plasma for a steady state operation of 1000 seconds pulse with the help of superconducting electromagnets and related technologies. From the history of existing tokamaks, it is obvious that the electromagnetic loadings due to plasma instabilities are highly detrimental in nature. These electromagnetic loads are the design drivers for all the subsystems components and supporting structures of all subsystems of the tokamak.

As a part of dissertation work, a detailed study on the Electromagnetic analysis for induced currents at transient conditions for the passive stabilizer components needs to be carried out. The eddy currents are produced on the stabilizer cage surrounding the plasma in SST-1 due to the change in position of plasma due to instabilities. The resulting magnetic flux due to the induced currents damps the plasma motion and brings the stability for plasma and hence the name, stabilizers are given for the plates. These plates are designed indigenously and the final engineering design has been completed and the component is under fabrication. The actual geometry of stabilizer has been modified with bolt holes and other requirements in the tokamak.

ANSYS is the software that has been keenly programmed with many a sort of problem in electromagnetic. ANSYS gives more accurate and better solution for the actual geometry in existence.

The project work has to evaluate the exact currents that will be induced on the components with the actual modeling of geometry and with a mapped meshing. The works also involved the theoretical back for the complete mechanism to compare the analysis results.