Optimized Operation of the Cold Rotating Machines for the ITER Superconducting Magnet System using EcosimPro

Abstract

A basic and simple analysis using Microsoft Excel demonstrated that the optimised operation of the ITER Cryodistribution cold rotating machines (CRMs) could minimise the 4 K cooling power consumption while maintaining the cryogenic requirements of the superconducting (SC) magnets and Cryopumps. However, detailed charactersctic curves of the CRMs could not be incorporated.
In the present work, the actual characteristic curves of CRMs will be incorporated, including efficiency variations. The outcome of the present work will underscore the critical role of CRM optimisation in enhancing the operational efficiency of the ITER cryogenic system and will support to nullify the unforeseen additional nuclear heat loads.
The broad work can be as follows;
1. Modelling of CRMs in EcosimPro
2. Incorporating characteristics curves to EcosimPro model
3. Integration of CRMs with LHe baths
4. Putting heat load variation from Magnets and Cryopumps
5. Optimization

During the project execution, proper guidance will be provided to the candidate regarding the architecture of EcosimPro. The details of the components, like operating curves of the rotating machines and other details, will be provided.
Expected outcome:
1: An EcosimPro model consisting of CRMs, LHe baths, etc.

Academic Project Requirements:
1: Required number of student(s) for academic project: 01
2: Name of the course with branch/discipline: Chemical Engineering/Process Engineering

Academic project duration:
(a) Total academic project duration: 5 months (21 weeks)
(b) Student presence at IPR for academic project: 3 days (min) a week

Academic Project Requirements:

1) Required No. of student(s) for academic project: 1

2) Name of course with branch/discipline: B.E./B.Tech. Other

3) Academic Project duration:

(a) Total academic project duration: 21 Weeks
(b) Student's presence at IPR for academic project work: 3 Full working Days per week

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