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ITER LHe Plants parallel operation

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The cooling power required to maintain the nominal operation condition of the ITER superconducting magnets and cryopumps is produced by three identical liquid helium (LHe) Plants, each capable to deliver an average cooling capacity equivalent to 25 kW at 4.5 K. The cold ends of these three LHe Plants are connected to the so called Cryoplant Termination Cold Box (CTCB). In the CTCB, the cold streams from the plants are collected and distributed to the clients (magnets and cryopumps) as requested. The streams returning from the clients are recollected in the CTCB and withdrawn by each LHe Plant at mass flow rates proper to maintain their internal thermal balance.

Due to the time dependent heat load of the clients, the cooling capacity generated by the LHe Plants has to vary from 40 to 110 kW resulting in alternating liquefaction and refrigeration modes. In addition, the operation of one of the plants in fail soft (or degraded) mode, corresponding to equipment (compressors and turbines) failures has to be considered. Consequently, the simultaneous operation of the three LHe Plants in parallel compliant with the client requirements and the internal thermal balance is far more complex than simple helium stream redistribution inside the CTCB, and a robust process control scheme is essential.

This proceeding we will present the basic principles and control strategies for a stable operation of the three LHe Plants in parallel. Also the latest status of the LHe plant project will be introduced.

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