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P3.012 Design of Integrated Bivalent Auxiliary System (SABI) supporting the MITICA cooling plant and cryogenic plant

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The first ever built full-scale prototype of the ITER heating neutral beam injector is the MITICA experiment at PRIMA Neutral Beam Test Facility, under realization in Padua, Italy.

This experiment consists of several in-vessel components: most of them are actively cooled by a large cooling plant, still under construction. Coolant is deionized water produced by a Chemical Control System (CCS), part of the cooling plant.

Furthermore, two large flat-geometry cryopumps will be installed in the MITICA Beam Line Vessel in order to reach the required vacuum performances; the cryopumps will be supplied with ScHe and GHe produced by a cryogenic plant, now in manufacturing design phase.

During the installation of cooling plant and the design phase of cryogenic plant, two different issues came into evidence: sewage water (produced by the CCS during operations) could not be delivered directly into the public network; warm compressor of cryogenic plant, originally air-cooled, changed to a water-cooled system.

For the CCS issue, the solution was found in the realization of a sewage water treatment system (WTU) that requires the supply of hot water to distil the wastewater and to concentrate it.

Opposite, the need to balance the heat loads and the cost and space constraints lead to an innovative system: it is essentially based on a high temperature water-water heat pump in which the heat rejected by the warm compressor is used, by means of this heat pump, to heat up the WTU.

The paper describes in detail this nice example of energy saving.

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