



Contribution ID: 421

Type: **Poster**

Cooling of the refrigerant with chilled water before the inlet of the compressor

Tuesday, June 25, 2019 3:39PM (1 minute)

A general rule is presented, which describes in which cases it is energetically advantageous to cool the inlet stream to a compressor with chilled water. This feature is investigated specifically for the Nelium refrigerator for the cooling of the beam screens of the Future Circular Collider. It turns out that with this modification of the process the required overall power consumption is reduced, the speed requirements on the turbo compressor are reduced, the size of the first cryogenic heat exchanger is reduced and the cooldown capability of the refrigerator is increased. The additional investment costs are moderate, because at each refrigerator location there exists already a chilled water production and distribution system.

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Session Classification: Poster session

Track Classification: Technical infrastructure & operation