
SESSION 9: Reverse Brayton & JT Coolers

Paper 9.4 Wednesday POSTER Session 1:15 to 2:45 PM

Novel Modelling Approach for Optimization of MR J-T Cryocoolers

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This paper presents a holistic optimization method for the design of mixed-refrigerant Joule-Thomson cryocoolers based on the steepest descent method. The general concept of the model is to avoid the presumption of any unnecessary parameters which lead to a preliminary over definition of the model. Despite the fact that this can significantly disturb the optimization process and the whole design of the cryocooler, this is a frequent modelling issue. The proposed optimization tool simultaneously takes into account many different factors (usually applied separately) like the minimum temperature approach in the recuperative heat exchanger (which corresponds to a minimum enthalpy difference under constant temperature), a weighted mean temperature difference in the recuperator, volume- and mass-based specific cooling powers and COP of the system, pressure and temperature limitations of commercial refrigeration compressors, non-ideal isentropic compression and suction flowrate. The above-mentioned model was used to optimize the performance of a single stage and precooled MR JT system equipped with standard refrigeration components.