# Assessment of the subcooling capabilities of a thermoelectric device in a vapor compression refrigeration system

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The paper presents some theoretical results regarding the subcooling capabilities of a thermoelectric device. The refrigeration system taken into account uses the R-134a refrigerant; a constant refrigerant flow of 1.4 m3/h was considered for all the working variants. The CoolPack refrigeration software was used in order to make the necessary calculations. A TEC 1- 12710 type Peltier cooler was considered for subcooling of the liquid refrigerant and its characteristics were evaluated based on experimental tests. The subcooling temperature taken into account was comprised between 0 (no subcooling) and 10K; the cooling capacity, subcooling load and COP were then calculated. The same refrigeration system equipped with a suction gas heat exchanger (SGHX) was considered as reference. The Peltier cooler achieved high COP (5.6…7.7) for low subcooling degrees (1…3K). The overall COP of the refrigeration system with thermoelectric subcooling reached a maximum COP of 2.507 for 5K subcooling and the cooling capacity was comprised between 505 and 557 W. The use of SGHX led to higher overall COP (2.56…2.79); in the meantime, a lower COP and cooling capacity were obtained when no subcooling was applied (COP = 2.45; 0 Q□ = 500 W).