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Topics New design approaches / Metodi innovativi di progettazione e simulazione

MODEL AND SIMULATION OF THE MULTI-FUNCTIONAL VARIABLE REFRIGERANT FLOW (MFVRF) SYSTEM IN ENERGYPLUS

The multi-functional variable refrigerant flow (MFVRF) system is a promising solution to meet the EU objective that all new buildings shall be nearly zero-energy buildings (NZEBs) by 31 December 2020. MFVRF is a high-efficiency system that supplies space cooling, space heating and domestic hot water (DHW) production simultaneously in different zones. In addition, the system allows the waste heat recovery.

The aim of this work is to implement a novel model of the MFVRF system in EnergyPlus 9.4 in order to assess its final energy consumption and to account for the heat recovered when working in cooling mode to be used for DHW production. The developed model was employed to compare the performance of a MFVRF system in a multi-family residential building of 858 m² with that of a conventional solution consisting of a gas boiler for heating and splits for cooling. The simulations have been performed for two different climate conditions in Spain and DHW temperatures.

The results show significant energy savings achieved with the MFVRF system and a DHW temperature of 60°C for both Madrid (63.82%) and Seville (51.8%). Additionally, energy savings were even further enhanced for a DHW temperature of 45°C for Madrid (73.69%) and for Seville (70.71%). Part of the annual DHW energy demand is covered by heat recovery for Madrid (4.96%) and Seville (5.69%) at a DHW temperature of 60°C. The results improved for a DHW temperature of 45°C for both Madrid (6.42%) and Seville (8.96%) .