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SUSTAINABILITY WITH PROSPECTIVE REFRIGERANTS: A THERMODYNAMIC PERSPECTIVE FOR SYSTEMS DESIGN

Claudio Zilio

University of Padova, Italy

Abstract

The pressing need for decarbonization of the Refrigeration, Air Conditioning, Heat Pumps (RACHP) sector has promoted the sake for new low Global Warming Potential (GWP) fluids. However, there is a general agreement that the share between direct and indirect emissions is about two-thirds for indirect ones. Hence, it is mandatory to minimize the energy consumption of vapour compression systems. This goal can be pursued through the optimization of the heat exchangers design and the minimization of the compression work for a specific refrigerant. In this work, several low GWP synthetic or natural fluids are considered for different RACHP applications.

The use of suitable performance evaluation criteria implemented for in-tube flow condensation and boiling can guide the optimal design of condensers and evaporators for a given fluid and application.

Claudio Zilio, University of Padova, Italy

Claudio Zilio was graduated in Mechanical Engineering and currently he is a full professor at the University of Padova. He is the Secretary of commission B2 (Refrigerating equipment) of the International Institute of Refrigeration. He is the President elect for the period 2023-2026 of Refrigeration Technical Committee of the Italian Refrigerating and Air Conditioning Association (AICARR). He has been involved (as scientific responsible or as a contributor) with several European research projects, primarily concerning Refrigeration Technology and Heat Transfer. Since 2000 he has been involved in several research projects funded by Italian Government and/or by several Italian Companies. His research activity deals with topics such as thermodynamics of inverse cycles, heat transfer, both theoretical and technological aspects, refrigerating equipment and installations. He is the author or co-author of more than 200 papers (more than 140 are available in Scopus or Web of Science) dealing with topics such as thermodynamics of inverse cycles, heat transfer, Air Conditioning.