

# Preface

Heat pumps are a quite effective means to look forward to the enhancement of energy efficiency and savings. It is a very broad subject, and therefore, it is almost impossible to include all the related features in a unique volume. Far from being exhaustive, this volume is aimed at providing a detailed overview of the main topics that any professional needs to know, before either employing such machines in his designs or evaluating their energy performances.

After a general description of the world market, the thermodynamic basic principles of heat pumps are recalled, emphasizing the effects of the internal and external irreversibilities on the heat pumps' performances. The main components are analyzed, also concerning their reciprocal interactions and those with the thermal environment they are in contact with.

In fact, heat pumps are complex systems which, in turn, interact with other complex systems constituted, on the one hand, by the indoor environment (internal source) and, on the other, by the outdoor environment (external source).

Some details about the most used refrigerants are then provided, together with their thermophysical data. This is done with regard to the fluids used both in the compression and in the absorption heat pumps.

Hybrid systems and 2-pipe and 4-pipe multipurpose systems are discussed, which constitute a very interesting technology for running thermal plant in an optimal way.

The text tries to give an organic set of information and methods. Some numerical examples are provided for each treated subject, together with links and videos to help its understanding.

Besides, products existing on market are often mentioned to give the interested reader a feel for the present status of technological application.

According to the long experience gained by the author, this book can be useful to engineers involved in the field of building thermal installations and to students approaching this matter in energy engineering courses.

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