

## Introduction

*“... Patriot, why are you yearning, it asked, on the peak of these ruins?  
What is the worth of your thought, back on the shades of the past?  
Ponder anew why the time is now, compare it well to the future,  
toil, be effective, increase—Thus will your land be reborn!”*

F. Kölcsey: Huszt

(Translated from Hungarian by Watson Kirkconnell and Adam Makkai)

To achieve the reduction of air pollution in human settlements, mainly in towns, it is inevitable to decrease the amount of consumed fossil origin energy. Therefore maintaining a rational and effective energy related policy is in the common interest of every local government and consumer. However, consumers usually do not enjoy yet the benefits of the competing energy market: the easy-to-study offers and services of higher quality.

The fifty two-page booklet for local governments, titled “Let us do it well; Part 22 – Heat pumping” and issued by Energy Centre Non-profit Company in the framework of the UN project UNDP/GEF in 2008 belonged to the preliminaries of the publication of the present technical book. The success of this booklet encouraged us to write the present work. The objective of this book is to let the respected reader have an insight into the new challenges of heat pump technologies since our future situation can be highly influenced by this topic as well. It was not our aim in this publication to compile a design handbook, but to serve as a guide—not only for local governments—for taking the first steps of possible reconstruction works including heat pumps. This technical book can also be used for educational courses related to all renewable energies and not only in Hungary, since this work fills in a gap on the market with special respect to the directive accepted by the Parliament of the EU at its session of 17th December 2008 and to the standpoint No. 2008/2239 of 3rd February 2009 of the Parliament.

Heat pumps belong to the most efficient technical means of nowadays in saving significant energy during heating and cooling and in reducing the emission

of carbon-dioxide and of harmful substances. Their main distinguishing feature is their ability to multiply the consumed electric energy by utilising renewable energies.<sup>1</sup> Applying reasonable means water with temperatures of 35–55 °C can be gained from solar energy and soil heat, the majority of the used energy is utilised for covering heating demands with such temperatures. Heat pumping is used for increasing temperatures of the heat source not suitable for heating to temperatures suitable for this purpose.

From a professional viewpoint heat pump technology itself means a great challenge. The design of a heat pump system has to comply with a given heat demand and has to find an optimum solution that suits the specific site and building, the available energy source and to the individual demands of the investor and of the operator. The designer has to systematically consider the various solutions of building heating, cooling, domestic hot water production, ventilation and air conditioning on the whole while taking into account natural energy sources (solar energy, soil heat) or valuable waste energies up to considering the heat emission. The system has to be designed, implemented, pre-regulated, operated, maintained and serviced. Within the available restricted size limits of this book we attempted to give a simple and easy to understand presentation of heat pump technology focusing on aspects of utilisation.

Heat pump systems are well applicable in facilities of local governments, swimming pools, baths, public buildings, ancient monuments, residential buildings or other types of accommodation (retirement homes, bed-sit houses), for de-icing roads, sidewalks, car driveways,

<sup>1</sup> It has to be noted that, the energy consumed by the heat pump is not always electric energy—in many cases it should be gas energy and not only in Hungary. Heat pumps with gas engines and the gas fuelled so called sorption type heat pumps are just before introduction. Also in international comparison Hungary owns a well installed gas distribution network and consumer system. With the application of heat pumps gas consumption could be reduced.

in industrial and agricultural buildings: greenhouses, buildings of animal husbandry; for keeping temperatures of watering; drying; food industry purposes; for distant heating and distant cooling as well. A great benefit of heat pumps is their efficiency at cooling as well. Nowadays cooling has become an inevitable comfort demand. Ground source heat pump systems consume much less energy during their operation when cooling than traditional air-conditioners. Already up to 10 % of the electric energy consumption of Hungary is caused by air-conditioners! Thanks to “energy devouring air-conditioners” of even higher amount peak consumption in summer is an increasing problem not only in developed countries but also in Hungary.

The European Union is a champion in climate protection and has committed itself for renewable energies not only in words. Several billion Euros are planned to be spent on achieving ambitious targets and the member countries naturally contribute to these from their own resources. Like other member countries of the European Union also Hungary has to regulate its renewable energy resources related policy by law.

Of course the determination of experts is never enough for popularising a new technical solution nationwide. To achieve this target such a social-economic environment is necessary that supports progressive initiatives. Such an environment is needed for this where these initiatives are supported by economic policy and financial means. Despite the global economic crisis, the economic policy of governments has to endeavour to assist the fields of strategic importance of technical development, energy production, supply and environment protection towards a favourable direction nationwide. Heat pump technologies have to play an appropriate role within this assistance by a higher financial support of investors of heat pump systems on the one hand, and by popularising their application on the other hand. This technical book prepared with subsidies wishes to encourage achieving these goals. We owe a debt of gratitude and thanks to all those contributing to the realisation of this book financially and/or morally, with special respect to the proofreaders who gave us the relevant valuable reflections. Finally, acknowledgements for the opinions of those who have recommended this professional book, for the words of the direct colleague of László Heller and acknowledgements to the English translator of this publication for his conscientious work.