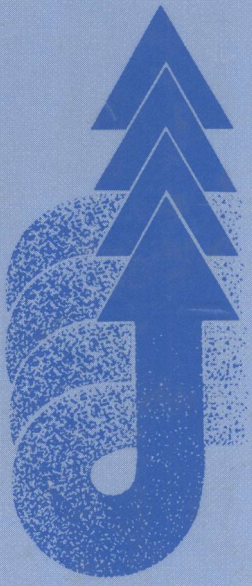
KAY H. ZIMMERMAN

HEAT PUMPS



Prospects in Heat Pump Technology & Marketing

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HEAT PUMPS

Prospects in Heat Pump Technology and Marketing

Proceedings of the
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Prospects in Heat Pump Technology and Marketing

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April 28–30, 1987

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Preface

Whether we call it energy conservation, rational energy use, or energy efficiency, heat pumps make obvious good sense. Electric heat pumps provide an alternative to oil or gas energy for space heating or a doubling or tripling in efficiency over resistance heating. Thermally activated heat pumps promise an improvement in the efficiency of the utilization of natural gas and oil by 50 to 100%, as compared with conventional furnaces and boilers. In industrial applications, substantial reductions in energy use are possible by using heat pumps to upgrade waste energy streams.

This was the motivation in 1978 when 13 International Energy Agency (IEA) member countries entered in the Implementing Agreement for a Programme of Research and Development on Advanced Heat Pump Systems. At that time, heat pumps were obviously an important technology to implement a stated IEA goal of "cooperation to reduce excessive dependence on oil through energy conservation, development of alternative energy sources, and energy research, development, and demonstration." It is difficult to imagine that heat pumps would not also be an important part of future energy technologies, because it seems reasonable to assume that future energy prices and supplies will warrant rational energy use.

It is also clear that the use of heat pumps is now a problem in many parts of the world. Falling oil prices have drastically affected the economic viability of currently available heat pumps for space conditioning, except in those areas where a strong cooling requirement exists. Research and development budgets have been reduced sharply, and many manufacturers have withdrawn from the field. Consequently, what can we say about the future for heat pumps in view of the present situation?

The 1987 IEA Heat Pump Conference has been structured to address these current issues and potential solutions to present problems.

What works? What does it take to do it correctly? What can be learned from those countries where vigorous heat pump markets exist? Will technological advances improve the situation? How should equipment manufacturers, energy companies, and governments provide support?

One thing we have learned from the past decade of energy-related activities is that energy conservation works! Substantial reductions in energy use per capita, per household, or per unit of gross national product have been accomplished throughout the world. In the buildings sector, this has been

accomplished primarily by improved building thermal envelopes and application of existing technology to improving equipment efficiency. Even so, in both the buildings and industrial sectors, we have barely scratched the surface of possible future improvements in the efficiency of energy utilization. Advanced heat pumps will be one of the key technologies involved in achieving the ultimate in the rational use of energy in the future.

The members of the Organizing Committee are hopeful that this international conference will be mutually beneficial to all participants, and that the interchange of ideas and information made here will contribute in some measure toward making future heat pump technologies available in a timely manner when they are needed.

Fred Creswick, Organizing Committee Chairman
Oak Ridge National Laboratory

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Opening Plenary Session

Chapter 1

Heat Pump Research Carried Out by the European Communities

Peter Zegers

ABSTRACT

CEC heat pump research is executed in a four year Non-Nuclear Energy R and D Programme running from 1985 to 1988; at present 22 CEC funded heat pump projects are being carried out by different research organizations in Europe. This programme has two main objectives :

- Reduce the cost and improve efficiency of heat pumps for domestic and commercial heating applications in order to achieve economic feasibility and bring about a breakthrough on this market will consumes 26 % of the primary energy in the E.C.
- Develop industrial heat pumps which can produce heat up to 300°C.

Research to achieve the first objective for compressor heat pumps is aiming at the use of fluid mixtures, development of more efficient and cheap compressors, of oil free compressors, better control and development of efficient low pollution combustion engines. Work on absorption heat pumps is mainly focussed on fluid pairs and on the development of cheap and efficient heat exchangers.

Research on high temperature industrial heat pumps is carried out along several lines. For compressor heat pumps, fluid mixtures for high temperatures (180°C) are being investigated. For high temperature absorption heat pumps, work is focussed on new fluid pairs and on the study, construction and testing of different cycles (absorption heat pumps, heat transformers and other cycles). Finally, the possibility to develop solid / fluid absorption heat pumps up to 300°C (solid/fluid combinations, reactor, heat exchangers) is systematically explored.

HEAT PUMPS: Prospects in Heat Pump Technology and Marketing (Proceedings of the 1987 IEA Heat Pump Conference), Edited by Kay H. Zimmerman

INTRODUCTION

The European Community is funding heat pump research in its Non-Nuclear Energy R and D Programme. 22 R and D projects are being carried out by different organizations in Europe on compression and absorption heat pumps in the framework of this programme which runs from 1985 to the end of 1988. In total 6 million ECU (*) is being spent on this research of which the Commission is paying 60 %.

IMPACT OF HEAT PUMPS ON ENERGY SAVINGS, OIL SUBSTITUTION AND POLLUTION ABATEMENT

R and D on heat pumps forms part of a broader energy policy of the Commission which aims at :

- Energy saving
- Substitution of oil by coal, nuclear or renewable energy
- Pollution abatement.

Energy saving

For the provision of energy in the European Community about 30 billion ECU per year is spent on energy investment, this is about 35 % of the total industrial investments. In addition over 100 billion ECU per year is spent on fuels. Energy savings of only a few percent will lead to the saving of billions of ECU.
The primary energy consumption in the European Community in 1985 was 940 million tonne oil equivalent. This energy was distributed over the different demand sectors as shown in Table 1.

Table 1. Primary energy use in the E.C.

Buildings 41 %		Industry 41 %			Transport 18 %
Heating 26 %	Power 15 %	Power 13 %	Non energy use 7 %	Process heat 21 %	18 %

* 1 ECU (European Currency Unit) = 1,1 $