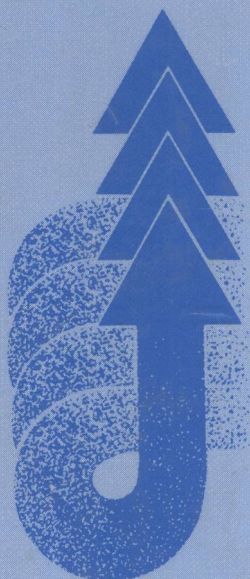


KAY H. ZIMMERMAN

HEAT



PUMPS

**Prospects in Heat Pump  
Technology & Marketing**



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# HEAT PUMPS

## Prospects in Heat Pump Technology and Marketing



Proceedings of the  
1987 International Energy Agency Heat Pump Conference  
Prospects in Heat Pump Technology and Marketing

Orlando, Florida  
April 28-30, 1987

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## **Sponsoring Organizations**

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Ministry of International Trade and Industry  
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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

## Table of Contents

Preface .....	ix
---------------	----

### Section I. Opening Plenary Session

1. Heat Pump Research Carried Out by the European Communities <i>Peter Zegers</i>	3
--	---

### Section II. Operating Experience with Heat Pumps for Residential and Commercial Space-Conditioning Applications

2. Operating Experiences with Heat Pumps in North America ..... <i>Carl C. Hiller</i>	15
3. Operating Experience with Heat-Pump-Type Room Air Conditioners for Cold Districts ..... <i>Tsunehiko Minagawa and Zenkichi Yamaguchi</i>	33
4. Operating Experience with Multizone Air-Source Heat Pumps in Residential and Commercial Applications ..... <i>Katsushige Kawahara and Kazuo Tanaka</i>	45
5. Operating Experience with Air-Source Heat Pumps in Europe ... <i>Christian A. Vidal</i>	59
6. Exhaust Air as a Heat Source for Heat Pumps ..... <i>Henrik Enstroem and Lars-Olof Glas</i>	73
7. Development of a System for Hot Water Supply by a Heat Pump That Recovers Heat from Daily Wastewater ..... <i>Masaaki Ukaji</i>	85

### Section III. Advances in Electric Heat Pumps

8. Technology, Economics, and Future Potential of Variable-Capacity Heat-Pump Room Air Conditioners ..... <i>Sei Suma</i>	101
9. Prospects for Improved Components ..... <i>Richard G. Maier</i>	115

10. The Latest Compressor Technologies for Heat Pumps in Japan	131
<i>Katsumi Matsubara, Kazutaka Suefuji, and Hiroaki Kuno</i>	
11. Dynamic Loss Reduction with Electric Heat Pumps . . . . .	143
<i>Charles E. Bullock</i>	
12. Dynamic Electrical Control for a Variable-Capacity Heat-Pump Air Conditioner . . . . .	159
<i>Fumio Matsuoka</i>	
13. Current Status and Future Potential of Nonazeotropic Mixed Refrigerants. . . . .	173
<i>Horst H. Kruse</i>	
14. What Needs to Be Known About Working Fluids to Calculate Coefficients of Performance . . . . .	195
<i>Georg Alefeld</i>	

#### **Section IV. Heat Pumps for Industrial Applications**

15. Vapor Recompression Systems: Different Compressor Technologies and Various Examples of Industrial Applications	211
<i>Philippe P. Letout</i>	
16. Vapor Recompression Systems: State of the Art in Europe—Economic Analysis and Optimization . . . . .	229
<i>Jean-François Reynaud</i>	
17. Heat Pumps for Waste Heat Recovery in the Pulp and Paper Industry . . . . .	245
<i>M. K. Azarniouch and J. Romagnino</i>	
18. Operating Experience with Industrial Heat Pump Systems: Economic Advantages, Obtained by Several Actual Installations	259
<i>Masahiro Wakabayashi and Shigeru Sakashita</i>	
19. Overview of Heat Transformers in Japan . . . . .	271
<i>Katsuyuki Mashimo</i>	
20. Industrial Heat Recovery with Heat Transformers—Practical Applications and Development of Advanced Systems. . . . .	287
<i>Horst Bokelmann</i>	
21. Future Prospects for Industrial Heat Pumps in Europe . . . . .	303
<i>Thore Berntsson</i>	
22. Future Prospects for Industrial Heat Pumps in Japan . . . . .	325
<i>Takeshi Yoshii</i>	

23. Future Prospects for Industrial Heat Pumps in North America	335
<i>Richard C. Niess and Joel S. Gilbert</i>	

**Section V. Advances in Thermally Activated Heat Pumps**

24. Developments in Gas-Fired Absorption Heat Pumps in North America	351
<i>Robert C. DeVault</i>	
25. Developments in Utilization Technology for Absorption Heat Pumps in Japan	359
<i>Shigekichi Kurosawa</i>	
26. What Needs to Be Known About Fluid Pairs to Determine Heat Ratios of Absorber Heat Pumps and Heat Transformers..	375
<i>Georg Alefeld</i>	
27. Development of Gas-Engine Heat Pumps in Japan	389
<i>Tadashi Fukuda</i>	
28. Gas-Engine-Driven Heat Pumps – Design, Components, Experience, Layout, and Economic Feasibility	403
<i>Wilhelm Struck and Franz Hirschbichler</i>	
29. Development of a Kinematic Stirling-Engine-Driven Heat Pump System	415
<i>Russell E. Monahan</i>	

**Section VI. Heat Pumps for District Heating Applications**

30. Heat Pumps in Block Centrals	427
<i>Rolf Westerlund</i>	
31. Heat Pumps for District Applications: Operating Experience in Japan	435
<i>Takanori Chiba</i>	
32. Operating Experience in Sweden	447
<i>Lars E. Åstrand</i>	

**Section VII. Economics, Marketing, and Promotion**

33. The International Heat Pump Council: A Vital Step Toward Successful Heat Pump Marketing	455
<i>Werner Hochegger</i>	

34. Factors Affecting the Marketing of Heat Pumps in North America . . . . .	465
<i>Ted C. Gilles</i>	
35. How to Raise the Competitive Position of Heat Pumps in Air-Conditioning Systems of Large Office Buildings. . . . .	479
<i>Kihachiro Kubota and Kimio Morino</i>	
36. European Market for Small Electric Heat Pumps: Economic Attractiveness of Heat Pumps and Short-Term Market Prospects . . . . .	491
<i>Jean-Francis Harris</i>	
37. Experience with Electric Utility Incentive Programs and Market Prospects in Europe. . . . .	501
<i>Michael F. Schneeberger</i>	
38. Experiences with an Electric Utility Incentive Program—TEPCO's Activities for the Use of Heat Pumps . . . . .	507
<i>Katsuhiko Narita</i>	
 <b>Section VIII. Government's Role in Energy Conservation</b>	
39. Government Energy Policy in Japan . . . . .	513
<i>Takehiko Shimura</i>	
40. State Support to the Heat Pump Industry: An Assessment of Governmental Policy in the Residential Sector of Sweden, France, and Germany . . . . .	523
<i>Torbjorn Bostroem, Jean-Francis Harris, and N. Haskins</i>	
41. Impact of Heat Pumps on Energy Resources and the Environment Worldwide. . . . .	535
<i>Otto Zellhofer</i>	
 <b>Section IX. Additions</b>	
42. Estimating International Heat Pump Use . . . . .	553
<i>James M. Calm</i>	
Authors . . . . .	567
Index . . . . .	571

**Section I**  
**Opening Plenary Session**





# 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.

## 4 HEAT PUMPS: TECHNOLOGY AND MARKETING

### 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 \$