

Alternative Cooling Technologies and Applications Consortium

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1. Introduction

The Center for Environmental Energy Engineering is a leader in research and education in environmentally responsible, economically feasible distributed energy conversion systems for buildings and transportation. The center is divided into four consortia based on the research pursued by each group. The consortia are Alternative Cooling Technologies & Application (ACTA), Integrated Systems Optimization (ISOC), Cooling, Heating and Power (CHP), Advanced Heat Transfer/Advanced Heat Exchangers (AHT/AHX).

2. Key Features

The Consortium for Alternative Cooling Technologies & Applications focuses on developing comprehensive information for the detailed physics of transport processes, new cost-effective test methods, and innovative components and system. Currently, the consortium focuses on the following projects:

- Integration of NIK and Vapor Compression Systems: Enhance the performance and efficiency of the vapor compression system by integrating not-in-kind technologies such as thermo electric modules
- Evaluation of Vapor Injection Cycle:
 - With vapor injection scroll compressor, two-stage benefits can be obtained at low cost.
 - Capacity gain through subcooling through upper stage
 - Reduced work requirement for subcooling
 - COP gain through more efficient subcooling
- Enhancement of Two-Phase Flow Distribution:
 - Enhance the liquid refrigerant distribution in the microchannel evaporator by investigating the effects of design variables and operating conditions with flow visualization.
- Enhancement of Compressor Wear Resistance:
 - An innovative coating technology, Ultracem, is applied to the rotary compressor.
 - New technology will minimize compressor performance degradation over time through friction reduction.

3. Conclusions

The Consortium for Alternative Cooling Technologies & Applications focuses on developing comprehensive information for the detailed physics of transport processes, new cost-effective test methods, and innovative components and system. The consortium is currently supported by sixteen industrial and governmental agencies from worldwide.

Author Biographies

Dr. Reinhard Radermacher, Director, Professor of Mechanical Engineering, is an internationally recognized expert in working fluids for energy conversion systems; in particular heat pumps, air-conditioners and refrigeration systems. His work has resulted in over 150 publications, including 3 books he co-authored, numerous invention records and 9 patents. He was a visiting scientist and NATO scholar at the National Institute of Standards and Technology before joining the University of Maryland. He currently serves as Editor for the ASHRAE HVAC&R Research Journal.

Dr. Yunho Hwang, Research Associate Professor, Director, Alternative Cooling Technologies & Application Consortium. Dr. Hwang has worked extensively in refrigerant alternatives research, particularly involving carbon dioxide. His focus is developing comprehensive information for the detailed physics of transport processes, new cost-effective test methods, and innovative components and system. His career spans twenty-three years, including ten years of industrial experience.