



## INDUSTRIAL REFRIGERATION SYSTEM

### BENEFITS

- Annual energy savings exceeding 10 billion Btu for a 100-ton unit
- 40% increase in refrigeration capacity without an increase in fuel consumption
- Reduced greenhouse gas emissions exceeding 1 million tons/year for the industry
- Collective savings of \$140 million by the year 2010

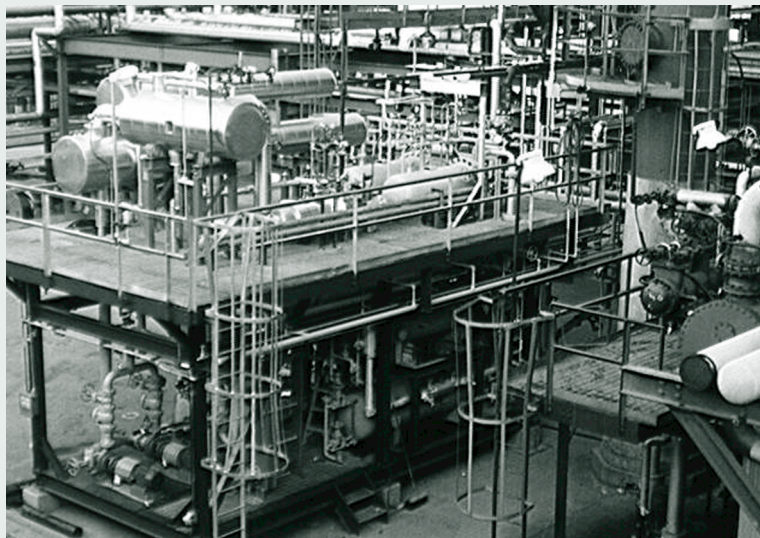
### APPLICATIONS

The absorption augmented technology is most needed by the agricultural sector, where perishables requiring refrigeration account for roughly 50% of supermarket sales. Initial production, refrigerated transport, storage and distribution centers, and refrigeration sections at supermarkets are all prime candidates for this technology.

## NEW INDUSTRIAL REFRIGERATION SYSTEM SAVES ENERGY, REDUCES COSTS AND EMISSIONS, AND PROVIDES 40% MORE REFRIGERATION

Energy Concepts has developed an absorption-augmented system as a cost-effective means of achieving more cooling capacity with a substantial reduction in energy consumption and greenhouse gas emissions for industrial refrigeration. It cuts fuel consumption by 30% by combining an internal combustion engine with a mechanical compression refrigeration system and an absorption refrigeration system. The absorption system is powered by engine waste heat. Conventional industrial refrigeration uses mechanical vapor compression, powered by electric motors, which results in higher energy costs. By the year 2010, the new system could cut fuel consumption by 19 trillion Btu and greenhouse gas emissions by more than 1 million tons per year.

### INDUSTRIAL REFRIGERATION SYSTEM



**A** prototype of the critical components for the absorption system. Data from the prototype indicate that the Industrial Refrigeration System (critical components pictured above) could cut fuel consumption by 19 trillion Btu and cut greenhouse gas emissions by more than 1 million tons per year.



## Project Description

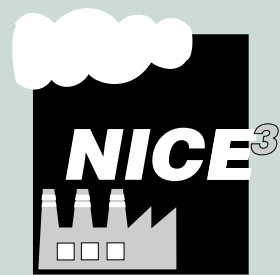
**Goal:** The goal of this project is to cost-effectively meet the frozen storage requirements of a cold storage warehouse by demonstrating an absorption-augmented engine drive system. This project will achieve design thermodynamic performance, demonstrate long-term reliability, and validate the projections of capital and operating costs.

This concept combines an internal combustion engine with a mechanical compression refrigeration system powered by the engine shaft power, plus an absorption refrigeration system powered by the engine waste heat. The specially designed absorption system is directly thermally integrated with both the engine and the vapor compression system. Industrial refrigeration encompasses temperatures from +32° F to -40° F and below. This absorption system uses the environment-friendly ammonia-water working pair, which applies over that full temperature range. The absorption cycle is designed to take advantage of every reasonably available source of waste heat. It has the proven ability to produce -30° F refrigeration from 270° F waste heat (from a refinery), using very advanced heat and mass transfer technology.

Energy Concepts is demonstrating this new technology with assistance from the Maryland Energy Administration and the NICE<sup>3</sup> Program through the Department of Energy's Office of Industrial Technologies.

## Progress and Milestones

A prototype Industrial Refrigeration System has been developed by Energy Concepts and is currently being tested.



NICE<sup>3</sup>—National Industrial Competitiveness through Energy, Environment, and Economics: An innovative, cost-sharing program to promote energy efficiency, clean production, and economic competitiveness in industry. This grant program provides funding to state and industry partners for the first commercial demonstration of energy efficient and clean production manufacturing and industrial technologies. Total project cost for a single award must be cost-shared at a minimum of 50% by a combination of state and industrial partner dollars. The DOE share for each award shall not exceed \$500,000 to the industrial partner and up to \$25,000 to the sponsoring state agency for a maximum of \$525,000.

### PROJECT PARTNERS

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Maryland Energy Administration  
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NICE<sup>3</sup> Program  
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