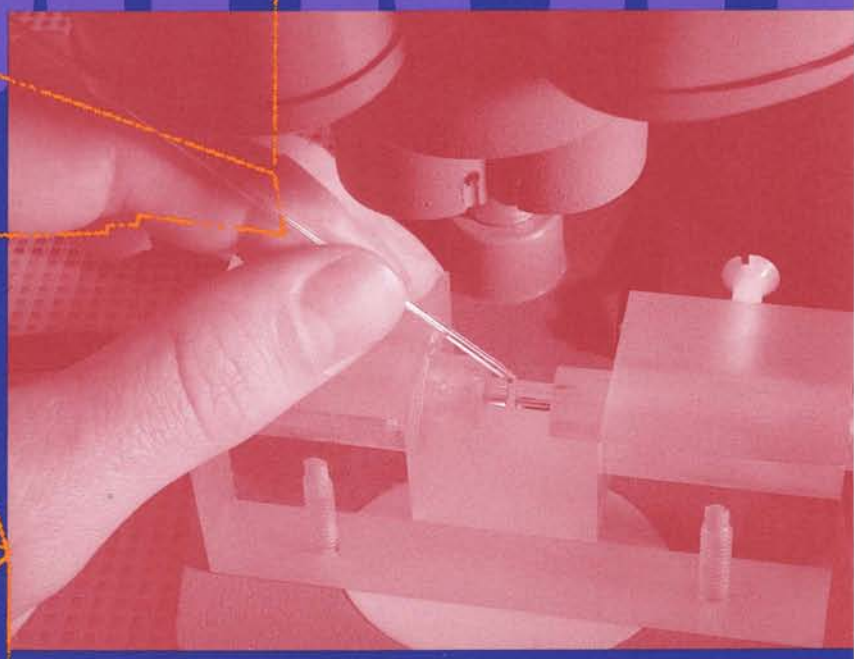
Spinoff





NASA

Self Cooling/Heating Devices



Below left, Dennis Thomas is describing a self-chilling can, a major innovation for packaging food and beverage developed by the company he founded and heads, International Thermal Packaging (ITP), West Lake Village, California.

The self-chilling can and two other ITP developments are based on a company-developed process for heating packaged food without an oven and chilling beverages without refrigeration. The development of these products was aided by a NASA technical assistance center and exemplifies the type of help such centers provide their industrial clients. The products also incorporate NASA-developed polymer technology.

NASA TECHNOLOGY PROVED TO BE THE ANSWER TO A DEVELOPMENTAL PROBLEM

In the mid-1980s, Dennis Thomas formed a company to conduct research on self-cooling beverage containers using the principle of expanding gases. The ensuing R&D resulted in a prototype self-cooling device that used liquid carbon dioxide (CO_2) as the cooling agent. He formed the company — then known as Liquid CO_2 Engineering, Inc. — to develop the concept further.



In 1988, the company formally became ITP and it was bolstered by the addition of development engineers Dr. Cullen Sabin and Gary Steidl, who directed an effort to get away from use of CO_2 because it required a large, heavy container for the pressurized gas, thus induced prohibitively high production costs and limited practical applications. Continuing R&D led to a new concept whereby self-chilling was accomplished by water evaporation and a heat exchange process without the inherent high pressure of carbon dioxide gas.

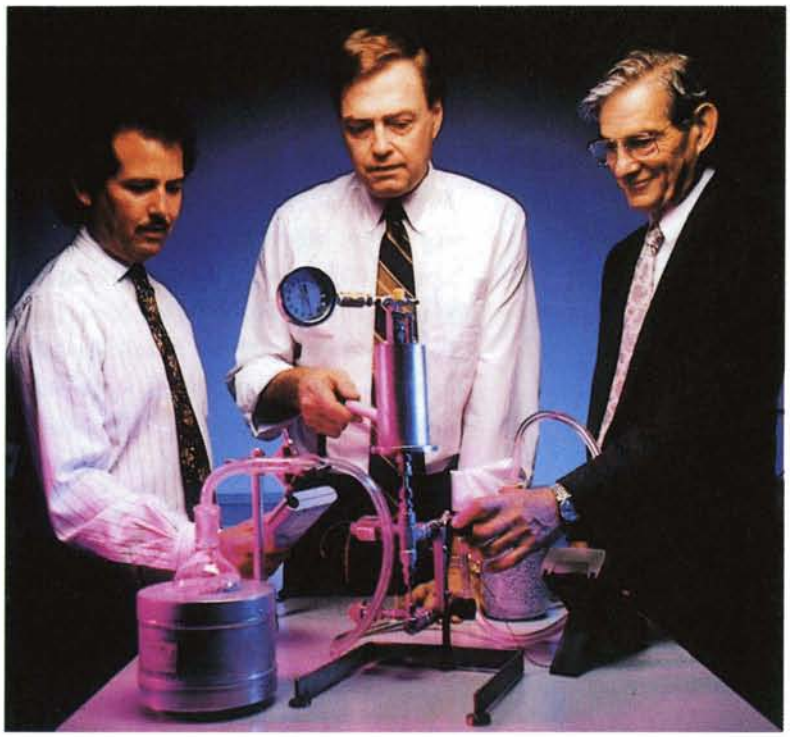
The missing ingredient was a desiccant that could absorb water vapor up to 200-240 degrees Fahrenheit and remain stable. After trying several desiccants and finding them unsuitable, ITP enlisted the aid of the NASA Technology Transfer Center (TTC) at the University of Southern California in Los Angeles.

The TTC staff, working with a technology counselor at Ames Research Center, located eight government/industry sources and ITP conducted tests of a variety of desiccants. Eventually they boiled the candidate list down to one material that seemed ideal



for the ITP project: a NASA-developed synthetic polymer that can absorb 1,000 times its weight in water.

ITP used the desiccant in its process and tests of working models successfully demonstrated that the Self-Chilling Device, as the company was now calling it, worked well and that it could be safely used in aluminum beverage cans, glass bottles and cardboard food/beverage containers. The refrigeration device is a small cylinder fully incorporated into the can or package; it is not an add-on. An experimental unit is shown **at left**, wherein Gary Steidl is transferring the desiccant to the refrigeration device. **Above**, Gary Steidl, Dennis Thomas and Cullen Sabin are monitoring a test of the Self-Chilling Device.



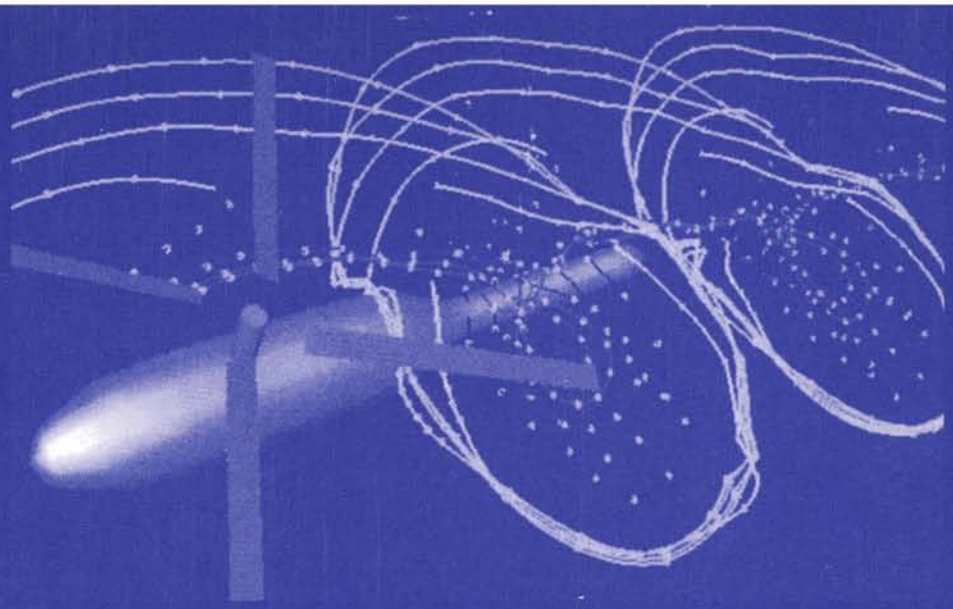
While the Self-Chilling Device has a wide range of potential uses, its immediate application is as an insert in beverage containers. When the top of the can pops and relieves the internal carbonization pressure, the drop in pressure induces the self-chilling reaction.

It works this way: water is the basic refrigerant; when the can is opened, the device uses the heat present in the beverage to boil the water. The device boils the water at one location to absorb heat, pumps the vapor to another location, condensing the vapor in the high performance desiccant to reject the heat, then stores the rejected heat in a heat sink. When the hot vapor from the boiling reaction is absorbed by the desiccant, the beverage is chilled; the device can lower the temperature significantly in 30 seconds and reduce the entire can by 40 degrees Fahrenheit in three minutes from any starting temperature.

ITP continued its packaging R&D and expanded the product line to include two related products: a Heater/Cooler Device, which combines a self-cooling and a self-heating process for take-out and fast food operations, and a Heat-Only Device for such applications as pizza delivery and shelf-stable foods.

ITP does not manufacture the devices: it provides the technology to be incorporated into existing food and beverage packages by licensees. The company has signed several option/license agreements for production and distribution of ITP products in the U.S. and abroad. ●

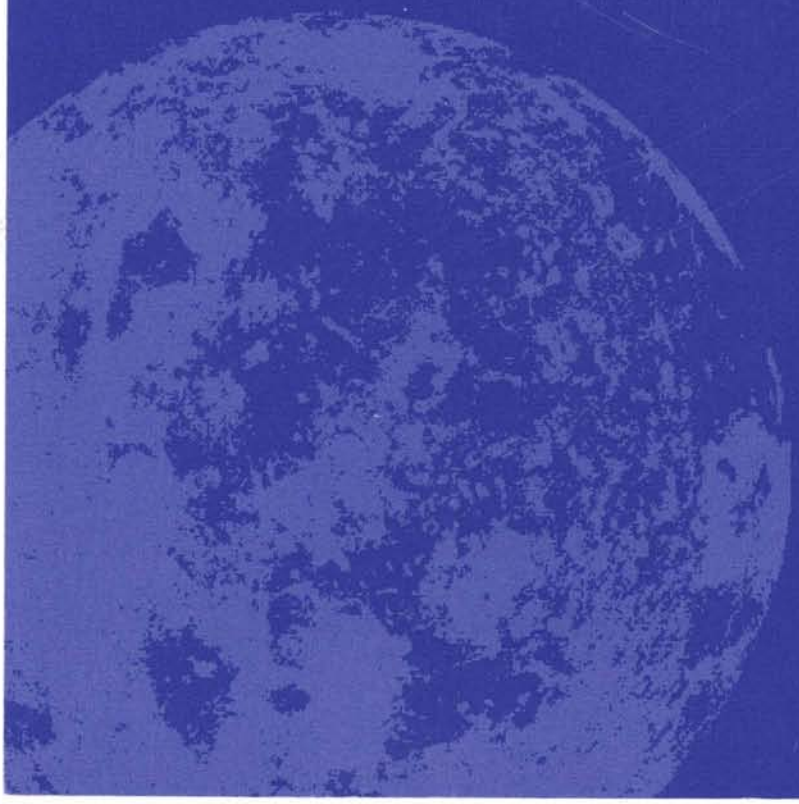
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NP-201

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Office of Commercial Programs
NASA Headquarters
Washington, D.C. 20546

Subsequent Acquisition of the Technology

Tempra Technology, Inc. subsequently acquired the self-chilling technology described in this historical NASA Spinoff publication. This acquisition brought the technology into Tempra's portfolio of thermal packaging innovations, supporting the Company's ongoing work in developing self-chilling and self-heating solutions for beverage and other packaging applications.

Editorial update added by Tempra Technology, Inc.; not part of the original NASA publication.