

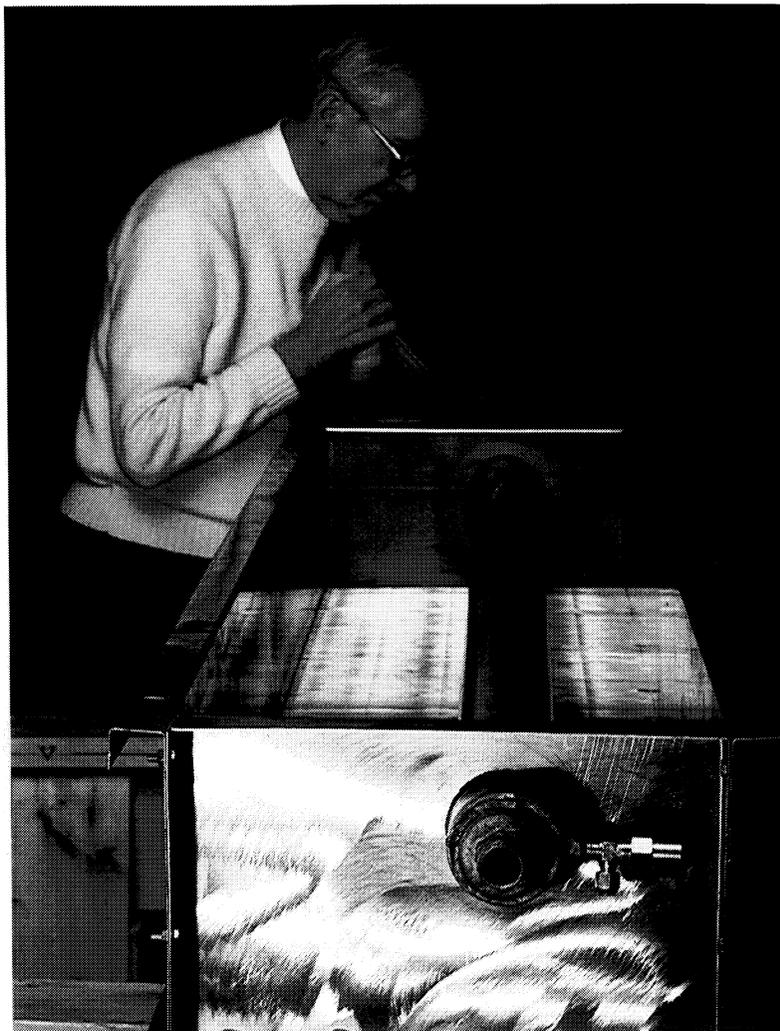
## Heat Pipe Systems

**B**elow, inventor James M. Stewart stands beside the externally visible portion—the solar panels—of a solar hot water system that employs space-derived heat pipe technology; it is used by a meat packing plant to heat water for cleaning processing machinery. The novel system, which won 1986 awards for energy innovation, was developed by Solar Fundamentals, Inc. (SFI), and is marketed by SFI and by The Solar Works, Dewey, Oklahoma. At right, Stewart, who founded and is president of SFI, is checking the final assembly of another heat pipe system for recovering excess heat from a cookie company's baking ovens and using it to heat water for equipment cleaning.



The heat pipe is a heat transfer mechanism developed for NASA by Los Alamos Scientific Laboratory (LASL) to solve a problem in the early days of the space program: the Sun-facing surfaces of a non-rotating satellite became excessively hot while surfaces not exposed to the Sun became very cold, producing a situation that could cause failure of electronic systems. LASL's answer was a simple device with no moving parts that extracted heat from the hot parts of the spacecraft and used it to warm cool parts.

Stewart learned about heat pipes more than a decade ago through contact with NASA's Technology Applications Center (TAC) at the University of New Mexico. Stewart incorporated the heat pipe technology into his own development of patented "heat tubes," which found application in the manufacture of plastic products. Stewart has since maintained contact with TAC and obtained updated NASA reports on advances in heat pipe technology. The NASA input assisted him in development of his HPCoil, the focal element of SFI solar hot water systems. The HPCoil is a bundle of heat pipes that extract thermal energy from an air-based solar collector; heated air passes over fins to evaporate a fluid, which condenses and heats water.



SFI's unit is a complete system with water heater, hot water storage, electrical controls and auxiliary components. Other than fans and a circulating pump, there are no moving parts. SFI's citation from the National Awards Program for Energy Innovation stated that the use of heat pipes "significantly increases system efficiencies" and added that the system's unique design eliminates problems of balancing, leaking, corroding and freezing. ▲