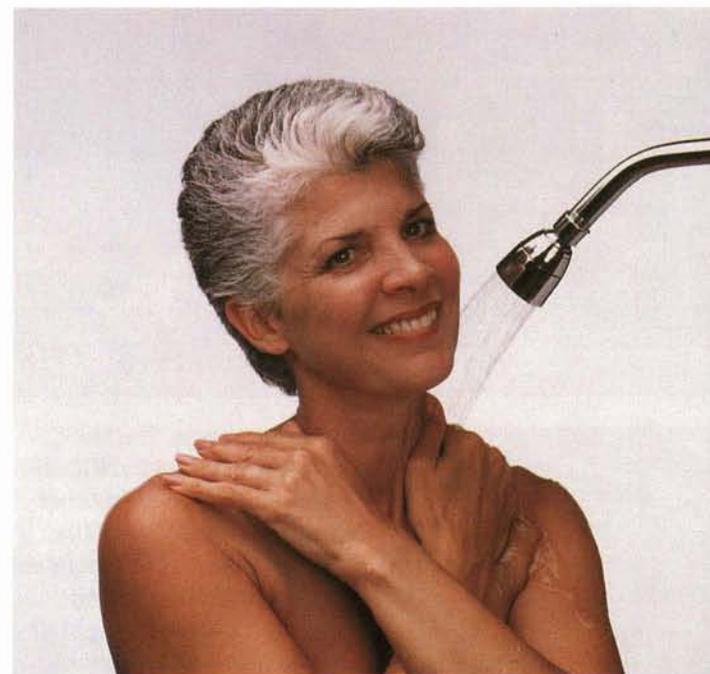


## MEMORY METALS

**S**hape memory effect, or SME, is a term for the ability of certain metal alloys to change from one shape to another in response to temperature changes, a direct result of a transformation of the alloy's crystal structure. An SME device can be made to expand when cooled or contract when heated; it may be a one-way or a two-way "memory." A one-way SME alloy can be deformed, then recover to retain permanently its original shape when heated to a certain temperature. A two-way alloy holds its original shape at one temperature and takes on another shape at a different temperature.

NASA explored this technology in the 1960s, shelved it for a time, then renewed interest in the 1980s, when the agency began preparatory work on the planned Earth-orbiting space station. Among companies awarded contracts for advanced SME investigations was Memry Technologies Inc., a subsidiary of Memry Corporation, Brookfield, Connecticut.

Under its NASA contracts, Memry produced alloys over a wide range of transformation temperatures in sheet, wire, rod and tube forms. The company developed



several types of one-way memory quick connect/disconnect joints for space station structures and two-way memory actuators for the disconnect feature. In the course of this work, the commercial potential of SME technology became apparent and, in the latter 1980s and early 1990s, Memry adapted its NASA-acquired shape memory expertise to the commercial market and introduced a line of home and industrial safety products. Memry has since refined and advanced the technology, and developed some additions to the product line.

Among the current products are a trio of MemrySafe® units designed to prevent scalding from tap or shower water in the kitchen or bathroom. The heart of each system is a small valve that

reacts to temperature, not pressure. When the unit senses dangerous temperatures (above 120 degrees Fahrenheit), it immediately reduces the water flow to a trickle. When the scalding temperature subsides, the unit automatically restores normal flow. This product line includes the ShowerGard® (**above**, with the simple valve insertion shown **at right**); the BathGard® for the tub spout (**above right**); and the FlowGard® (**far right**), which is installed easily in a bathroom, kitchen or utility room sink just like a standard aerator.

Memry products also include the FIRECHEK 2 and FIRECHEK 4 heat-activated pneumatic shutoff valves for industrial process lines. The FIRECHEK SME element, which needs no outside power source, senses exces-



sive heat and automatically cuts off the pneumatic pressure that controls gas cylinders and process line valves.

The most recent product to emerge as a spinoff of the NASA technology is Memry's Demand Management Water Heater for residential heating, which employs a shape memory-activated diverter valve. Water is stored at 180

degrees in a special tank that serves as a heat exchanger. Incoming cold water is pre-heated at the heat exchanger, then delivered to the residential system at 135-140 degrees. When the water temperature in the tank drops below 140 degrees, the diverter valve bypasses the heat exchanger. This system shifts the electricity require-

ment from peak to off-peak demand periods. The consumer pays off-peak electricity prices for home hot water heating at significant savings, enough, Memry says, to recoup the cost of the system in a year and a half. Utility companies benefit from electrical load shifting through reduced need for construction of additional power generation plants.

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