

NASA TECH BRIEF

Ames Research Center

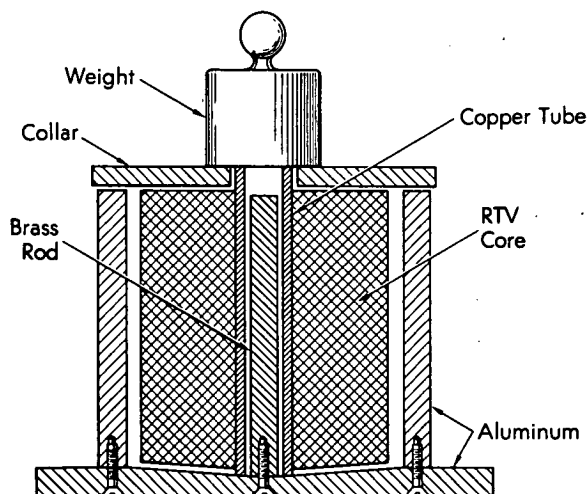


NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the National Technical Information Service, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Office, NASA, Code KT, Washington, D.C. 20546.

Method for Casting Polyethylene Pipe

The problem:

To cast short lengths of 7-cm (2.75-in) ID polyethylene pipe with 0.64-cm (0.25-in) walls; standard metal molds cannot be used because shrinkage around the metal core cracks the plastic.



The solution:

Cast the polyethylene in a mold which has a silicone core to allow for contraction of the polyethylene.

How it's done:

The mold for the outer diameter of the pipe is made of an aluminum cylinder which is 5 cm (2 in) longer than the required length of the finished polyethylene pipe. Since polyethylene shrinks when it cools, the outer diameter of the pipe mold is made 1.65 mm (0.065 in) oversize. The bottom of the mold is a removable aluminum plate provided with a centered brass rod (secured by a bolt) which acts as a locator

for the core.

The core is also 5 cm (2 in) longer than the finished product, and it is made by casting a room-temperature-vulcanizable (RTV) silicone around a 2.2-cm ($\frac{7}{8}$ -in) diameter piece of copper tubing which is about 2.5 cm (1 in) longer than the RTV core. The bottom of the core has a 4-degree taper to keep air from being trapped under the core during casting of the pipe. Also, the core mold is made 0.127 mm (0.005 in) oversize; the silicone core expands during the casting of polyethylene and shrinks on cooling. After the RTV silicone cures, the copper tubing can be removed; a collar is fastened flush around the upper part of the copper tubing and the lower part of the tubing is trimmed so that it protrudes about 0.25 cm. Cores can be used about 10 times before they soften enough and let the internal diameter of the pipe become oversized.

The sections of polyethylene pipe are formed as follows: A thin film of silicone grease is wiped on all metal surfaces and then 135 g of polyethylene pellets are poured into the mold. The core is slid over the guide rod in the mold and rotated to distribute the pellets. The assembly is placed in a vacuum oven and a 1-kg weight is set on top of the copper tubing; the weight forces the core down through the polyethylene as it melts. The oven is evacuated to about 47 kN/m² (14 in of Hg) and the temperature is brought to about 138°C (280°F) where it is maintained for about 7 hours. After the core reaches the bottom of the mold, the vacuum is released; 15 to 30 minutes later, the heat is turned off. The assembly is left in place to cool gradually (overnight). The castings come out of the mold easily, but the core must be forced out with the aid of a blast of air.

(continued overleaf)

Note:

No additional documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer
Ames Research Center
Moffett Field, California 94035
Reference: B73-10032

Patent status:

NASA has decided not to apply for a patent.

Source: Ray M. Elam, Jr.
Ames Research Center
(ARC-10706)