



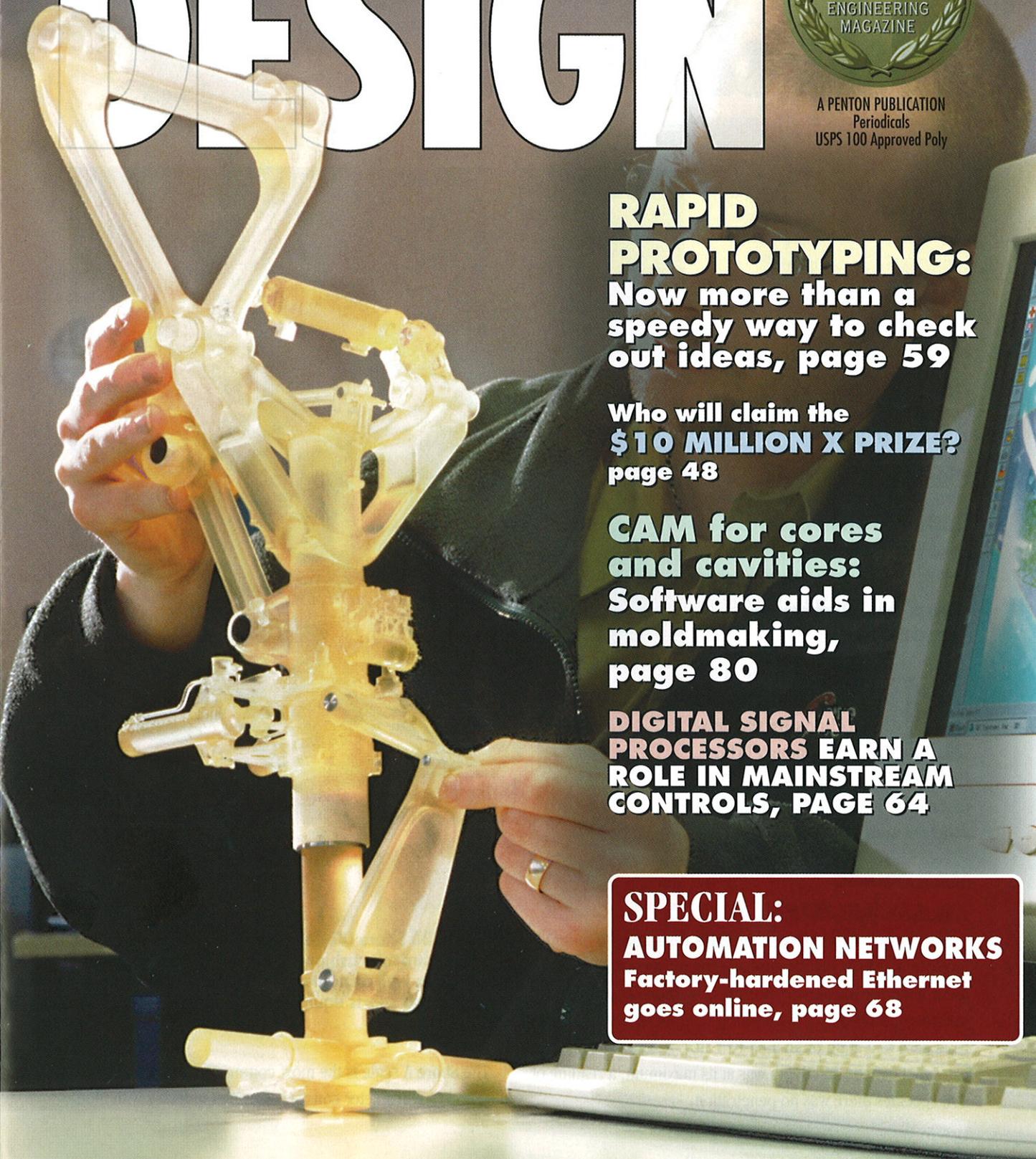
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Understanding hardness

A better understanding of hardness lets designers match the best soft-touch elastomer to their application.

Jean M. Hoffman
Associate Editor

Hardness is often one of the first criteria considered when choosing thermoplastic elastomers (TPEs). But confusion can arise when discussing hardness because of the variety of ways to measure it.

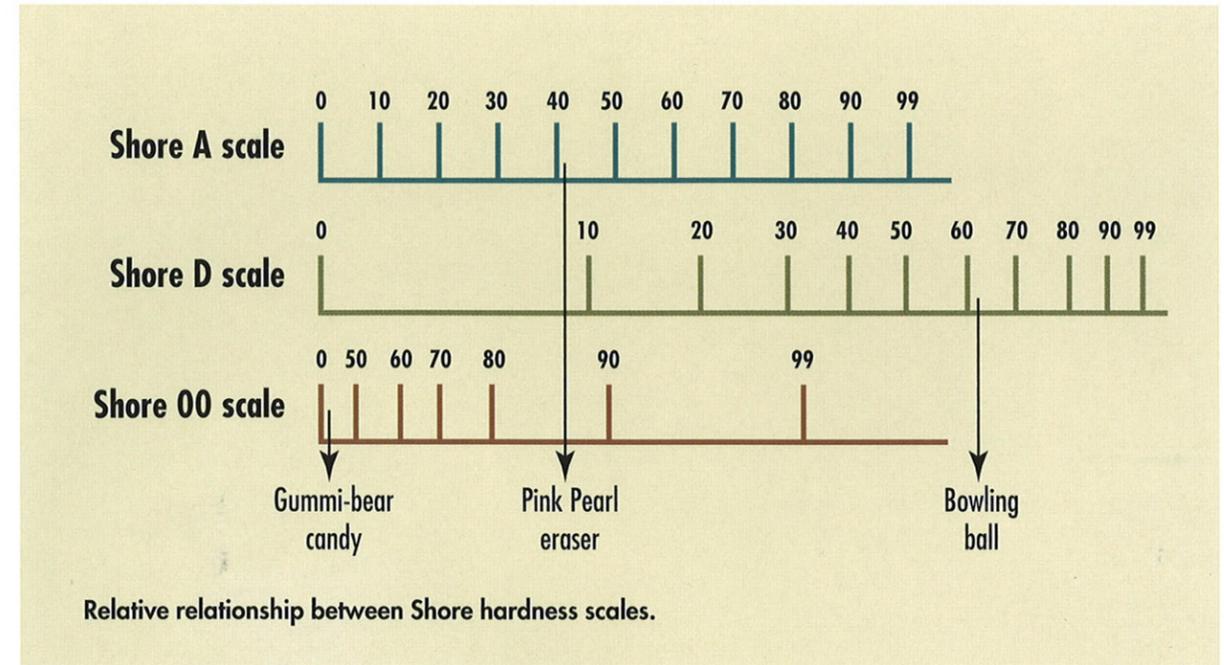
HARDNESS MEASUREMENT

Hardness is defined as a material's resistance to indentation when a static load is applied. The most common instrument used for measuring hardness is Shore Durometer. It measures the depth of penetration of an indenter on a scale from zero to a tenth of an inch (0.1 in.). A zero reading indicates that penetration depth was at its maximum; a reading of 100 specifies there was no penetration.



A gellike 30 Shore 00 Versaflex TPE is engineered to serve as ultrasoft cushions in bicycle seats, shoes, and furniture as well as nontacky grips on personal care products and sports equipment.

The Shore A scale is the most common scale for TPEs, and the Shore A Durometer consists of a blunt indenter with mod-



erate spring force. Shore A instruments are less accurate when readings are above 90. Shore D Durometers are more appropriate when hardnesses exceed 90 Shore A. This instrument uses a sharper indenter and higher force. Softer TPEs (below 5 Shore A) use a Shore 00 scale. Most soft gels and foam rubbers are measured using this scale.

METHODS

Most materials resist initial indentation but eventually yield over time due to creep or relaxation, so Durometer readings can either be taken instantaneously or after a specified delay — typically on the order of 5 to 10 sec. Instantaneous readings typically give higher (or harder) results than delayed readings. But delayed readings are more representative of hardness and resiliency. Weak, less-elastomeric

materials creep more than higher strength, more resilient materials.

Hardness is often confused with other properties such as flexural modulus or Coefficient of Friction (COF). Flexural modulus measures the materials' resistance to bending, and COF measures the resistance an

object experiences as it slides along the TPE surface. Although flexural modulus and COF also affect the overall feel and flexibility of the TPE, they are different properties than hardness which measures a materials' resistance to penetration. ■



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