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Roller Hardness

Hardness is defined as a material's resistance to indentation when a static load is applied. There are a few different methods to measure hardness. This article refers to the 2 most commonly used in the roller industry.

The first method is the Durometer. Hardness and Durometer are used interchangeably in the roller industry. The term Durometer is the international standard used for measurement of rubber hardness industries such as printing, laminating, coating, and converting, and also refers to the instrument itself.

American Roller adheres to the ASTM International standard test method ASTM D2240, www.astm.org/Standards/D2240.htm. Established in 1898, ASTM International provides a global forum for the development and publication of international voluntary consensus standards for materials, products, systems and services. Known for their high technical quality and market relevance, ASTM standards are used in research and development, product testing and quality systems. ASTM standards are a critical element of the information infrastructure that guides manufacturing and trade in the global economy.

Today, there are different manufacturers of the instruments used to measure hardness. Mostly they are based on the Shore scale durometers established in the 1920's. There are 12 different Shore scale instruments for testing extremely soft (00 scale) materials to extremely hard (D scale) materials. Each scale range is from 0-100, the higher the number, the harder the material. Shore A scale is the most widely used scale for the roller industry. Durometer hardness can be an instantaneous reading or set to be taken up to 15 seconds after load is applied.

The second method used to measure hardness is the Pusey & Jones Plastometer instrument, which is mainly for the paper industry and referred to as P & J hardness. The scale range is 0-300, the lower the number the harder the material. Please note this scale is the reverse of the Shore scale. P & J hardness is always taken 60 seconds after load is applied.

Factors Influencing Hardness of Rollers

There a certain factors that will have an effect on the actual durometer of the material on a roller. Any deviations will result in misleading data.

- The specimen to be tested should be conditioned at ambient room temperature. Some rubber compounds are more sensitive to temperature change than others, softening when exposed to heat, and hardening when cold. It would be wise to note the temperature of the roller surface at time of testing if other than ambient.
- The base of a hand held durometer instrument must be parallel with the axis of the roller journals or support shaft. The operator should apply a steady uniform force lowering the entire base so it touches roller surface in a parallel manner as the indenter penetrates the material.

- The P & J plastometer instrument has a spirit level bubble on the mounting frame to make sure it is level and the indenter’s point of contact is perpendicular to the roller surface. The load must be applied quickly without shocking the instrument.
- Different operators & different instruments will get different result. It is suggested to standardize your internal procedures based on the type of instruments and operators involved in the process.
- Material thickness if less than 0.250" will generally result in a slightly higher durometer reading.

Durometer is a dimensionless quality and there is no simple relationship between a material's durometer for one scale and it's durometer for any other scale or for any other hardness test method.