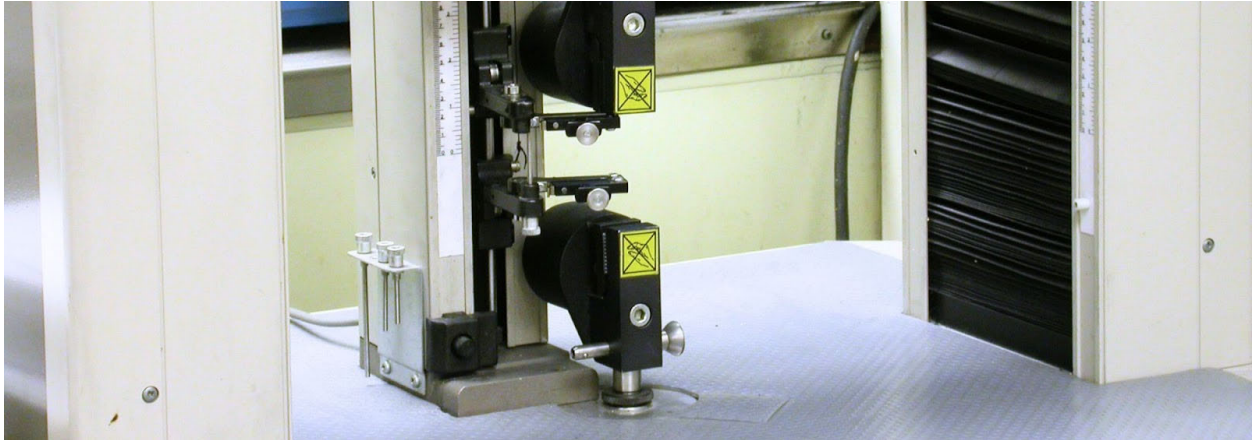
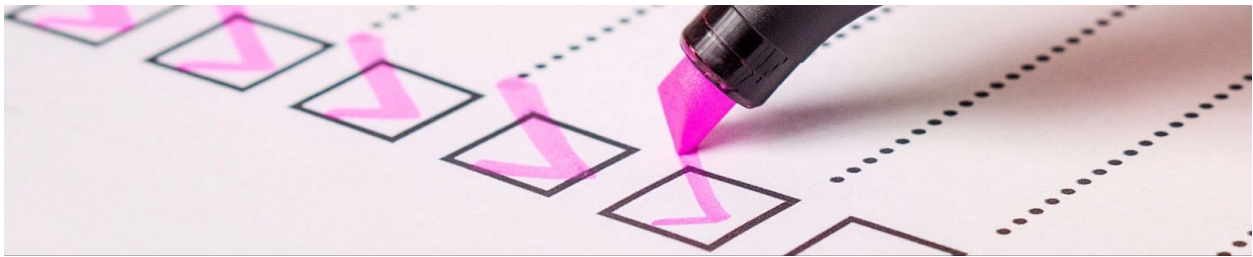




Trusting Your Rubber Parts

Understanding the Testing & Verification of Rubber Materials

Rubber testing serves as the cornerstone of ensuring the reliability, durability, and safety of rubber products across numerous industries, essentially verifying that your rubber products will meet your application's requirements. This article provides a comprehensive overview of rubber testing methodologies, basic physical tests, a brief dive into ASTM test standards, and the influence of specifications on testing protocols.

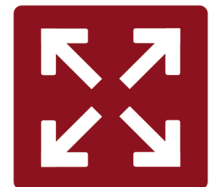


Standard Physical Tests

There is a set of standard physical tests that are performed at different stages of production. These tests verify that the physical properties of the rubber are fulfilling the application's requirements. While additional tests may be required (as dedicated by the specification), a view of these physical properties provides a working understanding of your rubber product's performance.

A. Tensile Strength

Tensile strength, the maximum stress a material can withstand while being stretched or pulled, is a fundamental property of rubber. This test involves stretching a standardized specimen until it fractures, with results providing data as to the material's integrity and performance. Tensile strength is particularly important in applications where rubber components are subjected to mechanical stresses, such as protective rubber padding or rubber cable jacketing.



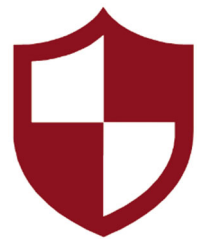
B. Elongation

Elongation at break measures a material's ability to stretch before failure, offering valuable information about its flexibility and resilience. The test procedure involves subjecting a specimen to tension until rupture occurs, with results guiding material selection for various applications. Rubber materials with high elongation at break values are often preferred for applications requiring significant deformation without failure, such as elastomeric seals, gaskets, and rubber lining.



C. Hardness (Durometer)

Hardness, the material's resistance to indentation, is evaluated using standardized Shore hardness scales. Different types of hardness tests, such as Shore A and Shore D, assess materials with varying degrees of hardness, informing material selection for specific applications. For example, softer rubbers with lower Shore A hardness values are often used in applications requiring flexibility and impact absorption, while harder rubbers with higher Shore D hardness values are preferred for applications requiring resistance to abrasion and compression.



D. Tear Strength

Tear strength measures a material's resistance to tearing or propagation of existing cuts or nicks. This test assesses a material's ability to withstand tearing forces, providing insights into its toughness and durability. Tear strength is crucial for applications where rubber components are subjected to tearing or ripping forces, such as gaskets, rubber seals, and other dynamic structures.



E. Viscosity

Viscosity is critical for assessing the flow properties of rubber compounds, influencing their processability and final product properties. This test measures a material's resistance to flow under applied shear stress, aiding formulation optimization and quality control. Rubber compounds with appropriate viscosity levels ensure uniform flow during processing, resulting in consistent product quality.



F. Specific Gravity

Specific gravity, which measures a material's density relative to water, aids in material characterization and composition analysis. This test provides insights into a material's composition, purity, and density, guiding quality control measures. Specific gravity testing is essential for verifying the uniformity of rubber compounds, ensuring compliance with specified requirements.



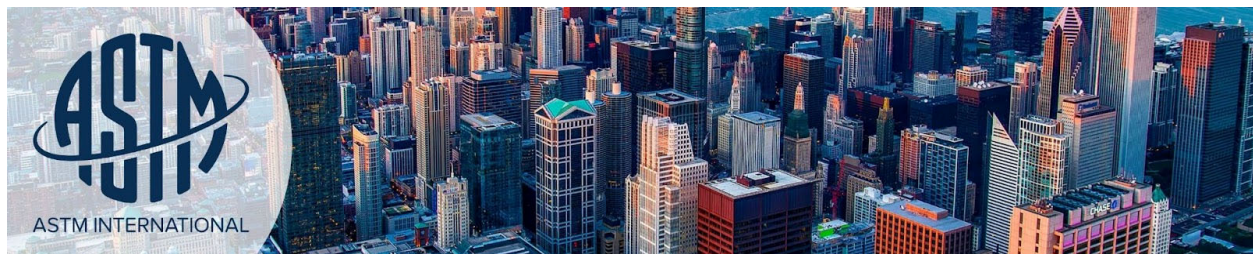


Specifications & Rubber Testing

Specifications play vital roles in guiding the appropriate testing protocols for your rubber parts. These specifications can define a wide variety of the rubber material's aspects such as the required chemical composition, mechanical properties, and performance criteria. There is a nearly endless range of specifications, spanning a host of industries, standards organizations, specific companies, and much more. Here is a list of a few common specifications standards that appear in the rubber industry:

- SAE AMS (Aerospace Material Specifications by the Society of Automotive Engineers)
- AASHTO (American Association of Highway and Transportation Officials)
- ASTM (American Society for Testing and Materials)
- UL (Underwriters Laboratories)
- MIL (Military Specifications and Standards)
- NSF (National Sanitation Foundation)

Many of these standards will have their own required methods for how to certify and properly test their rubber materials. Your rubber manufacturer should have a comprehensive understanding of each of these specifications and requirements.



A Key Test Method: ASTM

As a well-known standard in the rubber industry, we have provided a brief explanation of a few common ASTM test methods. This organization, ASTM International, is widely recognized and trusted in the rubber industry. ASTM provides standardized testing procedures that are used to certify that your rubber part complies with both the necessary quality benchmarks and regulatory requirements. While there is a wide range of unique and application-specific test methodologies, these 3 test methods are especially prevalent when certifying your rubber products:

- **ASTM D412: Tensile Strength and Elongation**

ASTM D412 specifies procedures for conducting tensile strength and elongation tests, including sample preparation, testing conditions, and result interpretation. This standard is instrumental in assessing material performance and characterizing rubber compounds. Tensile strength and elongation testing provide valuable insights into a material's structural integrity and flexibility, guiding material selection and product design.

- **ASTM D2240: Hardness (Shore Hardness)**

ASTM D2240 outlines methodologies for measuring material hardness using Shore scales, offering insights into material stiffness and resilience. This standard is crucial for material selection and quality control in rubber manufacturing. Hardness testing helps ensure rubber components meet specified hardness requirements, ensuring suitability for intended applications.

- **ASTM D624: Tear Strength**

ASTM D624 provides guidelines for determining tear strength in rubber materials, aiding in assessing material durability and resistance to tearing forces. This standard informs product design and performance evaluation, ensuring that rubber components withstand tearing forces encountered during service life. Tear strength testing helps identify potential weaknesses in rubber materials, facilitating product design and formulation improvements.

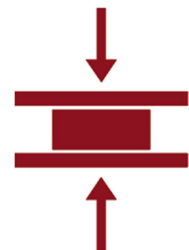


Additional Industry Standard Tests

In addition to the ASTM test methods, there is an additional set of requirements that various applications will require. These next 3 tests of the rubber products' physical properties provide that level of enhanced understanding within the context of the product's actual end-use.

A. **Compression Set**

The compression set test evaluates material resilience and dimensional stability under compressive loading. This test is essential for assessing material performance in applications subjected to prolonged compression. Compression set testing helps ensure that rubber components maintain dimensional stability and sealing performance over time, enhancing product reliability and longevity.



B. Abrasion Resistance

Abrasion resistance testing assesses a material's ability to withstand wear caused by frictional forces. This test informs material selection for applications requiring resistance to surface degradation. Abrasion resistance testing helps ensure that rubber components maintain their structural integrity and functional properties in abrasive environments, prolonging service life and reducing maintenance costs.



C. Aging (Under Heat, Ozone & More)

Aging tests predict material degradation over time due to environmental factors such as heat and ozone exposure. These tests simulate real-world conditions, providing insights into material performance and lifespan. Aging tests help manufacturers evaluate rubber products' long-term durability and reliability, ensuring that they meet performance requirements throughout their service life.



Takeaways

Rubber testing is integral to ensuring the quality, durability, and performance of rubber products across diverse applications. By adhering to standardized testing procedures and specifications, manufacturers can accurately assess material properties and meet industry standards. Through continuous innovation and rigorous testing practices, the rubber industry can deliver high-performance products that meet the evolving needs of consumers and industries alike. Investing in comprehensive rubber testing protocols ultimately leads to enhanced product reliability, customer satisfaction, and competitive advantage in the marketplace.

Unlike many other rubber manufacturers (dependent upon external laboratories and testing facilities), WARCO can develop compounds, mix materials, thoroughly test and shape your rubber products in a single facility. Additionally, we have over 114 years of providing quality rubber products to the American industry. Our wealth of experience, unique flexibility, and tight control over each step in production, are among the key contributors to how WARCO became America's Choice. Contact us at sales@warco.com or 714-532-3355 to build your projects today.

This is the third article of our new series, Stretching the Imagination: Ideas to Innovation, where we break down the major steps of rubber production. Stay informed of the latest articles by signing up for our newsletter at warco.com.