

Polymer High-Pressure High-Temperature Exposure Testing

KEYWORDS

HPHT Polymer Exposure Testing

Rubber Exposure Testing

Rubber Explosive Decompression

Rubber Adhesion Testing

Polymer Hardness and Mechanical Testing

O-ring Exposure Testing

Southwest Research Institute® (SwRI®) is working with industry to determine material compatibility and degradation resistance of polymeric and composite materials in high-pressure high-temperature (HPHT) service environments. SwRI has developed unique HPHT capabilities including conditions up to 20,000 psi and 650°F for testing in aggressive toxic environments.

To help clients meet new emerging material performance requirements for testing of nonmetallic materials (thermoplastics, elastomers and composites) and present accurate results following HPHT exposures, SwRI uses a broad selection of standardized testing methods in compliance with API and ASTM standards.

High-Pressure High-Temperature Autoclave Testing

The 10,000-square-foot Autoclave Testing Laboratory has 34 autoclaves dedicated to various types of HPHT tests. SwRI engineers and technologists conduct standard and customized exposure tests to assess the performance of polymeric and composite materials after exposure to HPHT toxic environments. Some types of specimens are:

- Standardized dumbbell-shape
- O-ring
- Adhesion
- Compression button



D017827

SwRI evaluates the effect of HPHT toxic gas or fluid environments on the mechanical properties of different types of polymeric compounds.

Test environments include chlorinated brines and hydrocarbon fluids equilibrated with H₂S / CO₂ / CH₄ mixtures as indicated in API 6A. SwRI also conducts testing in a wide variety of fluids charged with an array of H₂S / CO₂ / CH₄ mixture combinations.

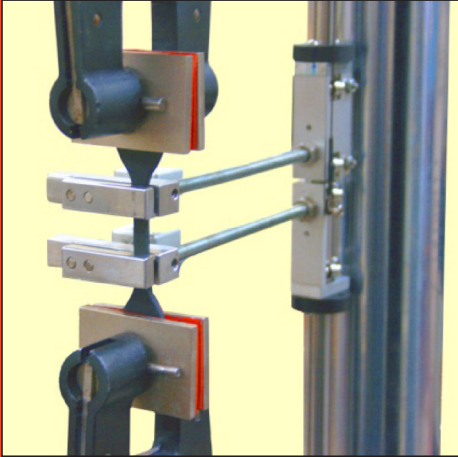
Both immersion testing and rapid gas decompression testing can be performed and certified for nonmetallic materials in valves or drilling equipment in compliance with API standards 16C and 6A. HPHT testing of sealing material in full-size components of drilling, wellhead and Christmas tree equipment per API 6A is also available. Other tests and standards are listed below.

Test	ASTM Standard
Changes in physical properties of rubber	D471
Changes in physical properties of rigid polymeric materials	D543
Specific gravity measurement of rigid polymeric materials	D792, Test Method A (water)
Compression set testing of rubber	D395
Compression set testing of rigid plastics	D695



D017828

Thin polymeric and rubber specimens are 'stamped out' of flat plates with certified cutting dies for various standardized tensile specimen shapes and sizes.



SwRI evaluates the effect of HPHT hazardous environments on the mechanical properties of different types of polymeric compounds.

D017826

Mechanical Testing

The 6,500-square-foot Mechanical Engineering Performance Laboratory has 36 tensile test frames dedicated to the mechanical testing of materials. SwRI engineers and technologists conduct standard and customized tests to assess the performance of polymeric dumbbell specimens before and after an exposure test. Typical tests and standards are listed below.



SwRI's HPHT autoclaves are used to expose different types of polymeric compounds to simulated in-service hazardous environments.

D017829



Hardness measurements are evaluated on various types of polymeric specimens before and after an exposure test.

D017825

Test	ASTM Standard
Hardness measurement of polymeric materials using Durometer scales	D2240
Tensile properties of rubber dumbbells	D412
Tensile properties of rigid polymeric dumbbells	D638
Flexural properties of rigid polymeric materials	D790
Strength of rubber adhesion to rigid specimens	D429



Southwest Research Institute is an independent, nonprofit, applied engineering and physical sciences research and development organization using multidisciplinary approaches to problem solving. The Institute occupies 1,200 acres in San Antonio, Texas, and provides more than 2 million square feet of laboratories, test facilities, workshops and offices for more than 3,000 employees who perform contract work for industry and government clients.

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