



HYDROGEN TEST FACILITY

Purpose:

To provide mechanical property data and mechanical testing services to our customers (payloads, projects and Shuttle elements) in support of MSFC's strategic initiatives.

The Hydrogen Test Facility provides mechanical property data to customers and performs mechanical testing in support of Center payloads, projects, and shuttle requirements. The test facility is used to investigate materials used by NASA, including design data development and evaluation of process effects, and to evaluate and characterize materials used in conjunction with hydrogen fuels in order to determine service life. The Hydrogen Test Facility (HTF) operates custom mechanical test systems in eight structurally reinforced test cells used to simulate a range of operating environments. Cryogenic testing is conducted at atmospheric pressure in propellant-grade liquid hydrogen (-423 °F), liquid helium (-454 °F), and liquid nitrogen (-320 °F), using 20-kip, 60-kip, and 100-kip custom material test systems. Test capabilities include compression, cryogenic exposure, fatigue crack growth rate, four-point bend, high/low cycle fatigue, fracture toughness, shear, tensile, and thermal conductivity. Support equipment includes two vacuum-insulated liquid hydrogen dewars (total capacity 530 gallons) and one liquid nitrogen tank (total capacity 1,000 gallons). Gaseous testing is conducted from atmospheric to 10,000 psi in propellant-grade gaseous hydrogen, hydrogenated steam, high-purity gaseous helium, and gaseous nitrogen from -200 to 1,800 °F. Custom material test systems include 10-kip atmospheric pressure ambient



temperature, two 20-kip high-pressure elevated temperature, 20-kip and 50-kip high-pressure ambient temperature. Test capabilities include compression, fatigue crack growth rate, four-point bend, fracture toughness, gaseous exposure, high/low cycle fatigue, shear, strain to crack, and tensile. Support equipment includes trailers for gaseous hydrogen (60,692 SCF at 3,750 psi) and gaseous helium (80,849 SCF at 5,000 psi), diaphragm compressors for gaseous hydrogen and gaseous helium (10,000 psi), and gaseous hydrogen purification systems (activated charcoal, molecular sieve, and alumina filter units) at 3,750 and 10,000 psi.

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