

**THERMAL PERFORMANCE TESTING OF CRYOGENIC PIPING SYSTEMS**

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Accurate measurement of the thermal performance of pipelines and piping systems under actual field conditions is important for future launch site development as well as commercial industry. Values for the true insulating effectiveness of a process system are needed in system design, development, planning, and research activities. A new 18-meter-long test apparatus for testing thermal insulation systems of cryogenic pipelines is the subject of this paper. Up to three different pipelines, rigid or flexible, in any length can be tested simultaneously. Cryogenic piping systems are typically insulated with high performance materials that provide thermal isolation for preservation of liquid product or for sufficient process control. The critical factors in heat leak measurements for cryogenic evaporation tests include eliminating heat transfer at the end connections of the pipeline and obtaining the proper saturation condition of the liquid. Effects due to variations in the external ambient conditions like wind, humidity, and solar radiation must be minimized. The new apparatus has been demonstrated using the static method of liquid nitrogen evaporation and can be adapted for dynamic testing with cryogenics, chilled water, or other working fluids. This testing technology is suited for the development of an industry standard apparatus and procedure. Examples of the heat transfer data from the testing of commercially available pipelines are given. A variety of prototype pipelines are currently being tested and evaluated at the Cryogenics Test Laboratory of NASA Kennedy Space Center for targeted technology development applications.

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