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Comparison tests of cellular glass insulation for the development of cryogenic insulation standards

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Standards for thermal insulation used in applications between ambient and low temperatures, below 100 K, require test data under relevant conditions and by different laboratories to develop data sets for the proper comparisons of materials. This critically important technology is needed to provide reliable data and methodologies for industrial energy efficiency and energy conservation. Under ASTM International's Committee C16 on Thermal Insulation, two standards have been issued that including C1774 Standard Guide for Thermal Performance Testing of Cryogenic Insulation Systems and C740 Standard for Multilayer Insulation in Cryogenic Service. Thermal conductivity data sets have been taken using identical flat-plate boiloff calorimeter instruments independently operated at the Cryogenics Test Laboratory of NASA Kennedy Space Center (KSC) and the Thermal Energy Laboratory of LeTourneau University (LETU). Precision specimens of cellular glass insulation were produced for both laboratories to provide the necessary comparisons to validate the thermal measurements and test methodologies. Additional specimens of commercial cellular glass pipe insulation were tested at LETU to compare with the flat plate results. The test data are discussed in relation to the experimental approach, test methods, and manner of reporting the thermal performance data. This initial Inter-Laboratory Study (ILS) of insulation materials for sub-ambient temperature applications provides a foundation for further ILS work to produce standard data sets for several key commercial materials.

Primary author: DEMKO, Jonathan (LeTourneau University)

Co-authors: FESMIRE, James (NASA); Mr BICKLEY, Jesse (LeTourneau University); Mr DOOKIE, Jonathan (LeTourneau University)

Presenter: DEMKO, Jonathan (LeTourneau University)

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