

Speed of Sound Measurements in Liquid Methane for Pressure up to 10 MPa

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A referable on-line sensor for density measurements of liquefied natural gas (LNG) is still not available, despite that it would solve many problems dealing with trading and production of these energy vectors. In this view, we have started the development of an ultrasonic densimeter based on the on-line measurement of the speed of sound and the acoustic impedance of LNG. For maintaining the traceability of the measurements, this sensor has to be calibrated, by comparison, with a referable instrument. A double pulse-echo sensor has been chosen as reference instrument for the measurement of the speed of sound. However, preliminary results, in pure methane, revealed this last to be precise but not accurate enough; probably it is due to a difference between the measured and the real methane temperature. For this reason, the experimental apparatus has been modified and thermometers have been set into the walls of the vessel even closer to the cryogenic liquid. Recently, the speed of sound of pure methane has been measured in the temperature range of (110 and 150) K and for pressure up to 10 MPa, with an associated uncertainty in the order of 0.1 %. Obtained results are compared with those predicted by a dedicated equation of state [1].

References:

[1] Setzmann, U. and Wagner, W., J. Phys. Chem. Ref. Data, 20 (6)1061-1151, 1991.