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Coriolis flow meters offer custody transfer level of accuracy for liquid hydrogen measurement

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As with LNG in the past, LH2 has the potential to revolutionize the energy storage and transportation sectors and roll out the net zero economy on a large scale. However, to enable global hydrogen trade, a list of challenges must be solved. Apart from safety issues, measuring LH2 for custody transfer is one of the main challenges. The key complication of measuring LH2 is its ultra low temperature (around -253℃) and low density, even in its liquid state (˜70 kg/m³).
Coriolis technology has the highest potential as a reliable flow measurement technique providing direct mass measurement for liquid hydrogen (LH2). The technology complies with explosion-proof requirements and has proven reliable record performance in liquid helium applications [1].
Coriolis meters can be calibrated with water at room temperature and still be used with all fluids [2]. Modern Coriolis meters are enabled with automatic corrections for different gases and viscous fluids with extremely high (+350℃) and low (-200℃) temperatures and high pressures. One major advantage of Coriolis meter is the water transferability feature. The concept has been proven for years in multiple major industries including the oil and gas sector.
The ultra-low temperature of LH2 does not allow for the use of an embedded temperature sensor in a Coriolis meter. This is why a newly patented method of temperature correction through known density has been developed. The proven water transferability concept for Coriolis meters and the patented temperature correction method can be used to establish LH2 measurement traceability. The proposed temperature correction method based on density is practical and can be easily verified at liquefied nitrogen (LN_2) facilities.
This work explains the basic principles of Coriolis meter operation and the reason for the vacuum secondary case of the Coriolis meter, as well as the principles of the new temperature correction. The combination of the proposed technical solutions can provide an accuracy of up to ±0.35% [3]. The work demonstrates test results of the proposed methods using LN2.

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