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métrologie française
LNE-LADG
French Designated Institute
for high-pressure gas flow metering

Poitiers, 07th October 2019

Object: *Input for GIIGNL revision in December 2019*

CESAME EXADEBIT / LNE-LADG is the Laboratory Associated with Gas Flow Measurement (in French - LADG) for the LNE (French National Metrological Institute). Therefore, it is the laboratory associated with the LNE for medium and high gas flows. The objective of CESAME-EXADEBIT is to hold, maintain and develop the national standards within this targeted field of metrology. The traceability chain put into place by CESAME-EXADEBIT is made up of a primary test rig PVTt of nozzle calibration and two secondary rigs for meter calibration, on which sonic nozzles are used as the transfer standard.

CESAME EXADEBIT is a member of the Join Research Program on Metrology for LNG (LNGIII). In this framework, we are working in the Wp1 dedicated to flow metering. CESAME EXADEBIT has created a new traceability route for cryogenic measurements with a LDV standard.

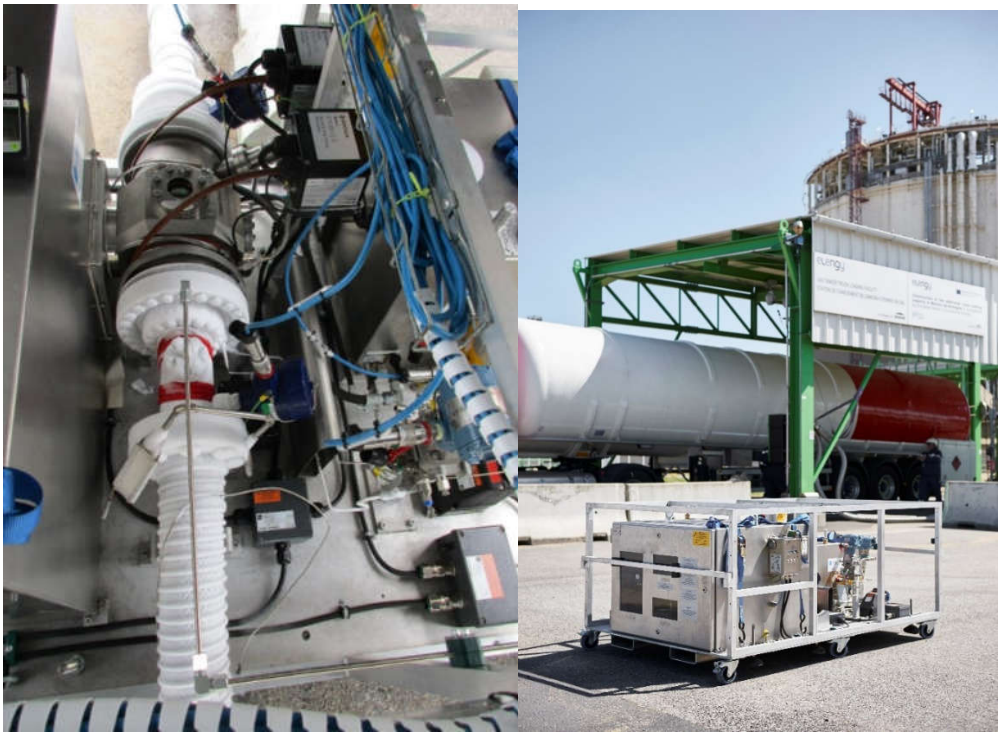
The LNG trading has increased up to 7.8% in 2018 compare to 2017 and new trading sectors are growing (truck loading and bunkering (*i.e. ship to ship*)). The major players have expressed the need to get traceable measurements to insure a fair trading for these new processes.

The GIIGNL is the most read / use handbook for LNG trading in the world. CESAME EXADEBIT has a change to present what has been developed within the LNG III EMPIR project in September 2019 in Brussel.

A promising alternative to state-of-the-art static volume measurement for Liquefied Natural Gas (LNG) custody transfer processes is the dynamic principle of flow metering. A new technology for cryogenic flow metering technology using Laser Doppler Velocimetry (LDV) as an alternative to ultrasonic and Coriolis flow metering is currently being developed.

This technique could be a primary standard for cryogenic flow meter calibration. Currently, cryogenic flow meters are tested and calibrated at ambient temperatures with water or with liquid nitrogen (N2). Results are then extrapolated to be within the Reynolds number range of real applications. The LDV standard offers a unique capability for performing online calibration of cryogenic flow meters in real conditions (temperature, pressure, piping and real flow disturbances). Furthermore, there is no technical limitation regarding the scaling-up of the calibrated flow meters. The available technology has a DN80 inlet diameter.

The primary reference has been tested on an industrial process in an LNG terminal during truck refuelling. The reference can calibrate Coriolis flow meters being used daily with all the real environmental constraints and its utilisation is transparent for LNG terminal operators.



The standard is traceable to Standard International units and the combined extended uncertainties have been determined and estimated to be lower than 0.6% (there is an on-going improvement for reducing the correlation function uncertainty which has a major impact on the uncertainty estimation).

The new LDV standard should appear in the next revision of GIIGNL in two sections : truck loading and bunkering.

Related paper:
“Cryogenic flow rate measurement with a laser Doppler velocimetry standard”
https://doi.org/10.1088/1361-6501/aa9dd1

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