APPLICATION REPORT

Oil & Gas

Custody transfer flow measurement for (un)unloading of LNG

- Equipping a dispensing system for cryogenic fuels with a Coriolis mass flowmeter
- Continuous measurement and indication of 2-phase-flow in the event of boil-off-gas (BOG)
- Improved control of loading procedure, cooling time and product quality

CETIL Dispensing Technology

1. Background

Cetil Dispensing Technology, S.L., located in Algete, Spain, is specialised in the field of fuel handling. The company produces among others fuel dispensers, systems for tank truck and loading racks as well as refuelling equipment. The manufacture's fuel dispenser portfolio ranges from CNG and LNG dispensers to dispensers for LPG, AdBlue® or multiproduct applications.

2. Measurement requirements

For ESK, a specialist company for the transport of dangerous goods, Cetil designed a dispensing system for loading and unloading of LNG (with a flow rate of up to 50,000 kg/h / 1837 lb /min). The dispenser was to be used for custody transfer (CT) operations on trucks.
LNG is a challenging product to measure. For loading, discharge, storage and transport it needs to be cooled down below its boiling temperature of -161.48°C / -248°F. Above that temperature the medium tends to evaporate, producing boil-off gas (BOG) that leads to gas entrainment. This frequently occurs at the beginning of loading procedures when the pipeline used for transportation has a much higher temperature than the liquefied gas. As a rule, a certain amount of LNG has therefore to be fed through the line to cool it down to the extent that custody transfer operations can be carried out. This is a costly and time-consuming procedure, involving significant product loss. Only if the pipeline is cooled down by the LNG, can the actual LNG measurement start.
Conventional Coriolis mass flowmeters have not been able to identify the point in time when the amount of BOG in the medium has significantly decreased so as to start with loading. They indeed switch to error mode whenever gas entrainments (vapour breakthrough) occur and have to be restarted. The customer was therefore searching for an MI-005 approved flowmeter (in accordance with the Measurement Directive 2014/32/EU) that is also able to continue measurement in the event of two-phase flow. It was another measurement objective to optimise the loading process by identifying the vapour breakthrough.

KROHNE

3. KROHNE solution

KROHNE recommended using the OPTIMASS 6400 for the truck-mounted CT system. The Coriolis mass flowmeter with V-shaped measuring tube is designed for CT measurement in cryogenic applications down to -200°C / -328°F. The flowmeter was installed with a DN50 stainless steel measuring tube and equipped with insulation casing.

Truck with MI-005 approved dispensing system

Unlike conventional mass flowmeters the KROHNE device provides reliable readings even in the event of gas entrainment of up to 100%. Using its Entrained Gas Management (EGM™) functionality, the OPTIMASS 6400 enables continuous and uninterrupted flow measurement, even if LNG contains a high amount of BOG. The device also provides the operator with a 2-phase-signal, indicating whenever BOG occurs in the process.

Converter of the OPTIMASS 6400 Coriolis mass flowmeter mounted on the LNG dispenser

4. Customer benefits

The OPTIMASS 6400 does not only comply with the requirements of the MID MI-005. The customer also stands to gain from the Entrained Gas Management functionality of the Coriolis meter in the event of BOG.

The Coriolis meter continues to measure even during start-up phase when vapour breakthrough occurs. In using the meter's 2-phase-signal, the customer is able to identify the best point in time to start with CT measurement. In this way, the EGM™ functionality helps with reducing the cooling time and enabling a faster loading / unloading process. The start / stop procedure of the truck-mounted CT system can now be controlled by the 2-phase flow diagnostics of the OPTIMASS 6400. As a result, the operator can save on costs as product loss during cooling can be limited. This in turn allows the operator to better meet the production quality criteria in the end.

The high accuracy meter for LNG and BOG is just one of several KROHNE instruments used by CETIL in many different applications.

5. Products used

OPTIMASS 6400 C

- Coriolis mass flowmeter for advanced process applications
- Variants for cryogenic to high temperature media (-200...+400°C / -328...+752°F)
- With Entrained Gas Management (EGM™): maintains operation even with entrained gas of up to 100%
- CT: OIMLR117, R137, MI-005, MI-002; API, AGA etc.
- With optional insulation casing for increased safety
- Flange: DN10...300 / ½...12", max. PN 160 / ASME Cl 1500
- 3 x 4...20 mA, HART®7, Modbus, FF, Profibus-PA/DP, PROFINET

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Would you like further information about these or other applications?
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