



APPLICATION NOTE

Oil & Gas

Real-time product release of LNG

- Quality release certificate and bill of lading available directly after LNG loading
- Avoiding disputes due to AMADAS automated instrument validation
- ISO 8943, GPA 2172, ASTM 4784 and GIIGNL calculation certified by NMI

1. Background

A natural gas hub in Australia has a capacity to produce 8.9 metric tons of LNG per year. The hub operator was looking for methods to obtain real live information on the quality and the quantity of the gas produced and shipped. In their current setup the operator was using off-line lab analysis combined with dynamic flow measurement. The L-QRS solution offered the customer instant availability of bill of lading and quality certificates.

2. Measurement requirements

Transferring LNG is based on a highly accurate measurement of LNG quantity and quality. In the past, the quantity measurement was mainly based on tank level measurement. In recent years this has been slowly shifting towards dynamic measurement using flowmeters. The quality measurement is usually based on a lab analysis of a representative sample of the LNG that was loaded.

Traditionally, a representative sample is obtained by an automated sampling system that regularly extracts a small amount of LNG during the loading process. After loading has been completed, a sample canister is then available that holds a representative sample of the cargo in the ship. The sample canister is subsequently taken out and transported to the LNG laboratory for analysis. A second similar sample canister is stored on the ship for later analysis in case of a dispute.

While this method has been in use for many years, it has some drawbacks: Analysis can only start after the load has been completed. The quality release certificate is usually only available after the ship left berth. Lab operation and manual calculation of calorific value leave room for disputes. Manual handling of cryogenic sample cans is required.

KROHNE

To improve this process the operating company and KROHNE initiated a solution to measure LNG quality directly during loading.

This includes:

- Automatic calculation of calorific value per typical LNG standards
- 3rd party verification that calculation methods were correctly implemented
- Guarantee performance and traceability of instrumentation used to measure LNG quality
- Generation of quality release certificate and bill of lading immediately after loading has been completed

3. KROHNE solution

Based on its SynEnergy metering software, in close co-operation with the gas hub operator, KROHNE developed the L-QRS LNG quality release software package. The L-QRS software includes ISO 8943, GPA 2172, ASTM 4784, ASTM E178 and GIGNL calculation methods, with correct implementation of these methods certified by NMI. To verify the performance of the instrumentation used for measurement of the LNG, the integrated CalSys module offers analyser management and data acquisition (AMADAS) functionality, amongst others per ASTM D3764, ASTM D6299 and OP 97-30425.

The L-QRS software is configured to work with the existing infrastructure, instrumentation and analyzers such as gas chromatographs. The core software runs on a SUMMIT 8800 Custody Transfer flow computer, with the operator interface integrated in the central HMI.

Certificate of Quality			
LNG Loading Lines			
Batch ID:	170112_1801_	Print Date:	12-Jan-2017 19:02:19
Shipment No:		Commence Delivery:	12-Jan-2017 18:32:11
Vessel Name:		Terminate Delivery:	12-Jan-2017 19:01:11
Gas Lifter Name:		Sampling Start:	12-Jan-2017 18:33:11
Target Cargo Size:	0	Sampling Stop:	12-Jan-2017 19:00:10
LKX System:	KDG-LDCS-SVC1 / KDG-LDCS-QRM1	Sampling Pause Times:	0 [s] (Loading Line 1)

Loading Full Rates			
LNG Line A	Batch Total *	Emp. Total *	
	Volume	1799.6689	1799.6689 m3
	Mass	794.402	794.152 t
	Average VFR	3999.0	m3/hr
	FVA Pressure	741.33	kPa
	FVA Temperature	-162.00	degC
	FVA Line Density	461.42	kg/m3
	FVA Heating	54.51314	kJ/kg
LNG Line B	Volume	1799.1000	1799.1000 m3
	Mass	786.493	786.305 t
	Average VFR	3999.0	m3/hr
	FVA Pressure	751.13	kPa
	FVA Temperature	-159.00	degC
	FVA Line Density	437.56	kg/m3
	FVA Heating	54.51115	kJ/kg

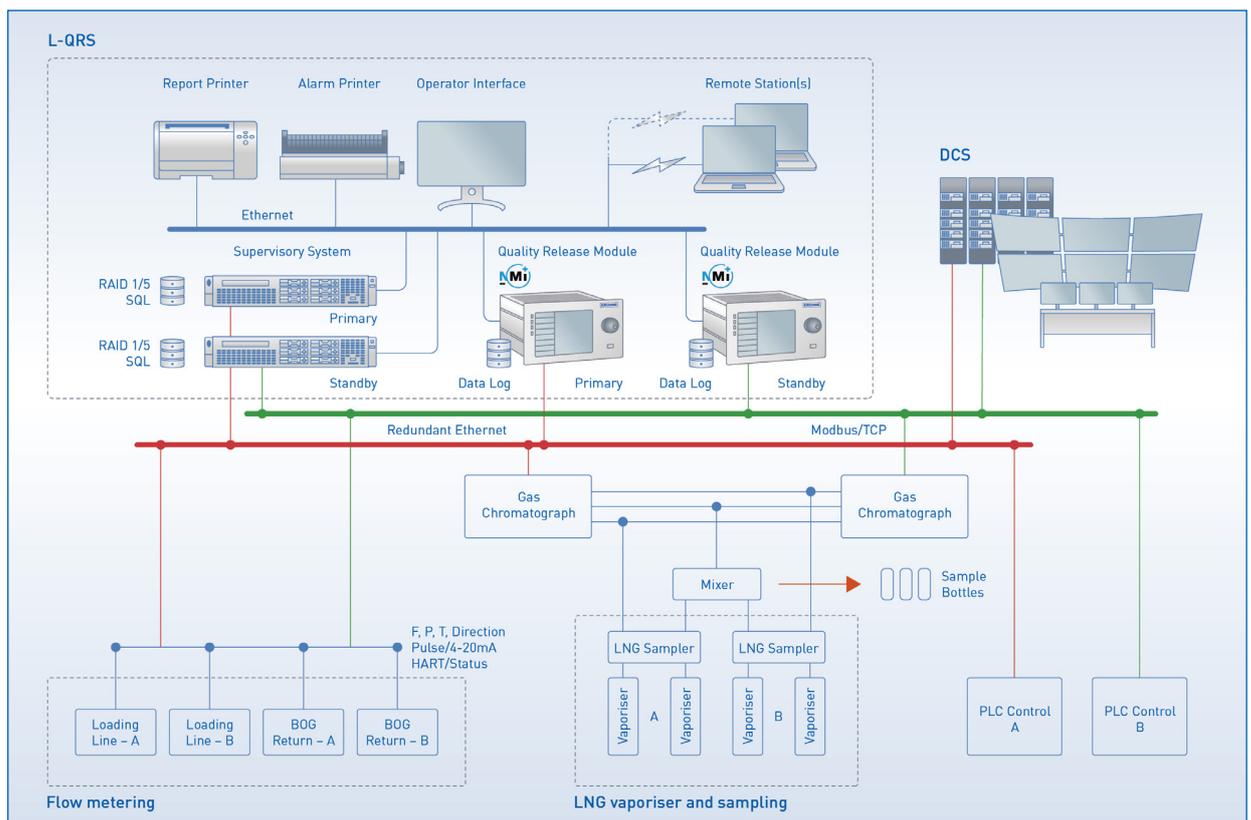
Section Totals		Section Volume Totals			
FVA Pressure	746.33	kPa	Ramp Up	132.3069	m3
FVA Temperature	-160.50	degC	Loading Full Rates	3999.7039	m3
FVA Line Density	439.29	kg/m3	Ramp Down	135.5311	m3
FVA Heating	54.51315	kJ/kg			

Loaded Figures		Vessel CTRM Readings			
Total Volume	3867.609	m3	Initial volume	0.000	m3
Avg. Line Density	439.3	kg/m3	Final volume	0.000	m3
Avg. Heating	54.5131	kJ/kg	Final - Initial	0.000	m3
Avg. Pressure	746.3	kPa	Avg. Pressure	0.0	kPa
Avg. Temperature	-160.5	degC	Avg. Temperature	0.0	degC
Energy	92620	GJ	Calculated energy	0	GJ
Energy	87782	MJBTU	Calculated energy	0	MJBTU

* Batch totals are inclusive of error losses
* Error losses are not recalculated or corrected for outliers

Note: For manual recalculation of the loaded figures, the values in the tables above are shown with an increased amount of decimal places

Sample quality release certificate



L-QRS typical systems architecture

5. Solutions and products

LNG-Quality Release System (L-QRS)

- Software solution for efficient LNG loading operations
- Instant availability of both certificate of quality & bill of lading, based on real-time quality measurement
- Certified by NMI and compliant with ISO 8943, GPA 2172, ASTM 4784, GIIGNL
- Automated instrument validation and statistical process control according to international standards
- Energy calculations, loading mass balance and billing reports on vapour returns



SynEnergy Supervisory and visualisation software

- Solution for continuous process monitoring and reporting
- HMI/SCADA software for measurement solutions
- State of the art HTML5 secure web technology
- Optimisation of operation results due to predictive maintenance
- Easy integration into existing DCS and ERP networks



CalSys Analyser Management software

- Solution for analyser management and data acquisition (AMADAS)
- Effective performance monitoring of quality measurement instruments (QMI)
- Automated analyser validation and statistical process control
- Complies with international standards and methods (ASTM D3764, ASTM D6299, OP 97-30425 etc.)
- Increased availability of gas chromatographs and critical process analysers



Custody transfer metering systems for LNG

- Metering solution for liquefied natural gas
- Based on ultrasonic or Coriolis cryogenic flow meters
- From large scale ship (un)loading to bunkering and truck loading
- Comprising flow metering skid, metering control cabinets, sampling and analyser systems, and all supervisory and validation software



SUMMIT 8800

- Flow computer for custody transfer (CT) measurement
- Cost effective solution due to modular hard- and software design
- Full colour graphical touch screen for maximum process transparency
- Easy operator access enabling time efficient maintenance
- Automatic Performance Monitoring extends recalibration interval



Contact

Would you like further information about these or other applications?
Do you require technical advice for your application?
application@krohne.com

Please visit our website for a current list of all KROHNE contacts and addresses.

