FHI INDUSTRIËLE AUTOMATISERING

KROHNE
measure the facts

Efficiënte laadoperaties van energiedragers

Bij het leveren en verkopen van energie is het meten van de hoeveelheid en de kwaliteit van de geleverde producten van essentieel belang, en onder invloed van regelgeving.

In deze presentatie wordt ingegaan op de mogelijkheden van een systeem met geautomatiseerde instrumentvalidatie en statistische procescontrole, volgens internationale normen. Dit maakt energieberekeningen, ladings-massabalans en factureringsrapporten over dampretours mogelijk.

KROHNE Nederland

Productie Proces Automatisering
25 januari 2024 | Van der Valk Hotel, Vianen

FHI INDUSTRIËLE AUTOMATISERING

KROHNE
measure the facts

Welcome

- **Tony van Weers**
- Product manager flow computer

- Hobbies:
- Running
- Trail running
- Mountain biking

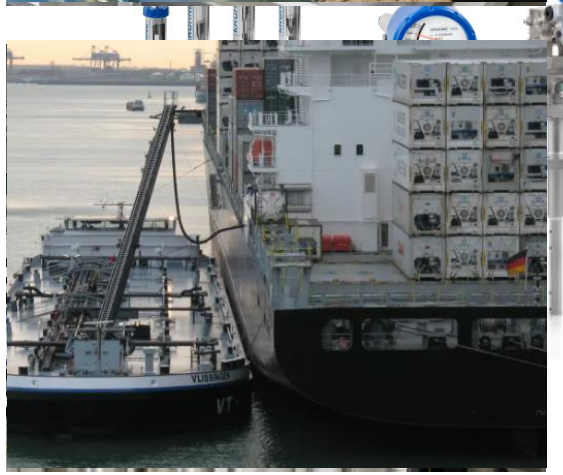
FHI INDUSTRIËLE AUTOMATISERING

KROHNE measure the facts

KROHNE

www.krohne.com

- Manufacturer of process instrumentation, such as flowmeter, pressure and temperature transmitters
- Metering systems
- Metering and monitoring software
  - Metering supervisory software
  - Pipeline leak detection
  - Analyzer Management (AMADAS)
  - LNG loading and quality release (LQRS)



Introduction

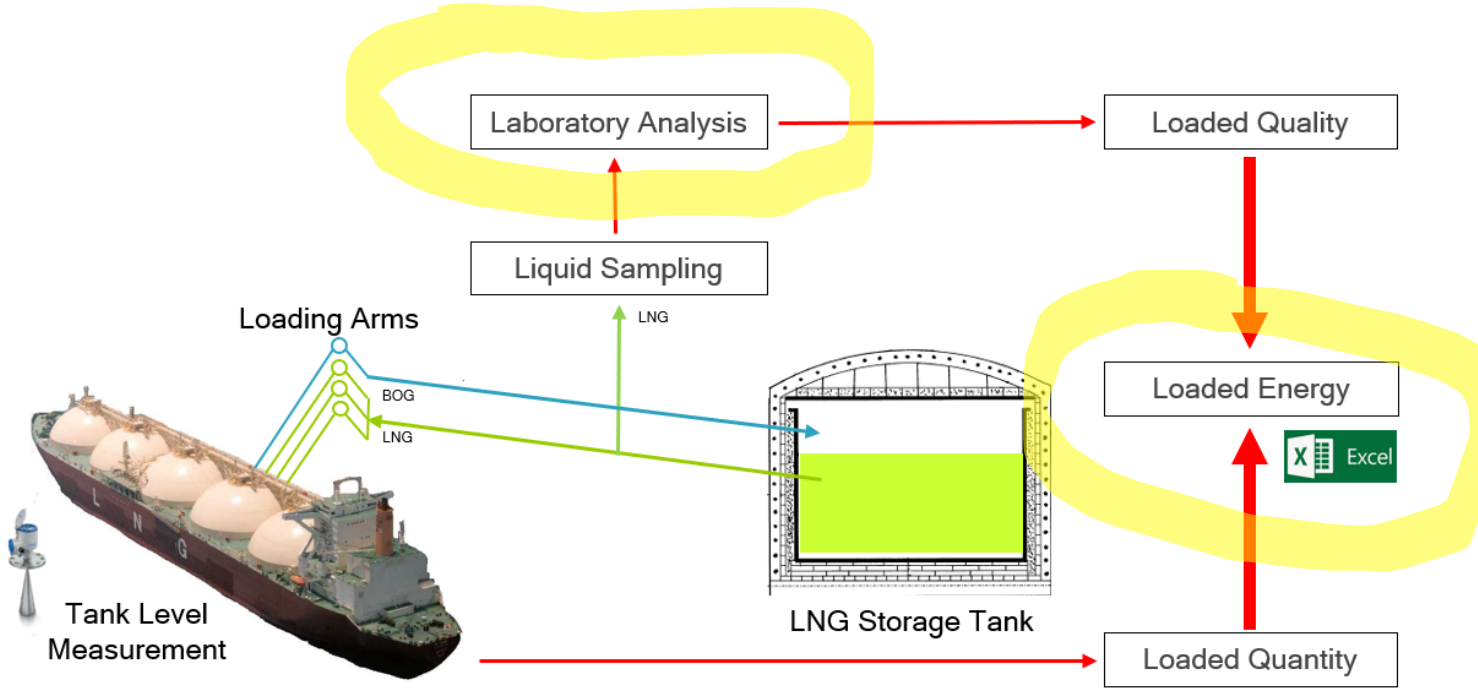
Current Situation and Associated Problems

LNG (un)loading requires as per GSPA (Gas Sales Purchase Agreement) a quality certificate and a bill of lading as a minimum to determine the amount of energy transferred.

The input for these documents is currently derived from multiple instruments and independent operated systems.

- The **Quantity** is determined with the level measurements on the LNG vessel and these measurements are the input for the bill of lading.
- The **Quality** is determined in a laboratory using samples collected during. The results are the input for the quality certificate.

All this data is manually collected and processed in mostly Excel based worksheets without traceable references to instrument uncertainties, standards and no dynamic validation.



Scope Description

Current Situation and Associated Problems

Reviewing the existing situation the following potential problems can be listed:

- Current systems allow introduction of human errors.
- Certificates of Quality are produced using DCS historians or external plant information systems such as PI and MS Excel
- Quality Data transferred through multiple interfaces with possible loss of resolution or loss of data due to filtering (ISO demands upto 6th decimal point)
- Calculations not validated or certified by an independent body such as NMi.
- Quality data is not traceable, and measurements often not in compliance with ISO/GPA standards
- No dynamic validation of data, while LNG loading is in progress.
- Validation of data is often done after the shipload with no means to reconcile if equipment had developed faults during the loading.
- Contractual clauses (including calculations) differs from site to site which could lead to wrong interpretations and calculations.
- Overall loading system is difficult to audit by the authorities
- This can be applied to any tranfer of energy in the form of liquid or gas.

Introduction

What can be improved?

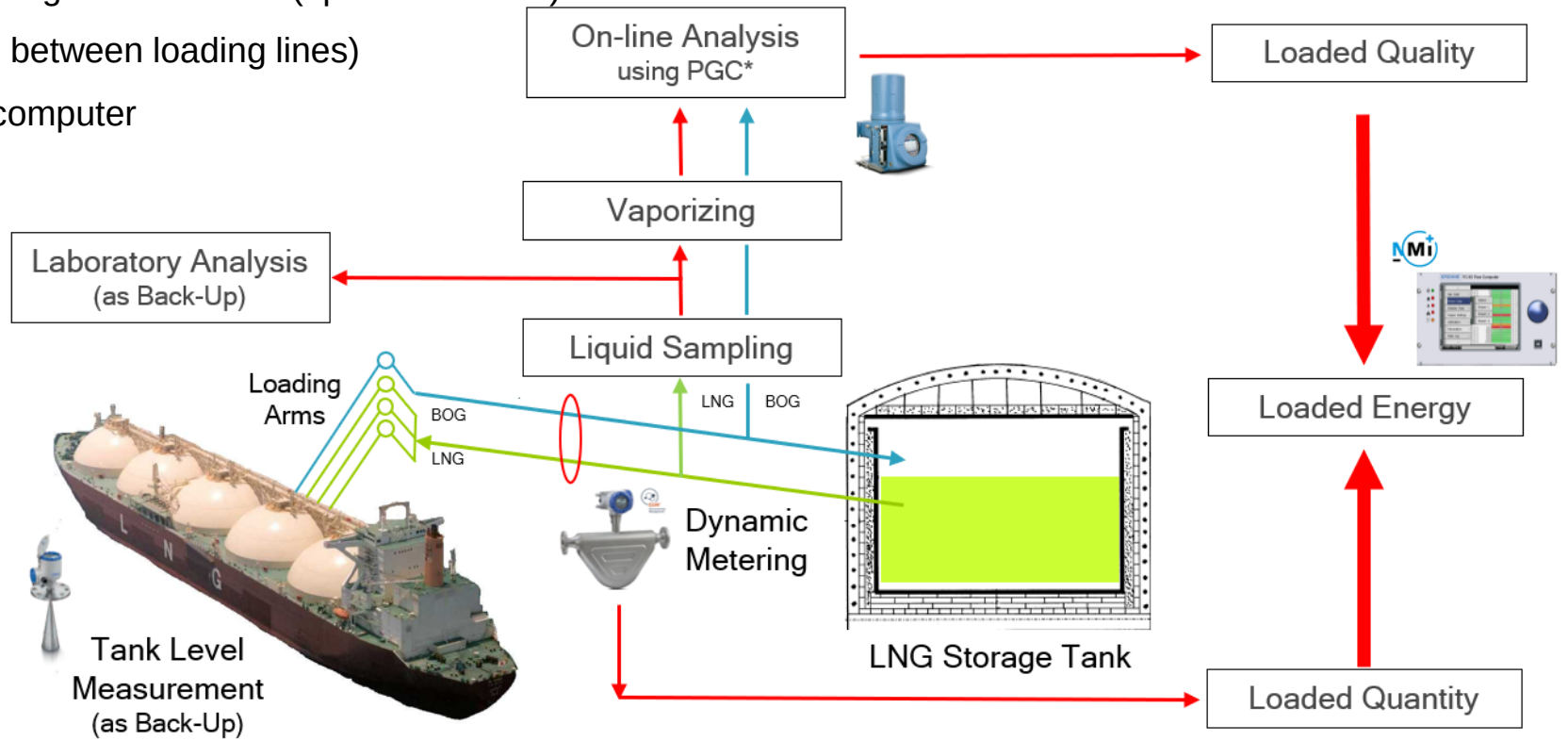
- Instant availability of bill of lading and quality certificates avoids costly retrospective corrections once the vessel has departed
- Elimination of human errors in the data processing by automated information flows
- Reduction of maintenance costs by an average of >25% appears to be feasible using the benefits of automated validation software
- Avoids discussions over the amount of energy transferred as system is indisputable compliant to GSPA and certified by NMi.
- Increasing availability of critical instruments ensuring constant and reliable quality measurements, less give-away.

Scope Description

Design Criteria

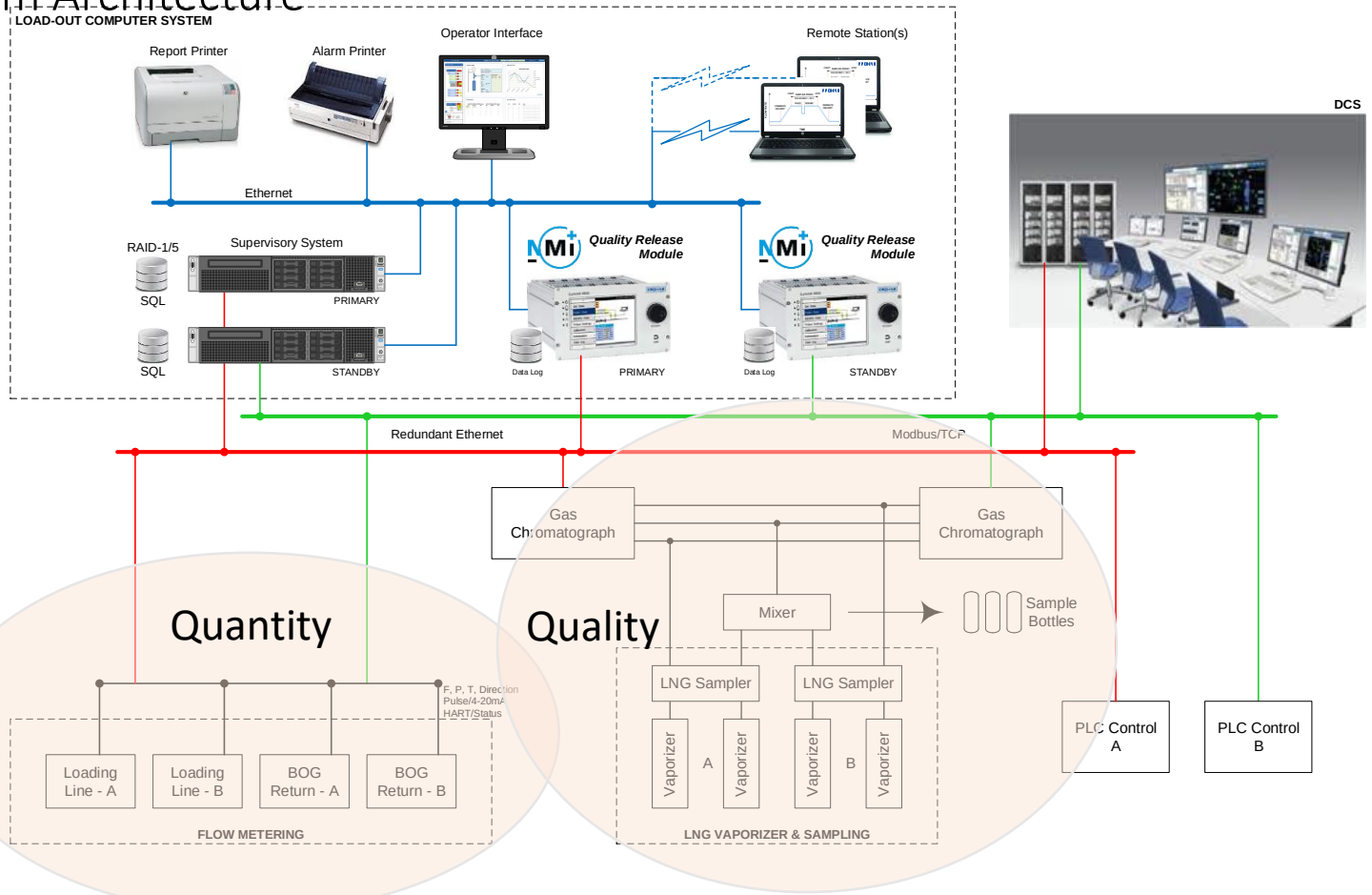
To benefit from the L-QRS the following is additionally required:

- Flow Measurement (incl P&T) on each loading and BOG line (optional for BoL)
- Quality Measurement (individual or shared between loading lines)
- L-QRS system with the Summit 8800 flowcomputer



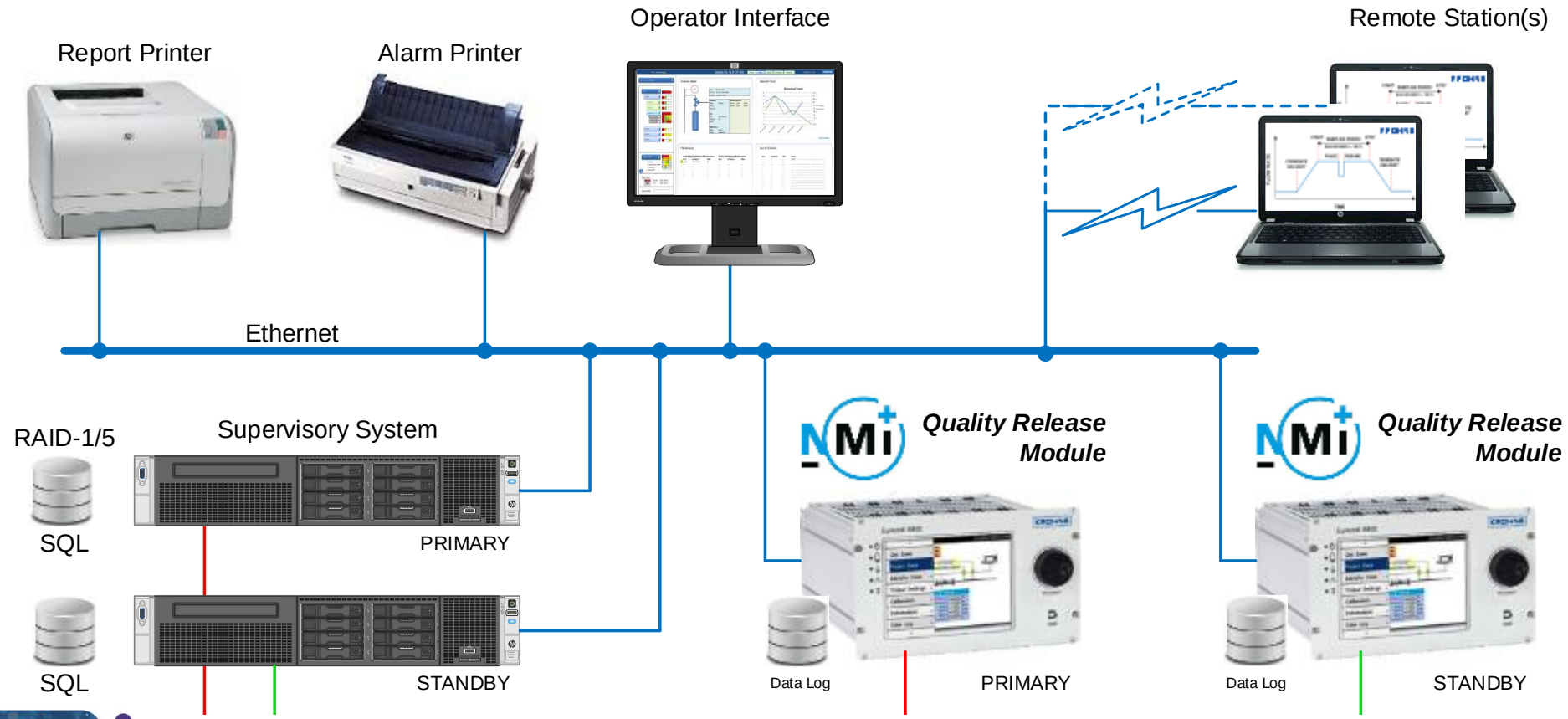
System Architecture & Functions

Typical Plant System Architecture



System Architecture & Functions

System Architecture Redundant KROHNE L-QRS

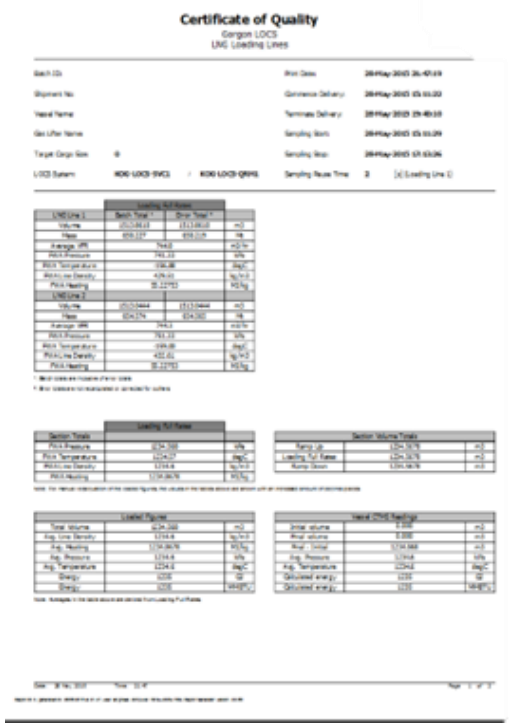


Productie Proces Automatisering

25 januari 2024 | Van der Valk Hotel, Vianen

System Architecture & Functions

Summit 8800 Flowcomputer Functionality & SynEnergy®



Data Validation and Outlier Detection:

- Outlier detection on mass-based heating value as per ASTM E-178 (2000)
- Two-tailed testing (lowest and highest values), confidence 98%
- Repetitive test until all outliers excluded / outlier replaced with last good value
- Flow Weight Average (FWA) mass-based heating value is recalculated with outliers removed & replaced
- If more than x% outliers, data set is considered invalid

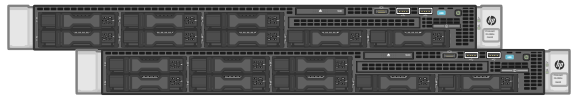
Note: *All calculations certified by NMi*

Reporting:

- Report calculations for
  - Total volume
  - Flow-weighted average for gas composition
  - Combined FWA for multiple loading lines
  - Total Energy based on L-QRS measured volume
  - Total Energy based on CTMS
  - PGC Coverage
- Certificate of Quality
- LNG Batch Report

System Architecture & Functions

SVC Instrument Management



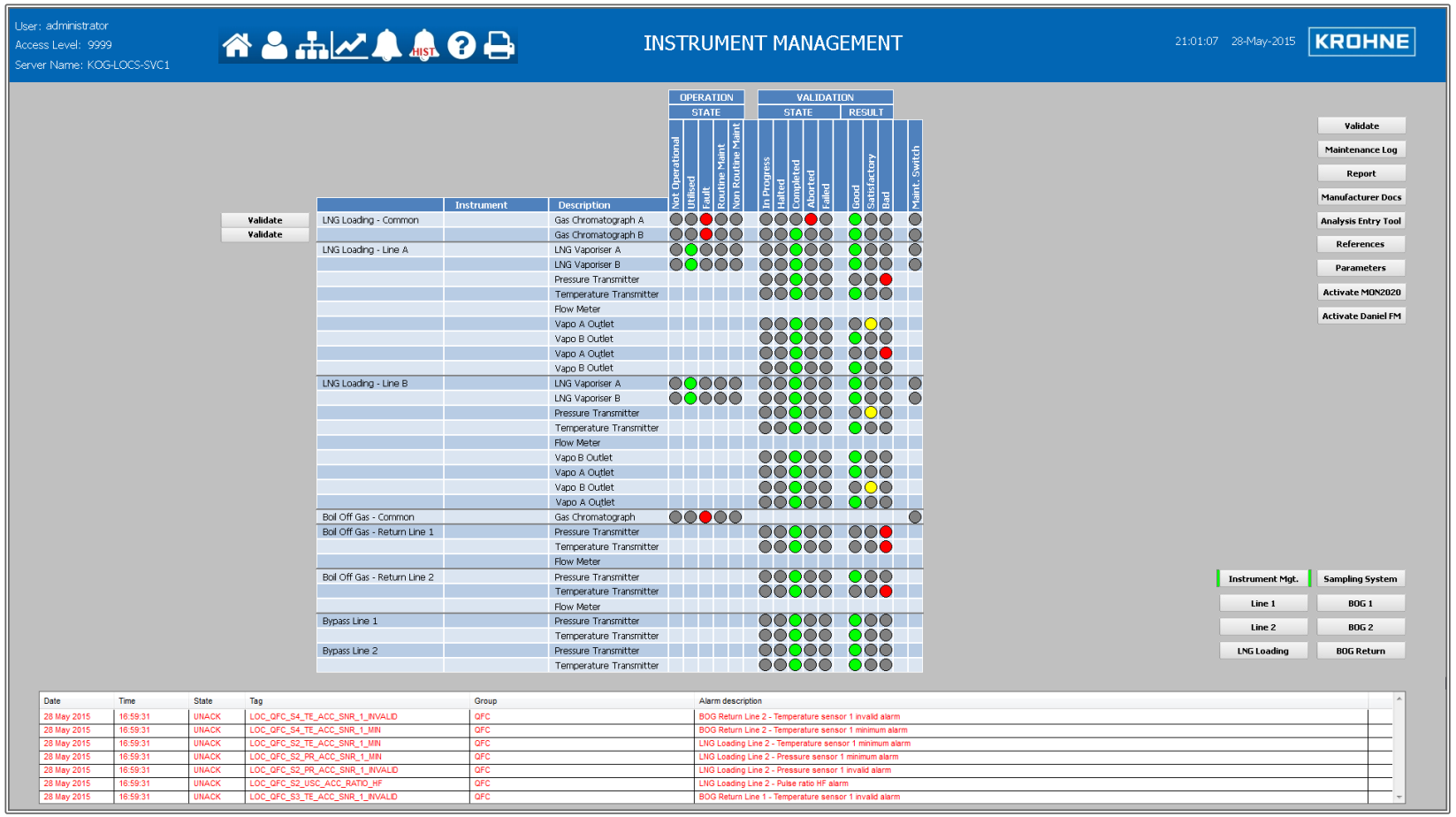
Analyser Management (AMADAS)

- Gas chromatograph validation (prior to each ship load)
- Long term evaluation using control charts
- Gas chromatograph Calibration and Round Robin testing
- Pressure- and Temperature transmitter validation
- Vaporizer system validation (repeatability check)
- Instrument Availability Monitoring & Availability calculations
- Instrument Maintainability

Using the statistical benefits significant benefits can be achieved with regards to availability of critical analysers and instrumentation, auditable and traceable maintenance and calibration records and cost saving on maintenance.

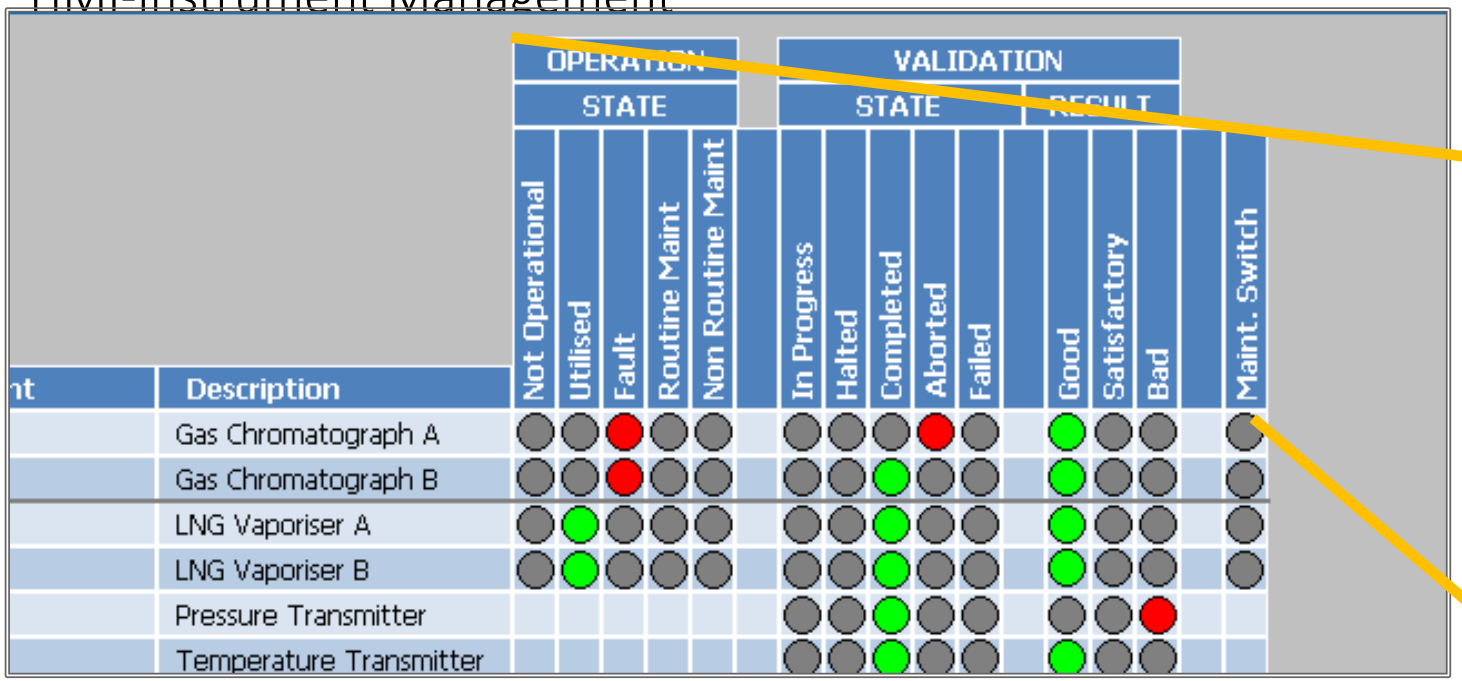
System Architecture & Functions

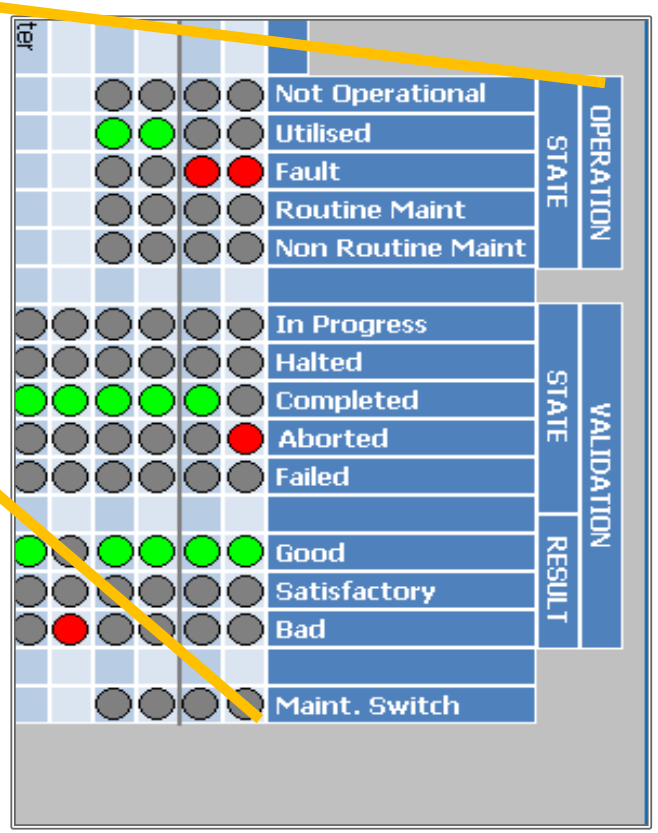
HMI-Instrument Management



System Architecture & Functions

HMI-Instrument Management





Customer Benefits

Basic Number Crunching

Typical key figures for LNG loading operation:

• Annual number of (un)loadings:	50		
• Average amount of LNG per batch:	65 – 80 M Euro	=>	3,250 – 4,000 M Eur / year
• Typical uncertainty level:	0.5 – 0.7%	(@95% confidence acc. GIIGNL)	
• Annual costs for disputes:	0.65 MEUR	(1% of cargo value every 1 out of 50 loadings)	
• Annual maintenance costs:	0.24 MEUR		

Once L-QRS is installed and operational improvement is expected in the maintenance costs, amount of disputes and availability resulting in less product give-away.

• Increased QMI availability reduces the uncertainty (subject to location):	0.01% (?) * 3,250 M EUR = 325 kEUR
• No more disputes as all data is tracible and available real-time:	650 kEUR
• 25% on annual maintenance costs:	60 kEUR
Total annual saving for LNG operator / train:	**1,035 kEUR**

More info

https://krohne.com/en/solutions/monitoring-solutions/supervisory-validation-software

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...

View solution details

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

View solution details

CalSys Analyser Management software

Solution for analyser management and data acquisition (AMADAS)

- Effective performance monitoring of quality measurement instruments (QMI)
- Automated analyser validation, statistical process control and increased availability of critical process analysers
- Complies with international standards and methods (ASTM D3764, ASTM D6299, OP 97-30425 etc.)...

View solution details

Productie Proces Automatisering

25 januari 2024 | Van der Valk Hotel, Vianen

Conclusion

- Even in our highly automated world we still can improve automation
- Elimination of human actions give trust in a system
- Reduction of maintenance costs by an average of >25% possible
- Avoids discussions due to certified systems for the amount of energy transferred
- Increasing availability of critical instruments results in less give-away.

Questions & Answers

Tony van Weers
Product Manager SUMMIT 8800

Phone: +31 78 6306 200
Mail: T.vweers@krohne.com

FHI INDUSTRIËLE AUTOMATISERING

KROHNE measure the facts

Thank you for your attention!