

## Mass Flow Meters: Has the market finally accepted them?

Nautisch Technischer Inspektorenkreis: 04.04.2017



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## Why Changing from Sounding to MFM?

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- Miss stating temperature
- Miss stating density
- Inaccurate volume to mass calculation
- Inaccurate measuring equipment
- Aeration on purpose – “Cappuccino Effect”
- Understating quantity on the receiving side
- In some cases fraud involves barge and vessel

***The possibility of quantity claims is an unacceptable liability for us that can damage our reputation and can tie us up in costly legal disputes. (N. Groenewold – CEO of VT Group)***

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## Development in Bunker Fuel Metering with MFM

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Accurate measuring equipment, standards, traceability, transparency and defined operation procedures ensure fair trade.



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## Working Group for Mass Flow Metering in Singapore

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1st Working group meeting on Mass Flow Metering **started in 2009**

- Working group consisted of experts from both, industry and government:
  - Maritime and Port Authority (MPA)
  - Spring's Weight and Measure Office(WMO)
  - The National Metrology Center under A\*Star (NMC)
  - Oil majors: Exxon Mobil and Shell
  - International shipping companies: Maersk and APL
  - Bunker tanker operators: Sinanju and Hong Lam Marine
  - Meter vendors: Endress+Hauser and Emerson
  - The Shipping Association (SSA) and IBIA
  - Surveying companies: DNV, SGS...
  - Mogas (Calibration Lab)

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## Key Milestones

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In 2013 the first barge with an Endress+Hauser MFM system was certified in Singapore.

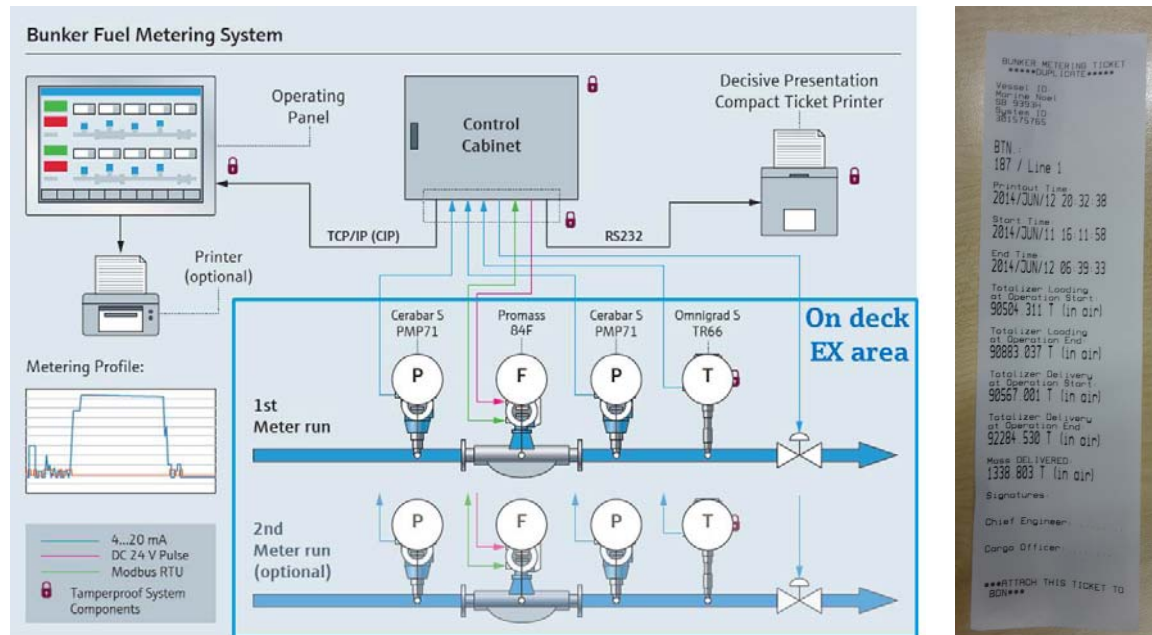




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## How does a Bunker Metering System Work?

A sealed Coriolis mass flowmeter based metering system measures inline the bunker quantity directly in metric tons and produces a tamper prove ticket which confirms the transferred bunker quantity.



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## How does a Bunker Metering System Work?

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### The basic features of a Bunker Metering System:

- Continuous mass flow measurement
- Air Index (measurement quality)
- **Compensation for dual-phase flow**
- Bi-directional measurement
- Flow optimization using control valve
- Totalizing quantity of the transferred fuel
- Bunker ticket printout
- Bunker metering profile
- Fluid temperature measurement

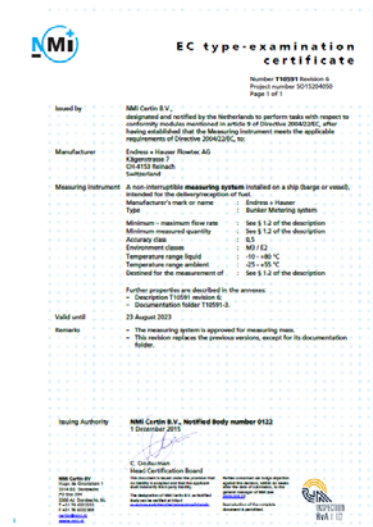
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## Acceptance of MFM ... Standards to Ensure Fair Trade

Bunker Metering Systems must meet requirements set by industry bodies such as API, ISO and national metrology standards such as OIML R 117. Custody transfer standards are setting the basis for fair trade.

Today, there are 2 custody transfer standards for bunker metering with MFMs.

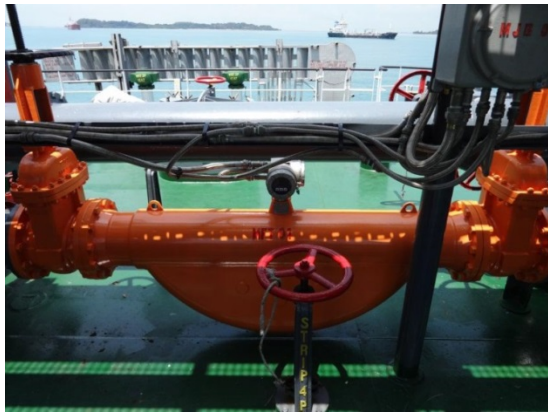
- MID (European Measurement Instrument Directive) – MI 005
- TR48: MPA (Maritime Port Authority of Singapore)
  - MPE of +/- 0.5% of reading
  - Evaluation certification on component level
  - **System** certification for measurement of **aerated** bunker fuel
  - Performance verification in the installation
  - Bunkering operation procedures
  - Frequent accuracy verification of the installation





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## Acceptance of MFM ... System Integrity



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## Acceptance of MFM ... Transparent Operation

Bunker Metering Computer
Batch Control - HFO
Endress+Hauser x

System Status: OK
Logged in user: BUNKERTESTADMIN
2015/10/28 18:37:27

Operation Complete
Reset Total

Valve Control:  
**Automatic**

Set Ref. Density  
996.4 kg/m<sup>3</sup>

**Custody Transfer Metering Result**

Totalizer Loading 2299.666 t

Total LOADED 28.058 t

t = metric tons

VESSEL  
LOADING  
MASS  
AUTO RESET  
OPERATION  
RUNNING

Mass Flow:	294.5	t/h	good	Totalizer Loading at Batch Start	2271.617	t
Average Pressure:	4.582	bar(a)	good	Totalizer Delivery at Batch Start	0.0	t
Temperature:	51.1	°C	good	Date/Time last Reset	2015/OCT/28 18:31:12	
Air Index:	22	-	decreasing	Batch Number	000000004	
Observed Density:	996.5	kg/m <sup>3</sup>		Observed Volume	28.871	m <sup>3</sup>
Std. Density (@15°C):	1020.6	kg/m <sup>3</sup>		Volume Flow	302.9	m <sup>3</sup> /h

Batch Control

System Overview

Parameter

Settings

Trends

Batch History

Messages

Admini-  
stration

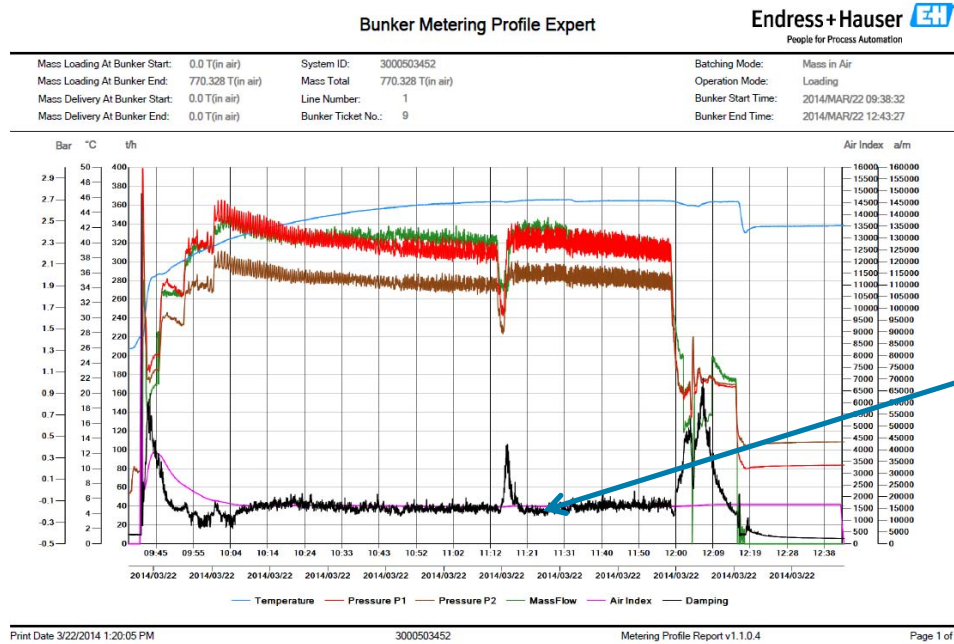
Login

Shutdown

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# Acceptance of MFM ... Transparent Operation

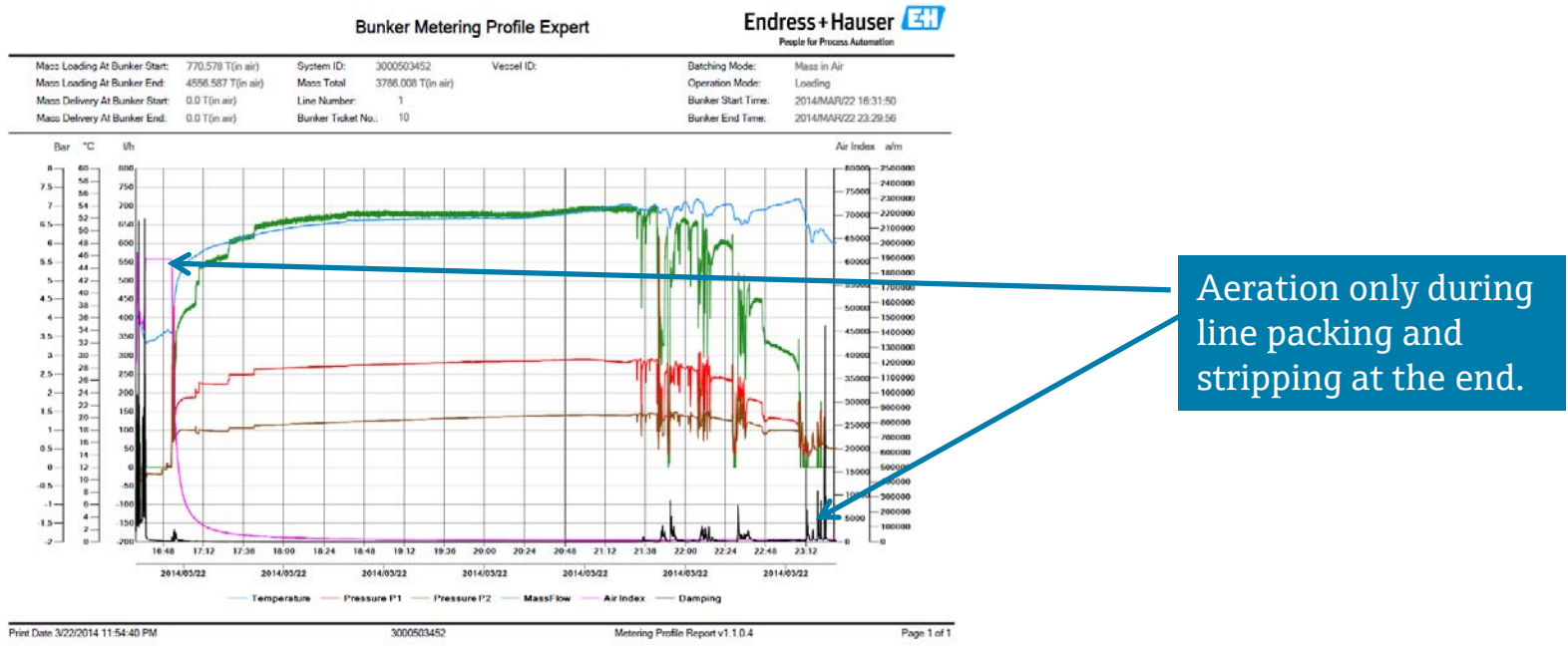
## Example of bad bunkering practice



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## Acceptance of MFM ... Transparent Operation

### Example of good bunkering practice



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## Acceptance of MFM ... Gains in Profitability

### Barge:

- Get paid for what you have delivered. No costly disputes.
- Increase in productivity due to 3h shorter operation time.
- Secured business due to higher level of trading credibility.

### Vessel:

- Pay only for what you get: about 3- 4% less. No costly disputes.
- Time savings of about 3h per operation.

### Ports:

- Increase in bunker volume due to higher level of trading credibility.
- Increase in bunker volume due to 3h shorter operation time.

### Fuel Supplier:

- Increase in bunker volume due to higher level of trading credibility.

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## Installation in the Port of Rotterdam: Bunker Barge “MTS Vlake”

### VT - Vereenigde Tankrederij

- Since 1916
- 250 employees
- 23 barges in operation
- Delivery of fuel oil to MAERSK.



### Results:

1. Proven measurement system for marine bunkering.
2. System accuracy of +/- 0.2% after 3000 bunker deliveries.
3. Vessel owner will save up to 4% of delivered bunker total.

→ More transparency

→ Fair competition

C.J.A. Groenewold CEO

**“ZERO SPILLS – NO INCIDENTS”**



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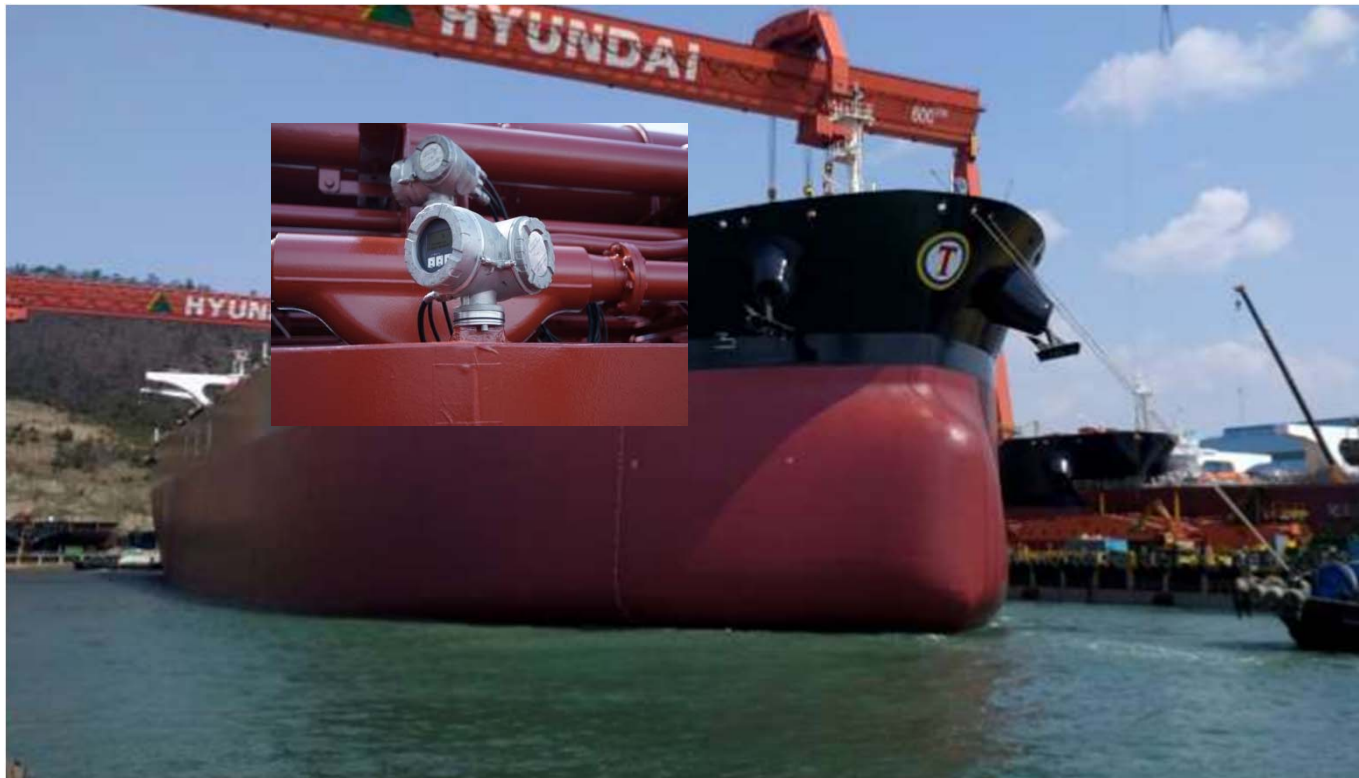
## Installation on vessel as check meter – container vessel

- Company: UASC
- Vessel name: Umm Salal, Al Riffa, Al Quibla, Al Ula, Ain Snan, Malik Al Ashtar, Jebel Ali Tayama, Unayzah



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## Installation on vessel as check meter - tanker



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## Acceptance of MFM ... Recent Market Developments

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- 102 x HFO barges with MFM are certified in Singapore.
- TR48 bunkering standard is now finalized in Singapore and introduced to other ports.
- MGO barges are under evaluation in Singapore.
- Ports like Hong Kong, Fujairah, Algeciras are following with recent installations.
- Vessels do more and more install MFMs.

## MFM ... The Technology and Acceptance is there ... Questions?

