An Overview of Singapore’s MFM Standard, TR 48

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SDO@SCIC Secretariat

- Working Group on Mass Flow Metering
- Working Group to review SS 600
- Working Group to review SS 524
- National Mirror Committees
From 1 Jan 2017, the Singapore national maritime agency, MPA requires its bunker suppliers to use approved MFM system for fuel oil bunkering.
Challenges in Bunkering

- Quality ie marine fuel specifications
- Quantity ie get what you pay for
  - Measurement
  - Security of measured quantity
- Quantity issues, a constant challenge
  - Biggest cost item for ships
Stakeholders involved in TR 48

- **National & International participation**
- **Building trust, confidence and acceptance**
New Application of MFM to Bunkering

Key milestones

• Singapore’s MFM bunkering project led by TC for Bunkering from 2009

• Achieved first milestone with 1st bunker tanker, MT Emissary using MFM system, approved by MPA in line with requirements developed by the TC for Bunkering, to carry out the 1st commercial bunker delivery on 11 July 2012.

• Transport Minister announced in Apr 2014 the mandatory adoption of MFM system in Singapore by 1 Jan 2017

• Launch of TR 48 by SPRING Singapore on 16 Feb 2016

• 113 bunker tankers met MFM system requirements and approved for fuel oil MFM operations by MPA as at 1 Jan 2017

• Mandatory use of MFM system for fuel oil delivery in Singapore from 1 Jan 2017
Key Success Factors

• Coriolis meters good in single phase fluid flow, less so for 2-phase fluid flow when air is mixed with oil
  ➢ Operational control of aeration – a small % of total delivered quantity.
  ➢ Product condition
  ➢ Maximize the quantity measured in single phase flow and minimize line packing and tank stripping
  ➢ Failure in bunkering application due to common “plug in & play” mentality, whether on bunker tanker or receiving ship.
  ➢ Calibration alone not enough
  ➢ Operational control ie metering procedure vital for performance (0.5% expanded measurement uncertainty)
  ➢ Measurement security
• The Coriolis meter needs to be set up as part of a custody transfer measuring system on board a bunker tanker to undertake the bunkering task

• A MFM system needs:
  – To be properly sized and installed to meet rigorous requirements of TR48 for custody transfer on a bunker supply tanker
  – To have a delivery procedure in place to achieve the required performance of TR48
Covers requirements of metering system qualification, installation, testing and procedures and documentation for bunker custody transfer using the Coriolis mass flow metering system.

**Metrology and Security**
- Clause 6: Traceability and calibration requirements
- Clause 7: System integrity requirements

**MFM Installation**
- Clause 8: Meter selection and installation requirements

**MFM System Approval for Operation**
- Clause 9: Acceptance test requirements

**Bunkering Operations**
- Clause 10: Metering procedures
- Annex AB: Dispute resolution
Two Foundations underpinning TR 48

- Measurement Accuracy (Clause 6)
- System integrity (Clause 7)
Two Key foundations

• Measurement Accuracy (Clause 6)
  ➢ Traceability to SI unit mass & calibration
  ➢ Expanded measurement uncertainty of 0.5% of MFM system

• System integrity (Clause 7)
  ➢ Security of the measured quantity being fully delivered to the buyer’s ship

• Clauses 6 & 7 requirements need to be followed or complied with from meter selection stage to bunkering operations i.e. Clauses 8, 9 & 10
Clause 8 : Meter selection and installation requirements

• This Clause assists MFM system owner to meet requirements of Clauses 6 & 7

• Includes pre-selection screening, site survey and highlights the responsibility of tanker owners/operators and meter vendors in this process

• Correct selection and installation should result in the MFM system meeting the operational objectives of the user and leading to the approval of the MFM system and commercial service
Clause 9: Acceptance test requirements

• MFM system is required to undergo an official acceptance test to validate that Clauses 6 & 7 requirements are met

• Success in the acceptance test will lead to MPA’s approval of the MFM system for bunkering service
Clause 10: Metering procedures

- Optimise performance of MFM system

- Covers pre-delivery, delivery, post-delivery checks and documentation requirements for the delivery of bunker using a MFM system

- Monitor measurement integrity and system integrity during bunkering, i.e. Clause 6 & 7 are complied with during bunkering

- Management of inventory through the meter totalizer log
Trust & Confidence
• Weights & Measures Office, a division of SPRING Singapore, prescribes requirements on the meter for trade use

• MPA is the authority that implements and enforce compliance with TR 48 for each MFM system installed on the bunker tanker
Benefits to industry

- More volume
- Increased bunkering capacity
- Less disputes
- Higher productivity
- More connectivity
- Better business processes
- Beyond bunkering
Post-implementation

- Misunderstanding measurement uncertainty
- Bunker supply chain issues, loading at oil terminals to final delivery to ships
- Small parcels and operational control on flow
- Low viscosity fuel
- System integrity breaches
- When does a dispute arise?
- Further developments
Thank you

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