The MFM[1] ecosystem: Why Technology Alone won't Fix Bunkering

In an industry where 'getting what you pay for' was not the standard, some large market players got together, back in the early 2000's, and agreed that the time was there to make a change. A project to find an alternative way of working, achieving that higher standard and ensuring they got what they paid for, was established. This was the birth of the Certified Bunker Measurement Solution[2].



Picture 1: MFM System on the MTS Vlaardingen (original picture from Press Release)

To understand the original challenge of these market players, it must be said that bunkering in general is a challenging process; high product flows, of high viscous fluids, temperature and pressure differences throughout the value chain and in most cases, bunker operations take place whilst cargo operations are taking place at the same time. All of this takes place in a global industry, where we are confronted with a maze of stakeholders, all with their own KPI's[3]. The one burning the fuel, does not have to be the same person who buys the fuel and the one selling the fuel does not have to be the same entity that delivers the fuel.

[1] Mass Flow Meter (based on Coriolis measurent principle)
[2] Original brand name from the Emerson solution, based on Coriolis mass flow meter for bunkering.
[3] Key Performance Indicator

In 2025, the global bunkering industry had an annual turnover of over 132 billion USD[4], where fuel bills make up between 50% and 70% of operational costs. When combining this with the previous mentioned challenges, it is understandable that these market players were desperate for finding a more reliable and transparent way of measuring the fuel delivered.

Let's take a step back and dive into some bunker basics; bunkers are being traded in tons instead of liters, which is a legacy from the days that ships burned coal as energy source. The traditional way of measuring bunkers (amount transferred) however is by tank measurements, which is based on centimeters. The conversion from centimeters, via volume, temperature, and density to mass can be a very accurate method but is also subject to calculation errors and mistakes.

Further, volume depends on temperature, and a higher temperature will increase the volume of the fuel oil, boosting the volume in the tanks. With the traditional way of measuring bunkers, there is a risk that this air is undetected and thus the buyer does not get what they pay for; bringing us back to the core of the challenge.

Fast forward, after a lot of testing and data analysis, the Certified Bunker Measurement Solution was born, with the first fully MID[5] certified system on the barge Vlaardingen[6] back in 2011. Shortly after the launch by Emerson, after also Endress & Hauser achieved the certification for their MFM solution[7].

Originally born from a market demand, it was The Maritime and Port Authority Singapore (MPA) who decided to make the use of the MFM mandatory in 2017 for all HFO bunkers in Singapore. In 2019 the mandate was further expanded, including also MGO and MDO.

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[4] Source: https://www.fortunebusinessinsights.com/industry-reports/global-bunker-fuel-market-100469

[5] Measurement Instrument Directive (European regulation, based on OIML for measurement devices for Custody Transer aplications)

[6] MTS Vlaardingen, Inland Waterway Bunker Vessel, owned and operated by VT Group in Rotterdam. Press Release on Certification: https://www.automation.com/article/emerson-supplies-bunker-fuel-delivery-to-vt-group

[7] Currently, November 2026, there are 3 MFM suppliers that have a certified system available: Emerson, E&H and Krohne. In addition, ODS supplies their own system, based on the Emerson MFM and original type certificate.

Since the widescale implementation in Singapore, the market has seen a significant reduction in shortages and cappuccino bunkers[8], making Singapore the more reliable and trustworthy port for bunkers[9], according to many market parties.

The transparency and the reliability of the use of MFM's for bunkering has been further enhanced by the industry standard ISO 22192. Developed in 2021, this standard describes the procedures of bunkering with MFM, the required documentation and the additional requirements on verification, calibration and integrity of the system. The ISO standard therefore is an additional level op assurance that the MFM is operated and maintained correct, including the full integrity of the barge; ensuring that all that has been delivered will pass the MFM.

However, the global roll out and market acceptance of this new measurement method could count on a lot of resistance from stakeholders throughout the full fuel value chain. Concerns about the MFM's still being easy to manipulate to surveyors fearing for loss of their job and objections from barge operators regarding the installation costs to fuel buyers objecting the (optional) price adder when MFMs where being used. It is fair to say that the MFM's for Bunkering were not welcomed with open arms.



Picture 2: E&H MFM, during verification by Metcore in Singapore

[8] Bunkers with excessive air, leading to very fine bubbles of air captured in the fuel , resulting in an extreme increase in volume.
[9] IBIA MFM Survey 2025 results

Today, in 2026, the industry is still divided when it comes to the use of MFM for bunkering. Rising fuel prices, increasing reporting requirement on fuel usage and CO2 emissions under EU-ETS[10] and FuelEU[11] do encourage a correct and transparent way of measuring bunkers. This is being supported by market trends and port mandates on e-BDN's[12].

So why is not everyone using a fully certified MFM measurement system on every bunker barge? Advantages like more efficient operations, less paperwork when integrated into digital systems[13] and the assurance that the buyer gets what they pay for, would make this the obvious way of measuring. Bunkering with a MFM measurement system does require a different way of working from all stakeholders and that is where the real challenge today lies. People, in general, don't like change and this is to be expected even more when this change results in lower margins or more control from governments and/or customers.

Also, one should understand that the MFM is considered a black box by many. A vibrating device installed on a vessel, providing an accurate mass measurement, resulting in the final invoice for large amounts of fuel transferred. Sidenote here; the resistance does not only exist on the delivering side of the industry, also surveyors, some ports and fuel buyers are not in favor.

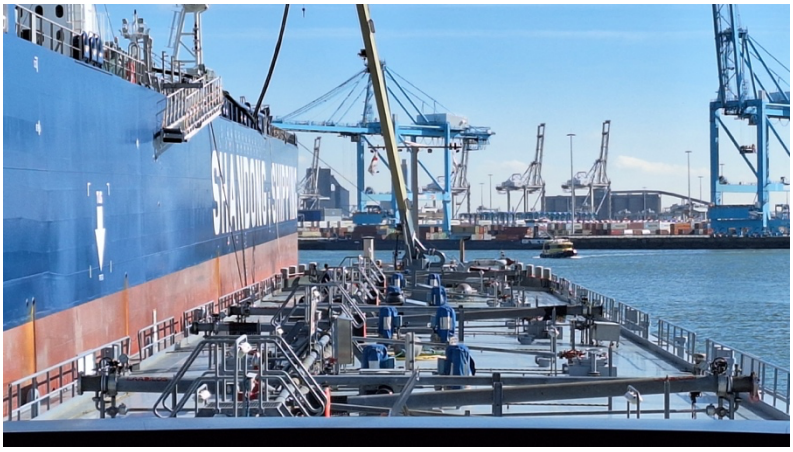
This is the true challenge today; how to create the MFM ecosystem in such a way that all stakeholders experience the added value, the system can be installed and operated in a reliable and integer way and that the industry agrees on one single version of the (measurement) truth which all trust?

To me, the solution is multi layered. First, it starts with communication and a constructive dialogue. Buyers, sellers and operators need to sit around the table and have that conversation on transparency and integrity. A positive

[10] The EU Emissions Trading System (EU ETS) is a global carbon market. It is the EU's main tool to reduce greenhouse-gas emissions.
[11] As part of the European Commission's fit for 55 legislative package, the FuelEU maritime regulation (regulation (EU) 2023/1805) promotes the use of renewable, low-carbon fuels and clean energy technologies for ships, essential to support decarbonisation in the sector
[12] Electronic Bunker Delivery Note
[13] Example of a fully integrated system is ADP from Minerva

example of this is BSI[14], where stakeholders agree on a certain way of working and level of transparency. But also, the original starters of the MFM for bunkering implementation agreed in their bilaterial agreement that all bunkers were measured by MFM and that that measurement method was the one valid for the invoicing[15].

Second, it comes down to education. MFM's are not the holy grail, but a measurement device that supports operational efficiency and reliable fuel measurements, when operated correct. Proper education on how to work with MFM's, what to expect from these devices, how to interpret the readings and how all stakeholders should adapt to this new situation is crucial for acceptation. In general, people are more open to accept a change when the change is better understood; the why and the how.



Picture 3: Bunker barge from United Bunkers alongside the receiving vessel, during bunker operations

In addition to education and dialogue, enforcement and assurance on the correct installation and operation of MFM systems are the final layer in creating this new bunkering ecosystem. Just like we have rules in traffic, bunkering should be subject to (global) rules as well, including a proper enforcement structure in case the rules are not followed.

[14] Industry led initiative where bunkers are being measured with MFM and stakeholders commit to a transparent and integer way of working, all checked and verified by an independent party.
[15] Maersk Oil Trading, Maersk and VT Group back in 2011 after the implementation on the MTS Vlaardingen.

MFM's are here to stay, and one can have its objections or concerns around it, but fact is that these devices have proven their added value for over 15 years in maritime and even longer in other applications. It is now up to the industry to step up their game and increase the level of transparency and robustness in their way of working throughout the full fuel value chain, resulting in a future proof bunkering industry.

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About the article and the author:

This article was written by Claudia Beumer, a bunkering expert by experience, involved in the use and development of mass flowmeters for fuel efficiency and bunkering for the past 16 years. Claudia has a wide experience on the operational side of bunkering with (and without) MFM and conducted many courses for C4 fuel B.V., IBIA and Ship.Energy on this topic.

The views and opinions in this article are based on her personal experience. Claudia's interest is to educate all stakeholders in the full fuel value chain on the impact of MFM implementation on their part of the supply chain and guide them in the adaptation of this new way of working.

Should any of the facts and statements be found not correct, the author is looking forward to hear about this and correct if needed.

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