

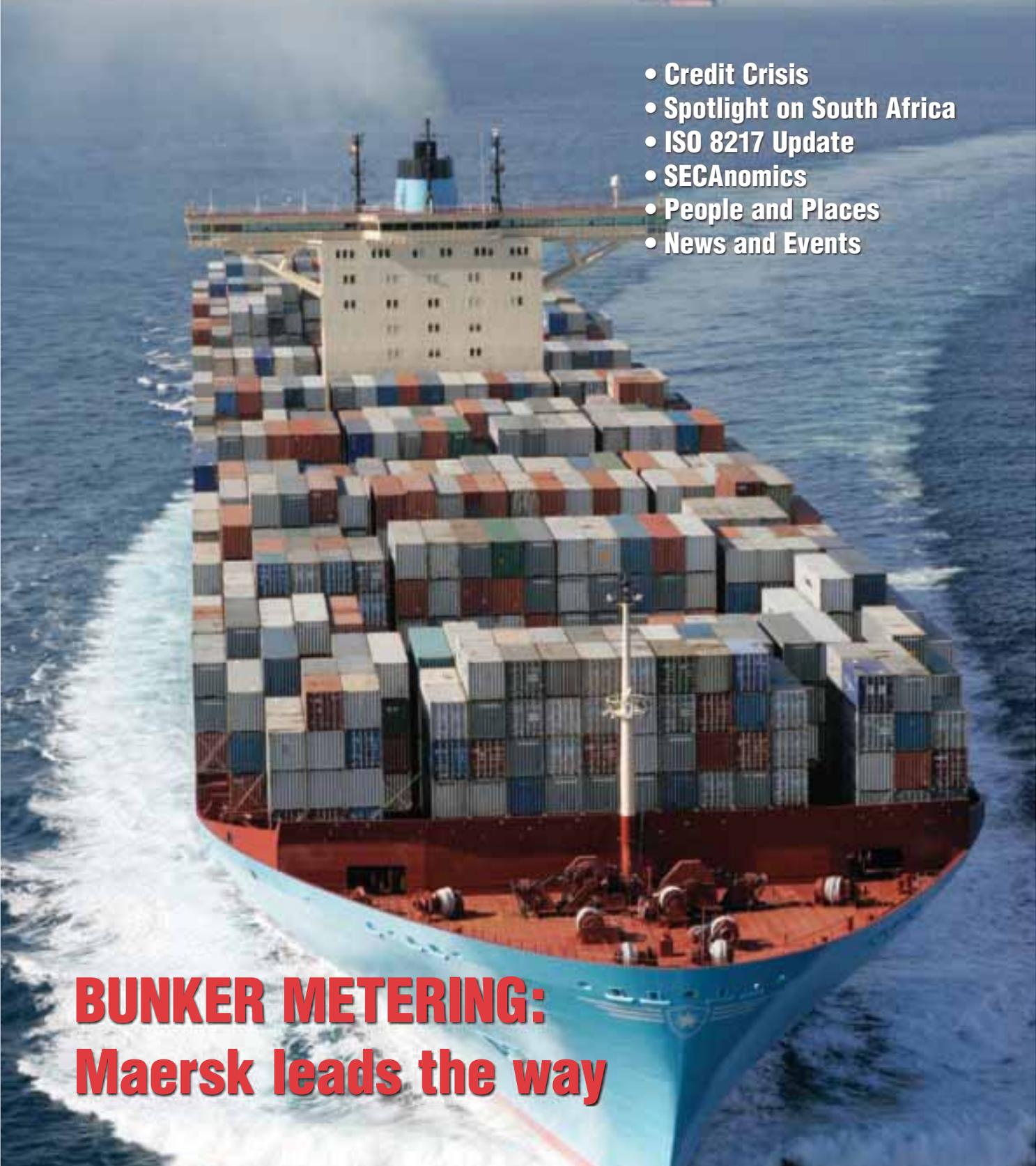
# BUNKERSPOT

INDEPENDENT INTELLIGENCE FOR THE GLOBAL BUNKER INDUSTRY

[www.bunkerspot.com](http://www.bunkerspot.com)

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**BUNKER METERING:  
Maersk leads the way**

# Critical mass

*Steve Jones explains why accurate measurement of delivered volumes is so important to the bunker industry and describes the testing and development of mass flow meters currently underway*



Steve Jones is the Business Development Director of Emerson Process Management, which helps businesses automate their production, processing and distribution in the chemical, oil and gas, refining, pulp and paper, power, water and wastewater treatment, metals and mining, food and beverage, pharmaceutical and other industries. A division of Emerson, Micro Motion, invented the first practical Coriolis flow meter in 1977, and is consistently rated as the world's leading Coriolis flow meter supplier. Emerson is based in St Louis, Missouri and listed on the New York Stock Exchange.

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**A**ccurate measurement of bunker delivery quantities poses many challenges that can reduce the accuracy of the final results obtained. Traditional fuel oil bunkering methods are based on volumetric measurements, calculations and errors that can – and do – lead to discrepancies between fuel supplier and user. Delivering measurement accuracy in the range of 1%-3%, and in some cases even as poor as 5%, represents significant losses and presents obvious areas for improvement. A more direct, mass-based measurement capable of handling the challenging application area of fuel oil bunkering would provide significant advantages to the industry as a whole.

Other benefits provided by accurate fuel oil measurement are tighter control and visibility to the amount of fuel consumed to assist with initiatives directed at improving fuel efficiency, and for these reasons Coriolis mass flow measurement poses an attractive solution to bunker measurement within the marine industry.

## The application

Metering heavy fuel oil (HFO) is not an easy application for flow measurement technologies. Flow meters must be able to handle the different bunker grades used, along with any impurities that have not been filtered out and varying degrees of entrained gas in the oil. This makes for a very challenging application, not to mention other environmental influences such as vibration, product solidifying and the need for low pressure drop.

For traditional bunkering measurement, look-up tables and a density measurement are used in conjunction with the 'dip' to calculate the total 'mass' of the bunker fuel delivered. Needless to say, there are many factors that contribute to errors in this calculation, such as the strike plate location, the dip tape, accuracy of tables, tank straps, and human error.

Coriolis flow measurement technology accurately measures the mass flow directly and eliminates the need for any mathematical conversions. Coriolis flow technology is clearly suited to HFO applications, particularly bunkering, where customer billing is based on mass.

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**'Coriolis flow measurement technology accurately measures the mass flow directly and eliminates the need for any mathematical conversions'**

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## Coriolis technology

The first practical Coriolis flow meter was introduced over 30 years ago by **Micro Motion**, now part of **Emerson Process Management**. Today, Micro Motion technology is used in various industries around the world with over 600,000 Coriolis meters installed.

The adoption of Coriolis flow meters is rapidly increasing as it offers solutions to many of the challenges faced in metering applications. Coriolis meters are non-intrusive, meaning that there are no moving parts or obstructions in contact with the fluid being measured. In addition to mass measurement, a single device provides an independent and very accurate density measurement of the fluid and a temperature measurement – three measurements from one device.

A known challenge to Coriolis meters is to accurately measure fluid with entrained gas or in two-phase flow conditions. Because entrained gas generates significant noise on the measurement signal, technical innovation has been required to overcome this common barrier. Based on years of experience and technical expertise, Emerson's Micro Motion technology has solved this dilemma through state-of-the-art digital signal processing algorithms to handle additional noise created by the entrained gas, and improved meter structure for stability and robustness in two-phase flow environments.

Micro Motion Coriolis measurement technology has been proven to tolerate portions of air in liquid and still deliver acceptable performance. This is critical for bunker delivery operations where tank stripping means that air will be entrained at certain times during the delivery.

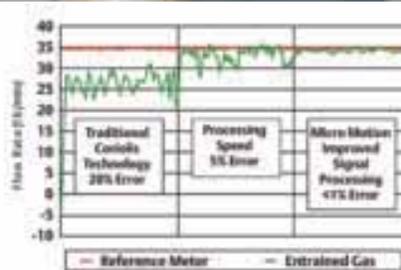
A unique feature of Micro Motion Coriolis flow meters that is valued in

Emerson Coriolis flow meter onboard Vitrol's barge, the *Antwerp*.

bunker applications is *in-situ* meter verification. Meter verification technology on Micro Motion meters measures the actual mechanical characteristics to a very high accuracy – in line and without removing the meter. When a change in the meter's tube performance is detected, the results determine whether measurement performance remains within the original factory specifications. This technique enables a quick and easy means to verify performance in-line, thereby negating the need to remove the meter for calibration unless otherwise demanded by local regulatory bodies.

### Experience

To address the growing demand to improve the accuracy of bunkering measurement, Emerson has been conducting bunker measurement mass flow meter trials. These trials have been conducted in association with **A.P.Moller-Maersk** (as the end-user of the fuel) as well as **ExxonMobil Marine Fuels** (as the seller of the fuel), and **Victrol N.V.** (as the transportation link of the fuel). Phase I of the ExxonMobil / Victrol trial has seen a Micro Motion ELITE CMFHC3 Coriolis meter installed



and operating on the Victrol barge in the Port of Antwerp, Belgium for six months during 2008.

The trial has shown favourable results and is now entering Phase II where Emerson and ExxonMobil will complete further testing of Coriolis meter performance and refine the actual operating procedures with a view to gaining custody transfer certification.

### Weights and measures

Custody transfer certification requirements lay out the accuracy requirements of any measurement system used in the billing of customers. The accuracy of the equipment and the measurement system design must be such that weights and measures can approve the performance of the system and validate

it for legal metrology.

### Maersk initiative

In addition to the project testing taking place with ExxonMobil, A.P.Moller-Maersk has undertaken its own, independent programme to validate Coriolis measurement technology in bunkering applications by installing the same Micro Motion Coriolis flow measurement solution on its own vessels (see page 37).

These projects reflect operators who have the same goal: to charge or be charged for the fuel oil they supply and to pay only for the fuel oil received. This goal can only be realised through superior accuracy of measurement, no matter the port of call, from an internationally recognised and certified metering solution.

### Conclusion

While Emerson continues to work with A.P.Moller-Maersk, ExxonMobil and others to provide international metrology certification of Coriolis measurement in fuel oil bunkering applications, initial test results illustrate the great potential this technology offers to the advantage of the marine industry as a whole.

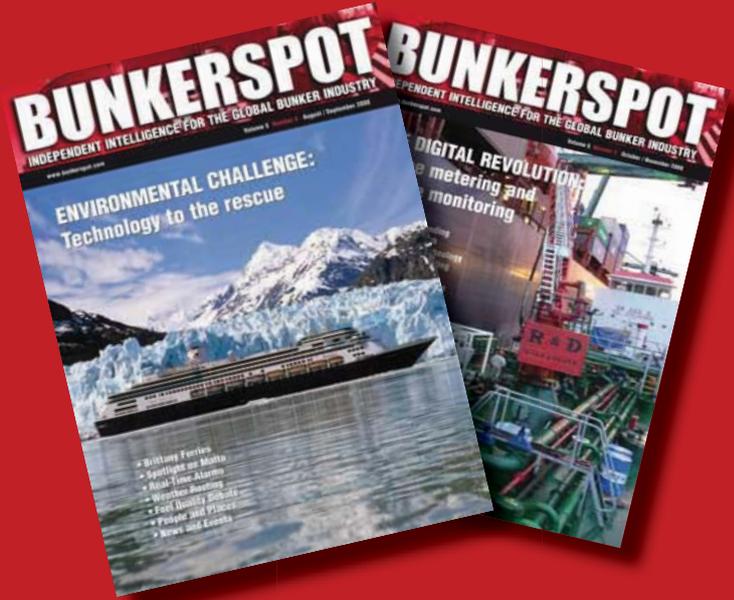
# BUNKERSPOT

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