



# Application Story



## Coriolis measurement and performance monitoring in real time

### NSB GROUP:

Worldwide, around 6 million containers are shipped by sea every day. As a leading provider of tramp tonnage in the container segment, the NSB Group has a substantial share of this market with its vessels. With capacities ranging between 1,000 and 11,000 TEU, NSB reaches a total dead-weight tonnage of more than 3.5 million tdw and an overall TEU capacity of approximately 325,000 TEU. Since 2011, the NSB Group has also managed tankers as well as offshore jack-up vessels.



### Top performance through "Made in Germany"

Thanks to the know-how of our nautical and technical superintendents, all with many years of experience on-board and ashore, the NSB Group leverages the German seafaring location. This way, customers can trust in the reliability, efficiency and innovative strength of "Made in Germany". It is also important for NSB to combine economic success and sustainability.

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### APPLICATION:

The NSB Group has developed tools for real-time data collection to improve the measurement of fuel consumption. This allows accurate evaluation of the information and transparency for the customer. For this, NSB uses the TRICOR Coriolis mass flow meter (TCM) from KEM Küppers.

In the past when fuel was relatively inexpensive, vessels were operating at full capacity and quickly on their way. The existing measurement methods for determining fuel consumption were sufficient. However, due to inaccuracies in the calculations, converting volumetric flow to mass flow, a proper fuel inventory management on the vessel was difficult. Moreover, the measuring instruments were designed to match the full capacities of Main (ME) and Auxiliary (AUX) engine.

Today the old systems have reached their limits. With slow steaming, fuel price fluctuations, increasing environmental and efficiency requirements, efficient ship management is no longer possible. At the same time, charterers and owners are demanding cost control and transparency.



## CHALLENGE:

The challenge for the NSB Group was to update the traditional measurement methods. These adaptations are necessary to remain competitive in the modern shipping market.

This is the reason why the NSB Group uses Coriolis metering to determine fuel consumption. The units are installed on the main engine and the auxiliary diesel engine. Regardless of temperature and density changes during operation, the meter outputs 99,9% accurate fuel consumption by means of direct mass flow metering. Additionally the fuels used on board range from very heavy and high-viscosity refinery residues (so-called heavy oil) through to distillate fuels. Coriolis metering is ideally set to measure all these liquids accurately.

## TECHNICAL SPECIFICATIONS:

	Main engine	Auxiliary engine
Examples of engines used on board	MAN 12 K 98 MC C with 68640 kW	MAN L27/38 with 2970 kW
Type Coriolis	TCM: Type 028K	TCM: Type TCM 3100
Measurement range	280 to 28,000 kg/h	24 to 1500 kg/h
Operating point	288 to 4200 kg/h	24 to 625 kg/h
Measurement medium	Heavy oil and distillate fuels	
Viscosity	12 to 300 cSt	
Density:	800 to 1,010 kg/m <sup>3</sup>	
Medium temperature	20 to 90 °C	
Operating pressure on the TCM	5 to 7 bar	
Display	Flow rate in mt/h and total mass in mt	
Interface	2 x analogue outputs RS 485 (Modbus RTU)	2 x analogue outputs RS 485 (Modbus RTU)

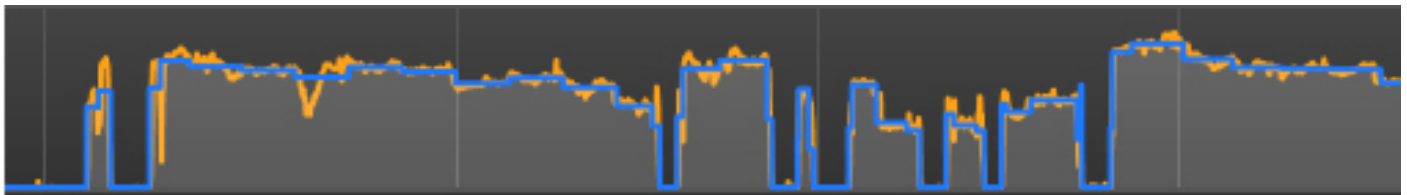




## SOLUTION:

After extensive research of what is available on the market, NSB has selected the TRICOR Coriolis mass flow meter. The high flexibility of the system output to match the performance data module and the easy commissioning were additional criteria. NSB also paid particular attention to the reliability of the system.

To improve the accuracy of the fuel measurement, volumetric measuring instruments are gradually replaced by modern mass flow meters based on the Coriolis principle. These meters allow a direct mass balance of consumption and can provide sustainably assessable data through high accuracy and reproducibility. This provides NSB with an above average ability to meet the transparency requirements to the cost structure of the vessels combined with the accuracy of the fuel billing. When challenges arise in the implementation process, the NSB Group can always fall back on the active and rapid support of KEM Küppers.



*Fuel consumption reports (blue) in direct comparison with automatic data collection (orange)*

All vessel relevant operating data are communicated via MODBUS to the performance monitor co-developed by NSB. This modular system consists of a “reporting module” and a “performance module”. The core of the system on-board is a small server unit with the program, reporting module and database. The server is integrated in the ship’s computer network. The transmitted data is stored in the ship’s database, whose content is automatically transmitted ashore several times a day. So the shipping company always receives the information “live”.

Importantly, the “performance module” automatically collects all the relevant operating data using data collectors that are installed on the bridge and in the engine control room. The collected data is stored in the ship’s database. This way, for example, all fuel consumption, engine performance data and speeds are measured “online” and transmitted with the regular data transfers. The modular design of the measuring system allows continuous expansion to adapt to increasing demand and needs.

This globally distributed system by NSB Marine Solutions digitally prepares the collected data in such a way that it provides the Management at NSB as well as the charterers, ship owners and other users with valid performance indicators that serve as a basis for further optimization of the ship operation. The TRICOR Coriolis flow meter and the performance monitoring system form a comprehensive management solution.

## CUSTOMER ADVANTAGE:

- Highly accurate fuel billing
- Ship consumption using online performance monitoring
- Realistic and accurate performance – evaluations of ships
- High transparency in the cost structure
- Simplification of fuel billing by avoiding error-prone conversions
- Cost-efficient and modern technology

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