Enhancing Vessel Performance through advanced Measurement Technologies

CleanTech for Shipbuilding & Shipping I
Maritime Technologies – Made in Germany

Tuesday, 14. Oct. 2025; Piraeus Chamber of Commerce & Industry

MITTELSTAND GLOBAL
MARKTERSCHLIESSUNGS-PROGRAMM FÜR KMU

KEM Flow Measurement

150 Employees

in Germany and China
(August 2023)

Over 60 years in business

Since its founding in **1965**, **KEM** is a innovative industry partner.

Part of TASI

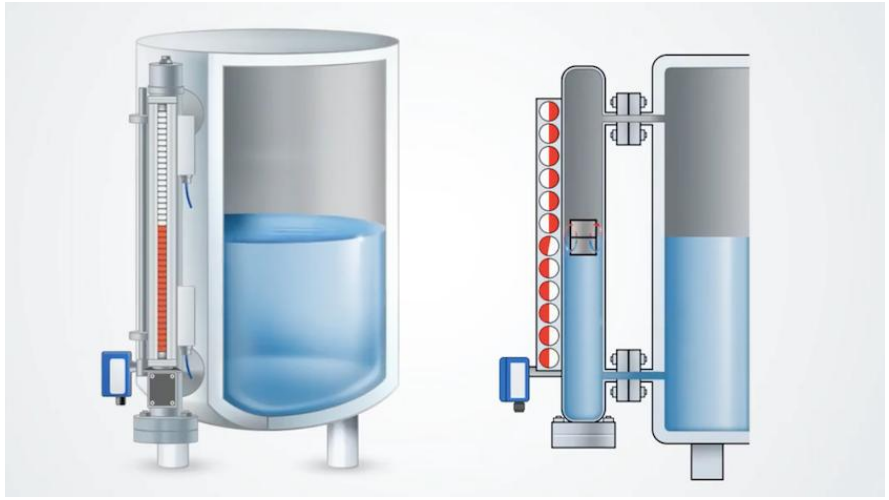
2005 **KEM** became part of the globally active TASI Measurement.

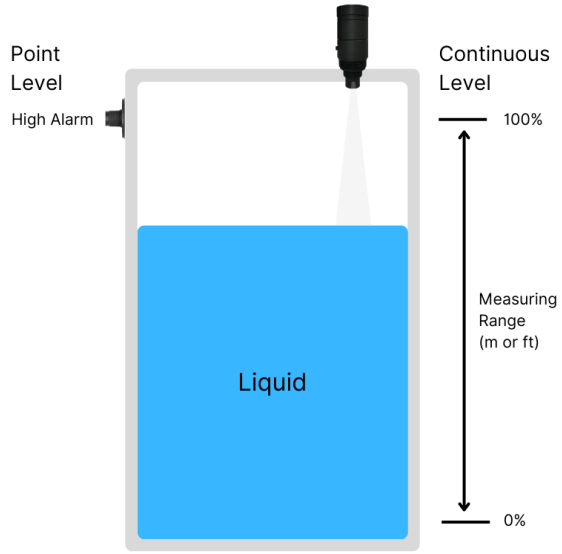
What are reasons to invest in advanced Fuel Consumption measurement?

- IMO / MRV Regulations / Reporting
- CO_2 Tax
- Fuel is the biggest operational cost of a vessel – looking for Fuel savings.

Methods to determine Fuel Consumption

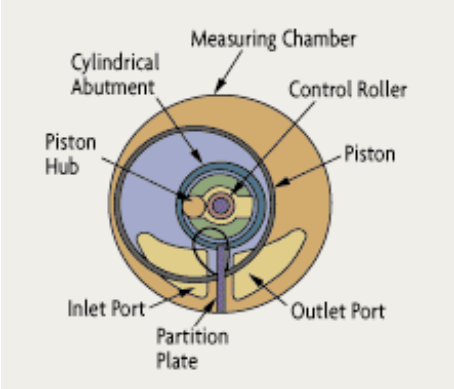
- Bunker Tank monitoring (Tank sounding / gauging)
- Bunker delivery Notes (BND) combined with tank records / inventory
- Indirect calculation (Engine Consumption calculation)
- Direct CO_2 / emission measurement
- Fuel flow meters (direct measurement)

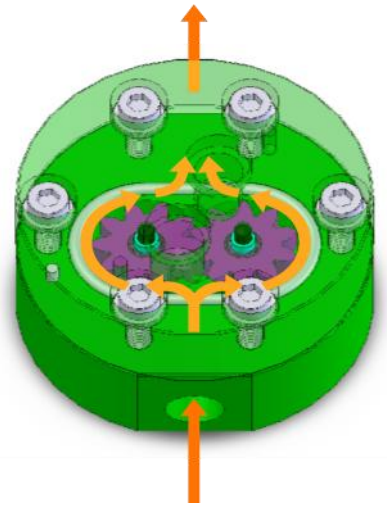


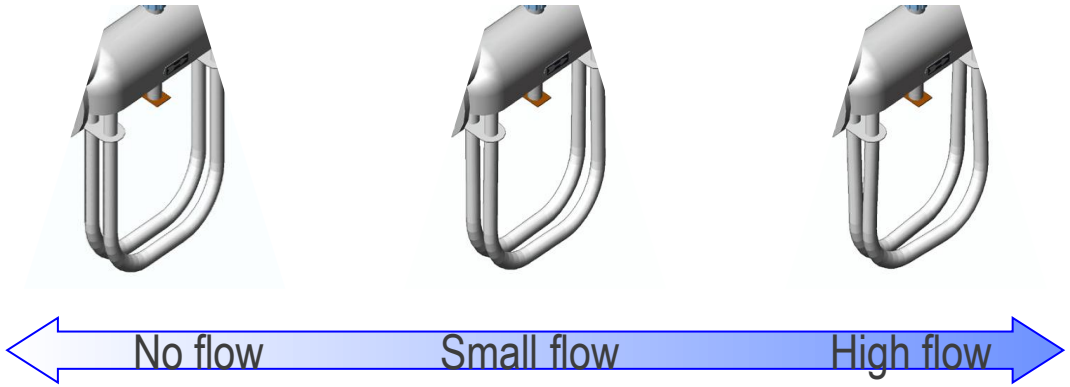


Fuel Oil Consumption measurement with flow meters

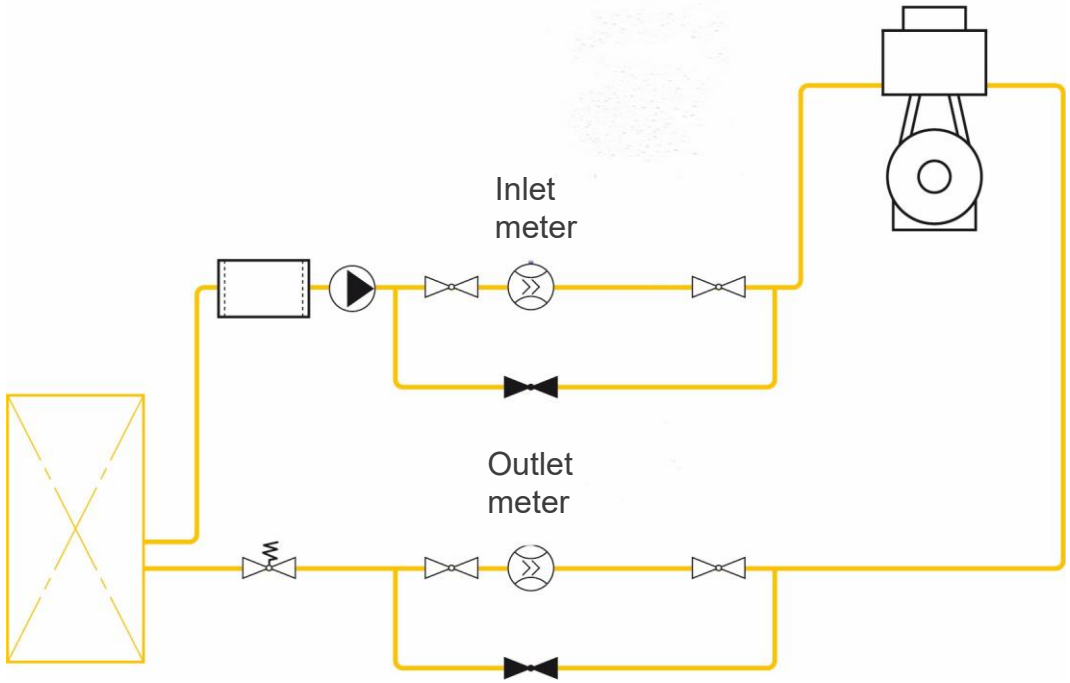
Mechanical flow meter (volumetric)	Mass flow meter (Coriolis Type)
Has been standard for FO Consumption measurmement for decades	First test on a fleet around 15 years back
Direct measurement of volume flow	Direct measurement of mass & density
Moving parts inside	No moving parts, open tupe
Abrasion on moving parts does lead to unaccuracy	Pipe vibration frequency shall not meet tupe vibration from flow meter, it would disturb measurement result.







Fuel Circulation for M/E or D/G



	flow rate	accuracy flow meter	
Inlet	6000 kg/h x	0,10% =>	6 kg/h
Outlet	4000 kg/h x	0,10% =>	4 kg/h
			10 kg/h total failure (abs.)
Consumption	2000 kg/h /		
total failure	10 kg/h =>	**0,5%** total failure (rel.)	

	flow rate	accuracy flow meter	
Inlet	6000 kg/h x	1,00% =>	60 kg/h
Outlet	4000 kg/h x	1,00% =>	40 kg/h
			100 kg/h total failure (abs.)
Consumption	2000 kg/h /		
total failure	100 kg/h =>	**5,0%** total failure (rel.)	

	flow rate	accuracy flow meter	
Inlet	4000 kg/h x	0,10% =>	4 kg/h
Outlet	3800 kg/h x	0,10% =>	3,8 kg/h
			7,8 kg/h total failure (abs.)
Consumption	200 kg/h /		
total failure	7,8 kg/h =>	**3,9%** total failure (rel.)	

Notwendigkeit

Mit der Einführung des ECO können nicht alle Funktionalitäten abgekündigter und noch bestehenden Alt-Elektroniken abgebildet werden.

ECO-Serie	Alt-Elektroniken
Kein 2-Leiter NAMUR	**2-Leiter NAMUR** - einfache EX-Anbindung möglich - Einfache Anbindung an ext. Anzeigegeräte
Lange Reaktionszeit im Schußbetrieb - Keine Ventilsteuerung im Schußbetrieb möglich	**Kurze Reaktionszeit im Schußbetrieb** - Wachsapplikationen mit extrem kurzen Ventilöffnungszeiten - Lackieranlagen mit kleinsten Ausbringmengen
Kein ECO für ZHM CT-Serie	**VTE04 und VTE-CT** - Kompakte Bauform für kleinsten Bauraum - Gewichtsoptimierte, kompakte Messzellen für Roboterarm
Temperaturbeständigkeit elektr. Bauteile + 85°C +X°C	**Temperaturbeständigkeit elektr. Bauteile 120°C** - Integrierte Elektroniken mit hoher Mediumstemperatur