

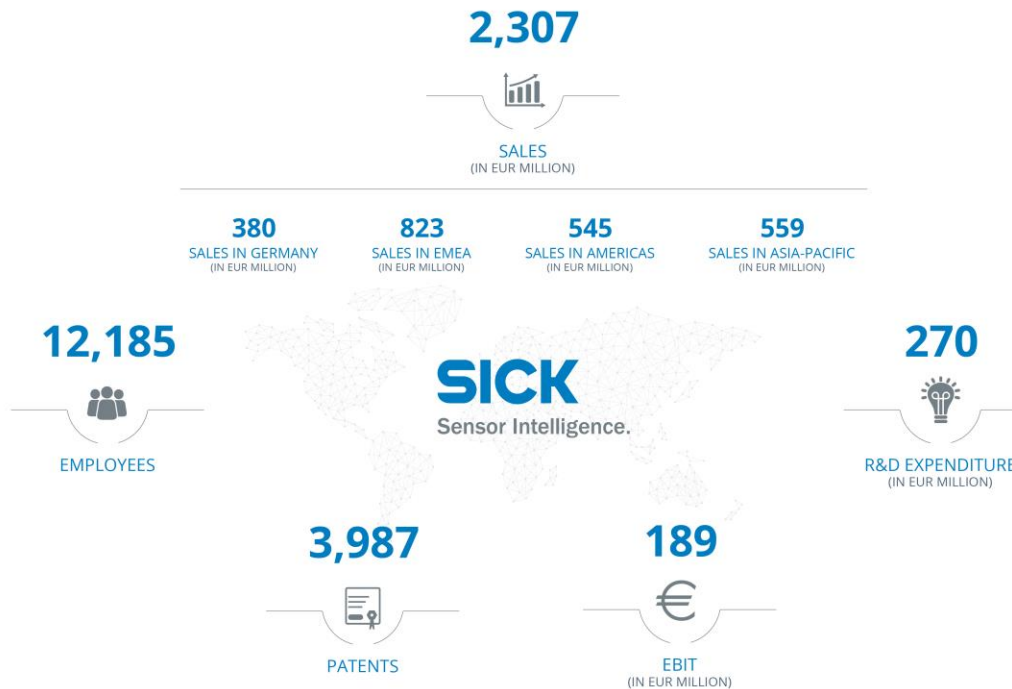


GHG measurement solutions for the maritime industry

Christian Lohner / Heikki Kangas / Hinrich Brumm

SICK at a glance

Key figures (fiscal year 2023)



WE ARE ONE OF THE WORLD'S LEADING COMPANIES

WE DEVELOP SENSOR SOLUTIONS FOR CUSTOMERS AROUND THE GLOBE





DECARBONIZATION



DIGITALIZATION

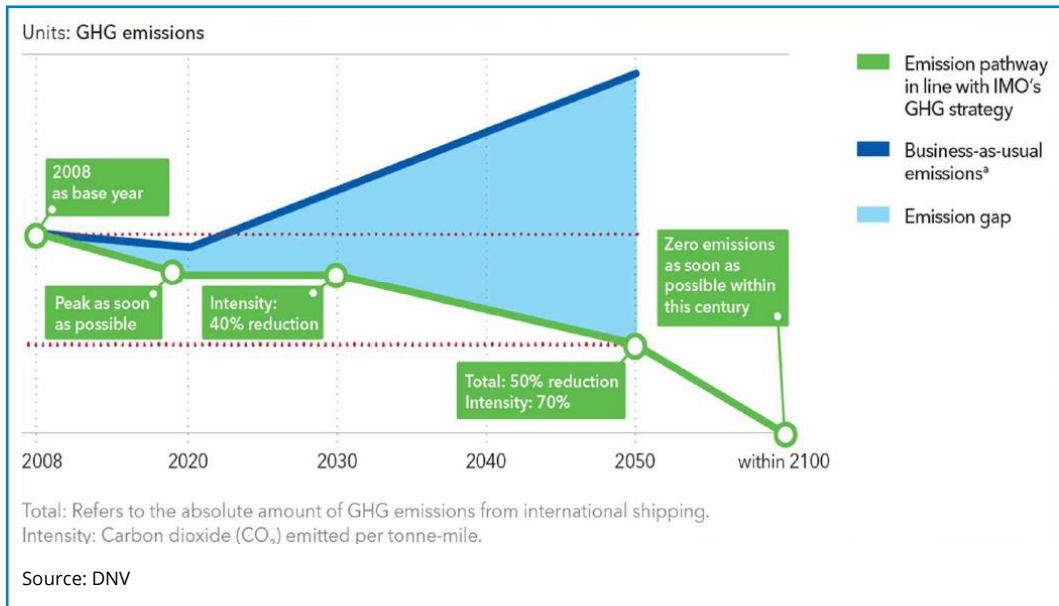


GHG Emissions become more transparent

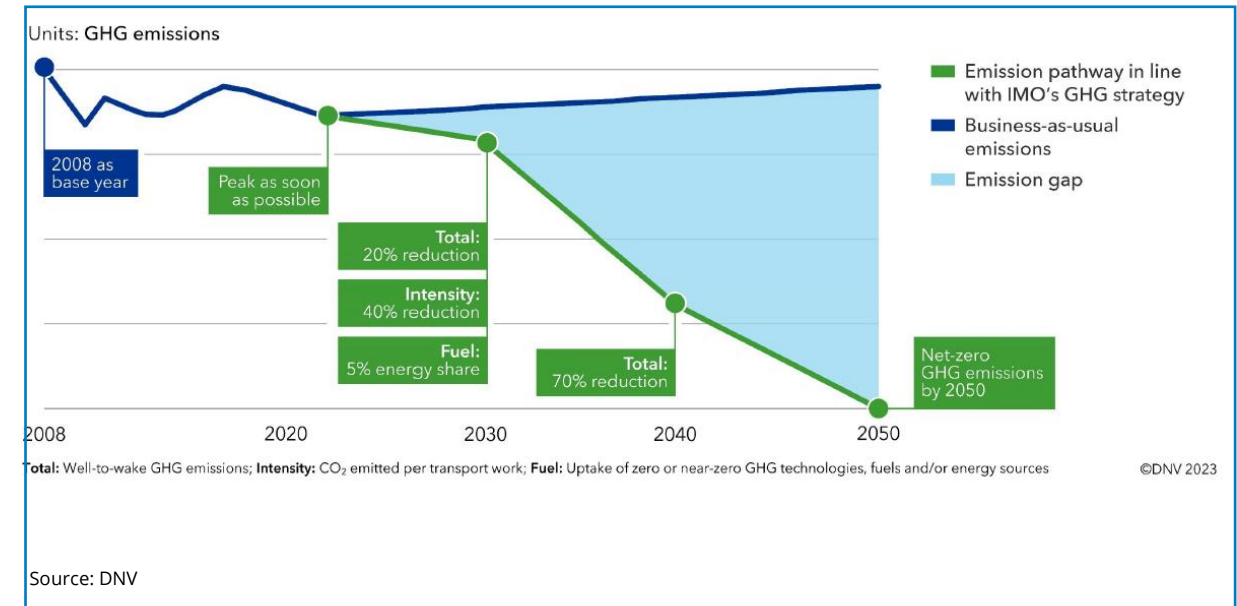
IMO Decarbonization Plan

Net Zero GHG Emission in 2050 compared to 2008

MEPC72 – April 2018 -INITIAL IMO STRATEGY ON REDUCTION OF GHG EMISSIONS FROM SHIPS



MEPC80 – July 2023 - The revised Strategy on Reduction of GHG Emissions from Ships



Emissions Transparency Becoming More Relevant

Source: <https://www.imo.org/en/2023/01/12/imo-data-collection-system-dcs/>

Source: <https://www.climate.ec.europa.eu/>

Source: <https://www.poseidonprinciples.org/>

Source: <https://www.seacargocharter.org/>

Source: <https://ogmpartnership.com/a-solution-to-the-methane-challenge/>

Challenges of GHG Reporting

Decarbonization/GHG Reporting relevant for the whole lifetime of the vessel

- › Starting from financing
- › Operation
- › SEEMP
- › Charter owner
- › Own motivation and generation responsibility
- › Sustainability commitment



Different reporting schemes require different data

- › Manual effort
- › Tamper proof



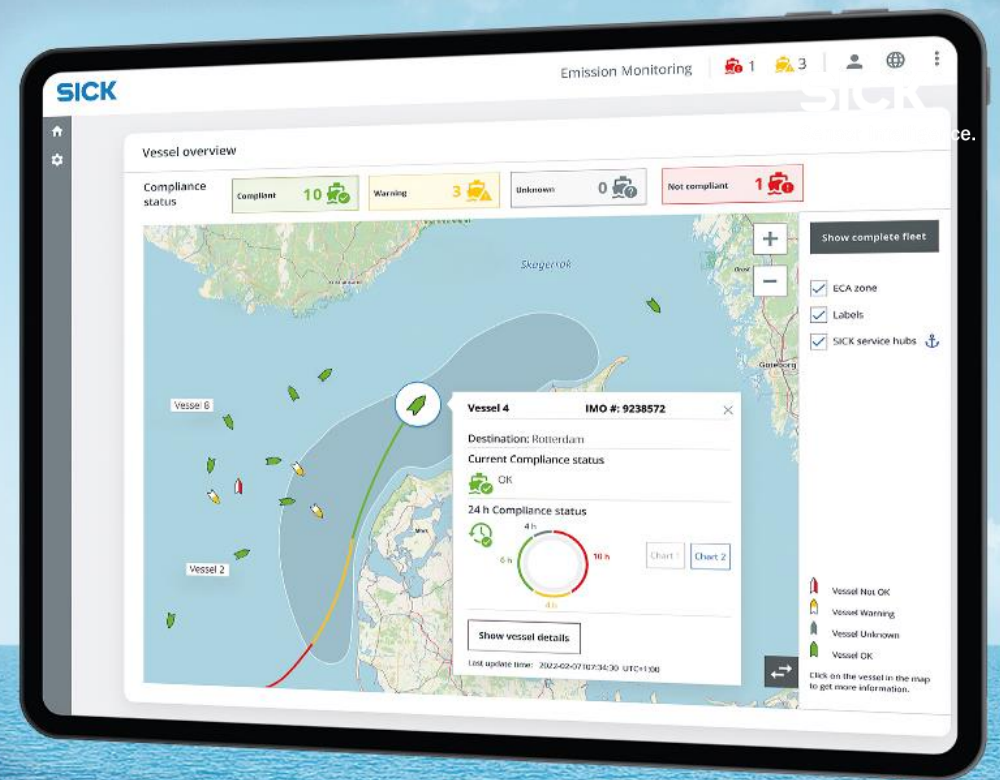
Models are mainly based on fuel consumption

- › Based on historical data (EIAPP)
- › Conservative correction factors



Why not measuring and reporting
GHG direct...?!
Real-time measurement is state of
the art for land-based applications.





SICK Maritime Solutions

Monitor adherence to emission limit values in real time

SICK MARITIME OFFERING

Benefit from the experience of a leading manufacturer in maritime emission monitoring

Installed Fleet



Global Service Network



- Running fleet of more than 2,300 vessels with MARSIC
- Type Approved solution
- Leading market position for Maritime Emission Monitoring
- New alternative fuels like ammonia or methanol will have new requirements
→ SICK can be a partner for this journey

SICK Maritime Suite Digital Solution



- Training
- Spare parts and modules
- Module exchange
- Trained service technician
- Global service port infrastructure

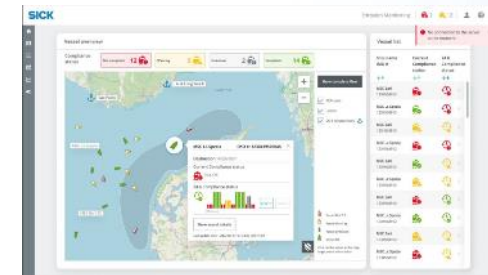
SICK MARITIME SUITE

Emission compliance assurance

MARdiagnostics
Condition Monitoring for increased CEMS availability



Asset Management
All details always @ hands

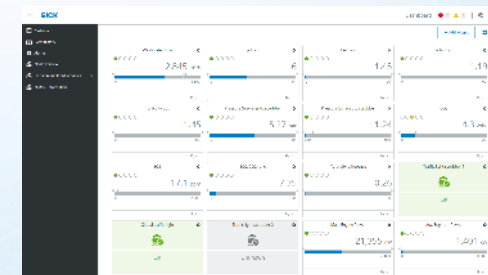


MARtracker
Transparency of emission data

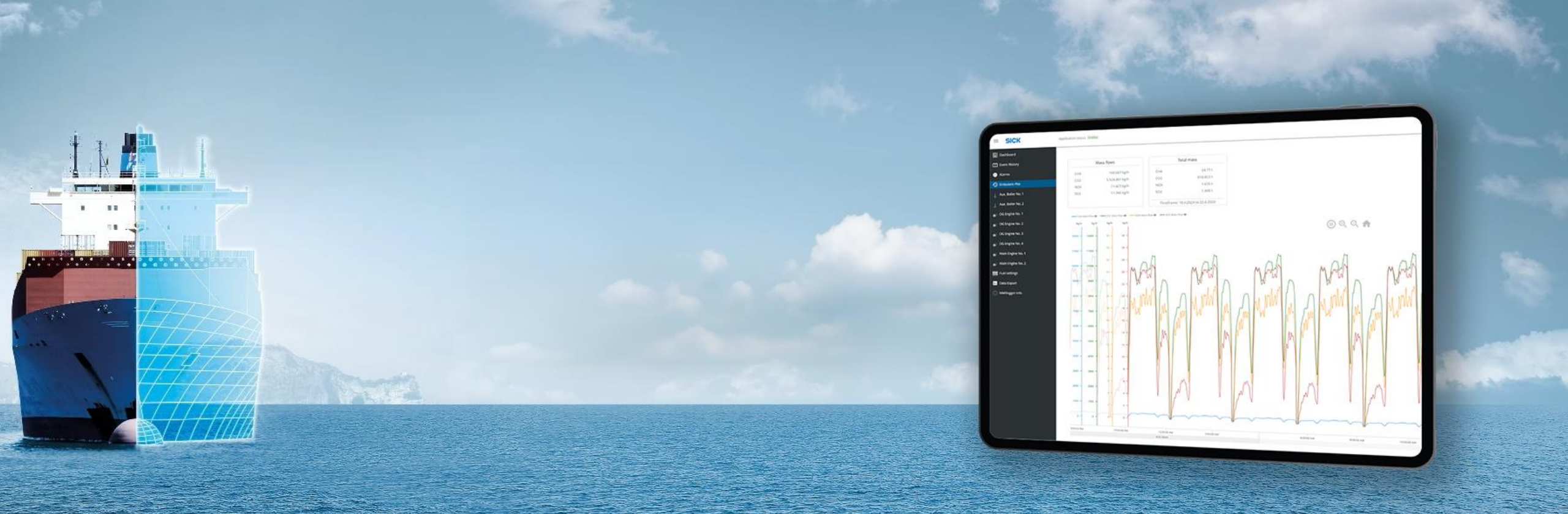
MARlogger
On premises GHG emission monitoring



New optional services
Based on "SICK Maritime Suite"



MARpems
Increased Scrubber availability and Emission Compliance

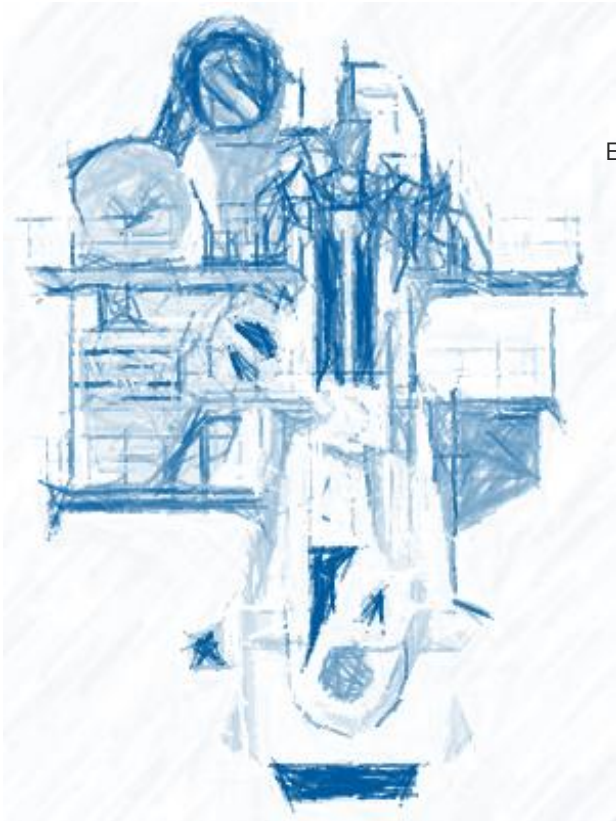


MARlogger

Data acquisition and handling system for transparency of real emission

Real time GHG measuring

Carbon Balance Method acc. to MARPOL Annex VI



Exhaust Gas Analyzer

Gaseous Emissions

- NO_x
- CO
- CO₂
- O₂

Vppm / Vol-%

- Needs additional sensors
- Needs access to engine data
- Needs intensive calibration
- Manual input of S,C,H,O,N of fuel

Engine Performance

- Power
- Speed
- Fuel Oil Consumption
-

Engine Data

Ambient Conditions

- t_{Ain}
- h_{Ain}
- p_{Ain}

Device for h_{Ain}, p_{Ain}, t_{Ain}

Fuel Information

- S,C,H,O,N Analysis.
- Heat-Value HFO
- ...

Bunker Delivery Note

Manual Input

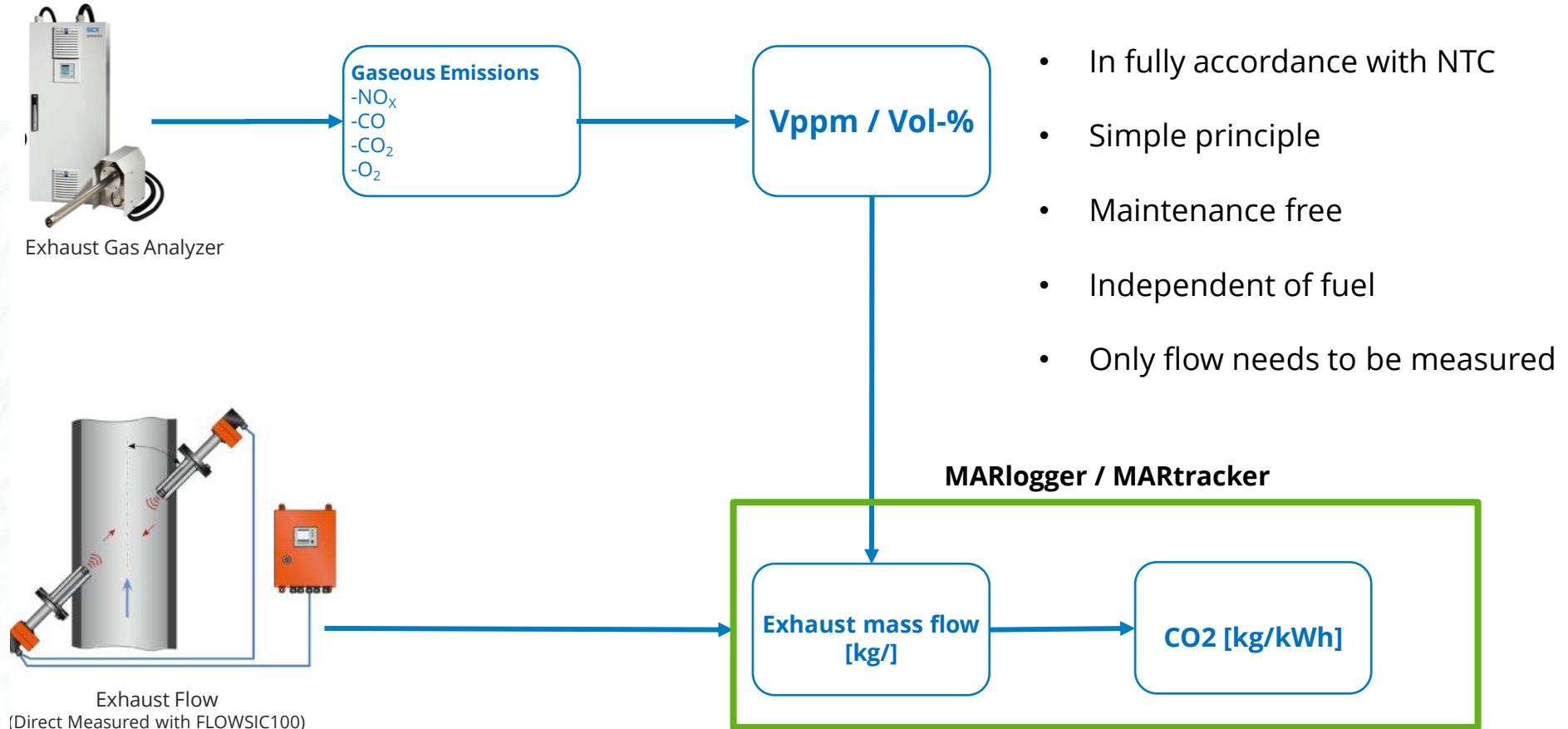
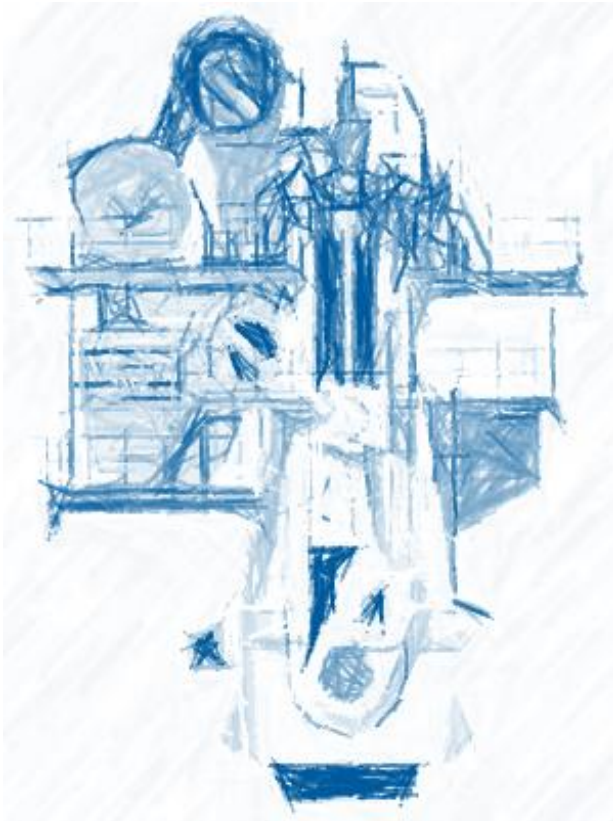
MARlogger

Exhaust mass flow
[kg/]

CO₂ [kg/kWh]

Real time GHG measuring

Direct Measuring Method acc. to MARPOL Annex VI



Real time GHG measuring and cloud-based reporting

Practical Impression of CO₂ Monitoring and reporting



MARlogger

Dashboard

Application status Online
Dashboard ! 0 ! 0 ! 0 |

Last measurement: 4/15/2024, 10:21 AM + Add widget

Vessel

Totals		Sums	
Total SO2 kg/h	24.393 kg/h	Sum SO2 mass	0.974 t
Total CO2 kg/h	9,675.028 kg/h	Sum CO2 mass	543.4 t
Total CH4 kg/h	293.073 kg/h	Sum CH4 mass	16.468 t
Total NOx kg/h	19.14 kg/h	Sum NOx mass	1.086 t

Emitter

Main Engine 1 STDB		Main Engine 1 STDB		Main Engine 1 STDB	
Power No.1 Main Engine (STDB)	5,100 kW	CO2 kg/h No.1 Main Engine	2,951.356 kg/h	CO2 g/kWh No.1 ME	578.697
FOC No.1 Main Engine (STDB)	940 kg/h	CH4 kg/h No.1 Main Engine	87.976 kg/h	CH4 g/kWh No.1 ME	17.25
Operating Mode No.1 Main Engine (STDB)	0	SO2 kg/h No.1 Main Engine	9.769 kg/h	SO2 g/kWh No.1 ME	1.916
		NOx kg/h No.1 Main Engine	5.644 kg/h	NOx g/kWh No.1 ME	1.107

Main Engine 2 PORT		Main Engine 2 PORT		Main Engine 2 PORT	
Power No.2 Main Engine (PORT)	5,100 kW	CO2 kg/h No.2 Main Engine	2,951.356 kg/h	CO2 g/kWh No.2 Main Engine	578.697
FOC No.2 Main Engine (PORT)	940 kg/h	CH4 kg/h No.2 Main Engine	87.976 kg/h	CH4 g/kWh No.2 Main Engine	17.25
Operating Mode No.2 Main Engine (PORT)	0	SO2 kg/h No.2 Main Engine	9.769 kg/h	SO2 g/kWh No.2 Main Engine	1.916
		NOx kg/h No.2 Main Engine	5.644 kg/h	NOx g/kWh No.2 Main Engine	1.107

DG Engine 1		DG Engine 1		DG Engine 1	
Power DG engine No.1	3,600 kW	CO2 kg/h DG engine No.1	1,393.931 kg/h	CO2 g/kWh DG engine No.1	387.203



MARlogger

Data export - Total mass report



Application status: Online

- Dashboard
- Event History
- Alarms
- Emissions Plot
- Aux. Boiler No. 1
- Aux. Boiler No. 2
- DG Engine No. 1
- DG Engine No. 2
- DG Engine No. 3
- DG Engine No. 4
- Main Engine No. 1
- Main Engine No. 2
- Fuel settings
- Data Export
- MARlogger Info

Generate report ✕

Type
Settings

Name

EventsReport_2024-04-12T14:52:23.11Z

EventsReport_2024-04-12T14:53:01.30Z

Back
Finish

1	A	B	C	D	E	F	G	H	I
	Data Set Time	Relative Humidity (%) RH	Temperature (°C) TS	Barometric Pressure (hPa) pb	Load DG engine No.1 8H35DF (%) PHL	Operating Mode DG engine No.1 8H35DF (I OMI)	Load DG engine No.2 6H35DF (%) PHL		
2	14.04.2024 00:00	63	225	1025	6.51042E+15	2	9.20138E+1		
3	14.04.2024 00:00	63	225	1025	6.51042E+15	2	9.20138E+1		
4	14.04.2024 00:00	63	225	1025	6.51042E+15	2	9.20138E+1		
5	14.04.2024 00:00	63	225	1025	6.51042E+15	2	9.20138E+1		
6	14.04.2024 00:00	63	225	1025	6.51042E+15	2	9.20138E+1		
7	14.04.2024 00:00	63	225	1025	6.51042E+15	2	9.20138E+1		
8	14.04.2024 00:00	63	225	1025	6.51042E+15	2	9.20138E+1		
9	14.04.2024 00:00	63	225	1025	6.51042E+15	2	9.20138E+1		
10	14.04.2024 00:00	63	225	1025	6.51042E+15	2	9.20138E+1		
11	14.04.2024 00:00	63	225	1025	6.51042E+15	2	9.20138E+1		
12	14.04.2024 00:00	63	225	1025	6.51042E+15	2	9.20138E+1		
13	14.04.2024 00:00	63	225	1025	6.51042E+15	2	9.20138E+1		
14	14.04.2024 00:01	63	225	1025	6.51042E+15	2	9.20138E+1		
15	14.04.2024 00:01	63	225	1025	6.51042E+15	2	9.02778E+1		
16	14.04.2024 00:01	63	225	1025	6.51042E+15	2	9.02778E+1		
17	14.04.2024 00:01	63	225	1025	6.51042E+15	2	9.02778E+1		
18	14.04.2024 00:01	63	225	1025	6.51042E+15	2	9.02778E+1		
19	14.04.2024 00:01	63	225	1025	6.51042E+15	2	9.02778E+1		
20	14.04.2024 00:01	63	225	1025	6.51042E+15	2	9.02778E+1		
21	14.04.2024 00:01	63	225	1025	6.51042E+15	2	9.02778E+1		
22	14.04.2024 00:01	63	225	1025	6.51042E+15	2	9.02778E+1		
23	14.04.2024 00:01	63	225	1025	6.51042E+15	2	9.02778E+1		
24	14.04.2024 00:01	63	225	1025	6.51042E+15	2	9.02778E+1		
25	14.04.2024 00:01	63	225	1025	6.51042E+15	2	9.02778E+1		
26	14.04.2024 00:02	63	225	1025	6.51042E+15	2	9.02778E+1		
27	14.04.2024 00:02	63	225	1025	6.51042E+15	2	9.02778E+1		
28	14.04.2024 00:02	63	225	1025	6.51042E+15	2	9.02778E+1		
29	14.04.2024 00:02	63	225	1025	6.51042E+15	2	9.02778E+1		
30	14.04.2024 00:02	63	225	1025	6.51042E+15	2	9.02778E+1		
31	14.04.2024 00:02	63	225	1025	6.51042E+15	2	8.85417E+1		
32	14.04.2024 00:02	63	225	1025	6.51042E+15	2	8.85417E+1		
33	14.04.2024 00:02	63	225	1025	6.51042E+15	2	8.85417E+1		
34	14.04.2024 00:02	63	225	1025	6.51042E+15	2	8.85417E+1		
35	14.04.2024 00:02	63	225	1025	6.51042E+15	2	8.85417E+1		
36	14.04.2024 00:02	63	225	1025	6.51042E+15	2	8.85417E+1		
37	14.04.2024 00:02	63	225	1025	6.51042E+15	2	8.85417E+1		
38	14.04.2024 00:03	63	225	1025	6.51042E+15	2	8.85417E+1		
39	14.04.2024 00:03	63	225	1025	6.51042E+15	2	8.85417E+1		
40	14.04.2024 00:03	63	225	1025	6.51042E+15	2	8.85417E+1		
41	14.04.2024 00:03	63	225	1025	6.51042E+15	2	8.85417E+1		
42	14.04.2024 00:03	63	225	1025	6.51042E+15	2	8.85417E+1		
43	14.04.2024 00:03	63	225	1025	6.51042E+15	2	8.85417E+1		
44	14.04.2024 00:03	63	225	1025	6.51042E+15	2	8.85417E+1		
45	14.04.2024 00:03	63	225	1025	6.51042E+15	2	8.85417E+1		
46	14.04.2024 00:03	63	225	1025	6.51042E+15	2	8.85417E+1		
47	14.04.2024 00:03	63	225	1025	6.51042E+15	2	8.68056E+1		
48	14.04.2024 00:03	63	225	1025	6.51042E+15	2	8.68056E+1		
49	14.04.2024 00:03	63	225	1025	6.51042E+15	2	8.68056E+1		
50	14.04.2024 00:04	63	225	1025	6.51042E+15	2	8.68056E+1		
51	14.04.2024 00:04	63	225	1025	6.51042E+15	2	8.68056E+1		
52	14.04.2024 00:04	63	225	1025	6.51042E+15	2	8.68056E+1		
53	14.04.2024 00:04	63	225	1025	6.51042E+15	2	8.68056E+1		
54	14.04.2024 00:04	63	225	1025	6.51042E+15	2	8.68056E+1		
55	14.04.2024 00:04	63	225	1025	6.51042E+15	2	8.68056E+1		
56	14.04.2024 00:04	63	225	1025	6.51042E+15	2	8.68056E+1		
57	14.04.2024 00:04	63	225	1025	6.51042E+15	2	8.68056E+1		
58	14.04.2024 00:04	63	225	1025	6.51042E+15	2	8.68056E+1		

1	A	B	C	D	E	F	G	H
	Interval Start	Interval End	Vessel Total CO2 mass (kg)	Vessel Total NOX mass (kg)	Vessel Total SO2 mass (kg)	Vessel Total CH4 mass (kg)	Aux. Boiler No. 1 Total CO2 mass (kg)	Aux. Boiler No. 1 Total NOX mass (kg)
2	12.04.2024 13:54	15.04.2024 15:18	583,028,369	1,164,998	1,044,382	17,870,946	13,329,681	23291
3								
4								
5								
6								
7								
8								
9								
10								

Items per page: 5 1 of 1



Summary

Summary

SICK can offer the complete package

- › Product
 - Knowledge of Maritime application
 - Leading supplier of Maritime gas analyzer
 - Competence in flow measurement
- › Global Service Structure
- › Digital Services



Customer benefits

- › Transparency regarding real GHG emissions
- › Reduction of manual effort
- › Preparation for possible future requirements



Save the date: Next maritime webinar will be on Oct. 10th, 2024



Thank you for your attention!

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Head of Sales & Lead Account Manager,
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Christian Lohner
Product Manager Maritime

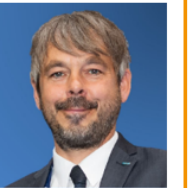


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