

Gas analysers and sensors: just how closely can emissions be analysed and monitored

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Premier partner



Supporting association



Panellist documents

Page 2: Ben Goossens, ABB

Page 9: Anders Skibdal, PureteQ

Page 12: Leif Nydal Abilgaard, Norsk Analyse

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Part of
Marine Propulsion
Webinar Week

6-9 April 2021

**marine
propulsion**
& auxiliary machinery



MARINE PROPULSION WEBINAR WEEK, 7TH OF APRIL 2021

CEMcaptain

Gas analyzers and sensors : just how closely can emissions be analyzed and monitored?

Ben Goossens, Product Line Continuous Gas Analyzers

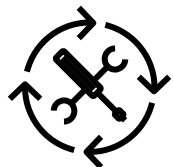


YES, we know how to measure.

CEMcaptain solution



Holistic approach to system integration



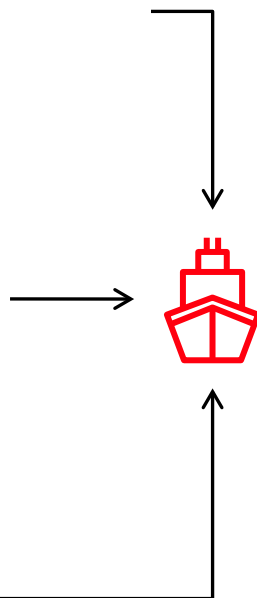
Practical experience

Transfer of engineering knowledge



Field-testing

Product certification



**ONE ABB CEMS
for marine industry**

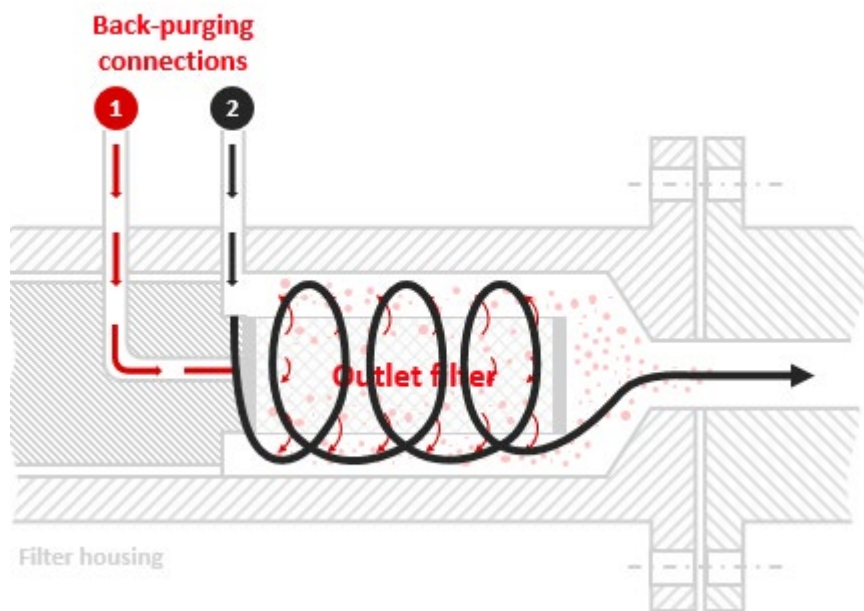
- Robust & reliable
- Digitally enabled
- Complete & compliant

YES, we can filter.

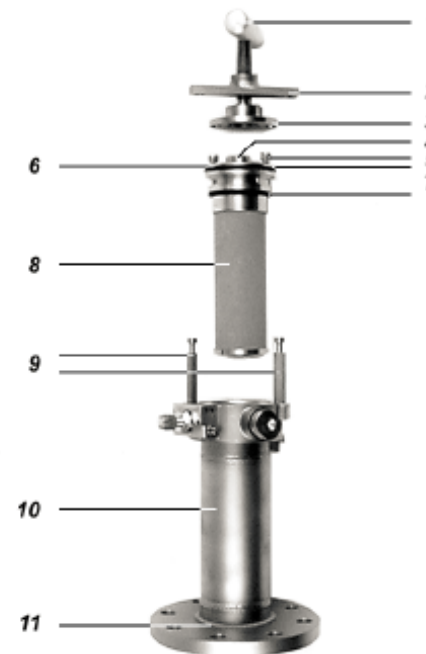
Options for automatic back-purging filter

2-stage back-purging

Automatic cleaning of the probe from in and outside

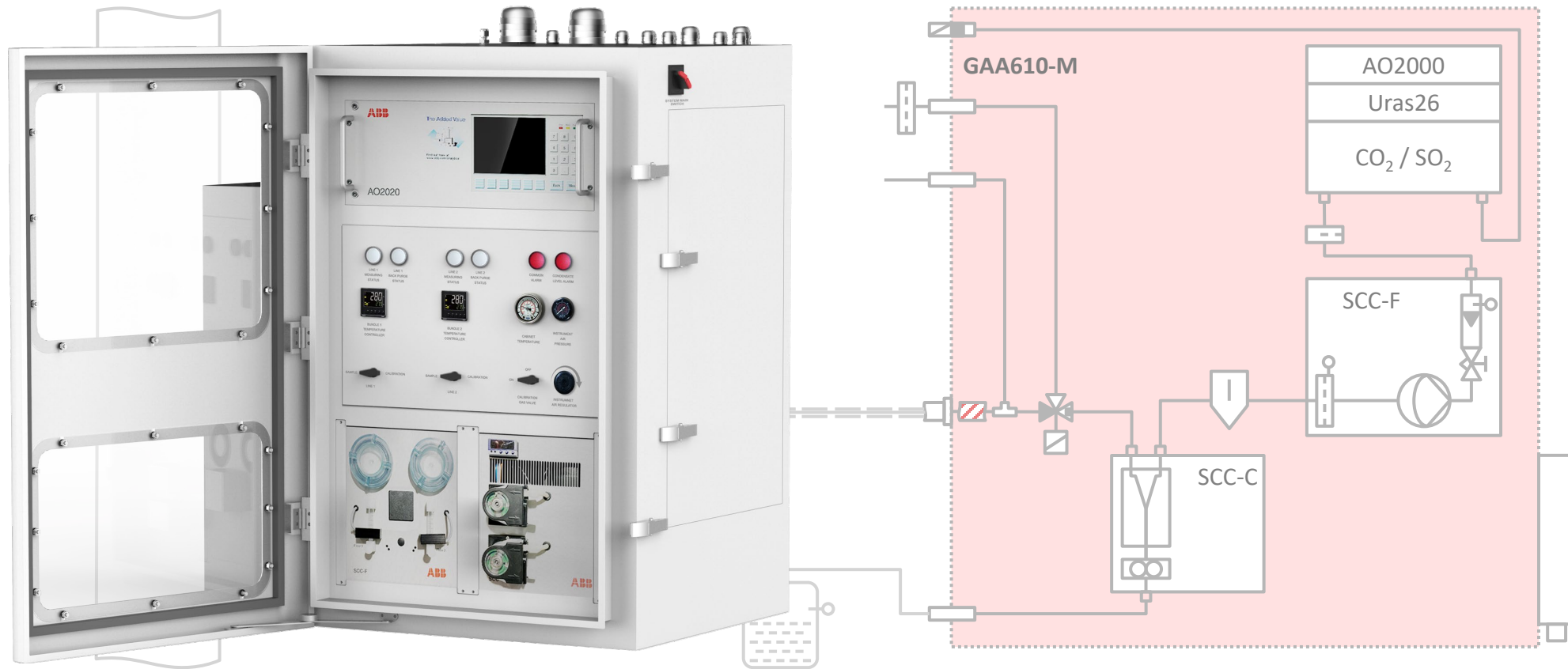


Easy exchange of filter



YES, we can cool.

Compressor sample gas cooler SCC-C for a stable dewpoint and evacuation of the condensate.

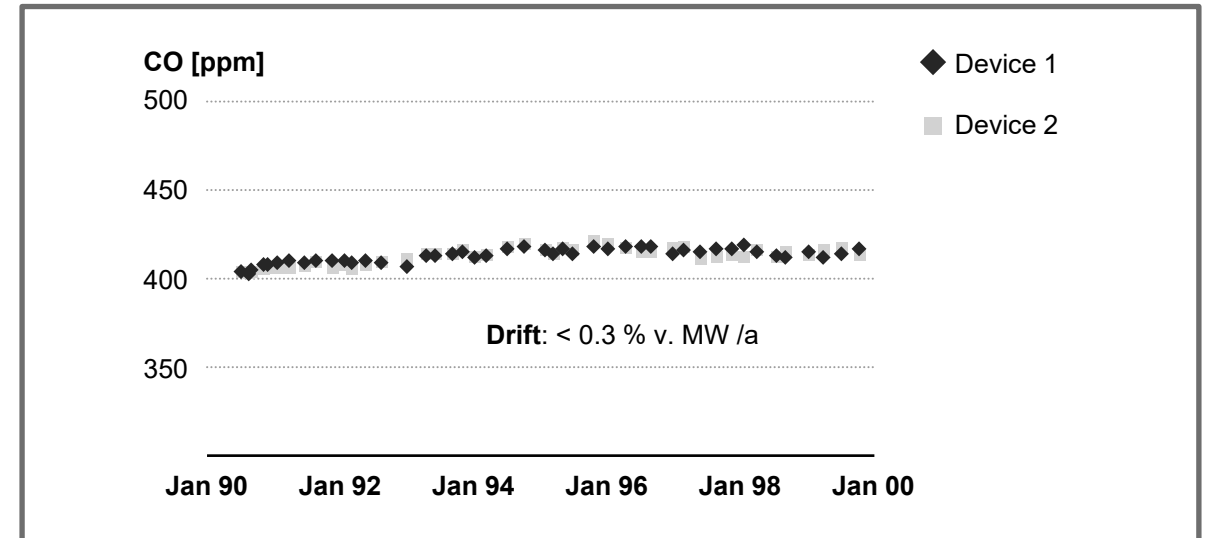
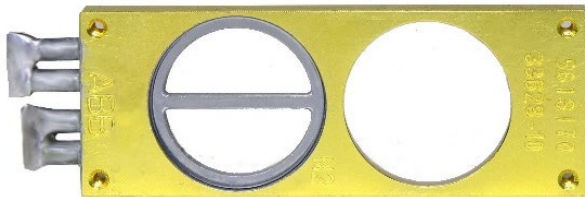


YES, you can calibrate.

Uras26 NDIR Spectrometer – Calibration Cell.

Automatic adjustments using gas filled calibration cells and ambient air

- No test gas cylinders needed for adjustments
- Gas-filled calibration cells with proven stability over a long period of time
- High level of tightness of the cells guaranteed
- Gas cylinders are only needed when commissioning the analyzer



YES, you can service.

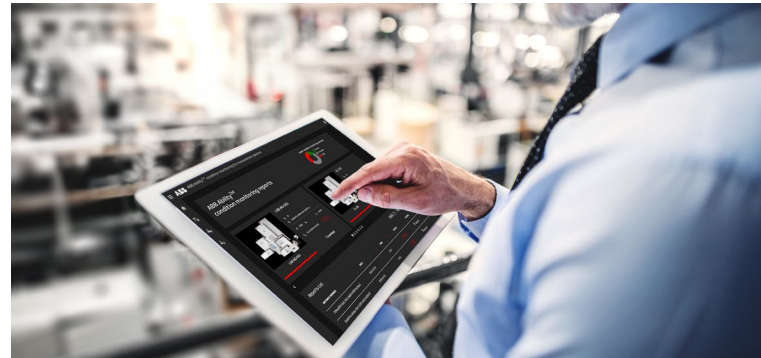
Local & remote service solutions to support the unique challenges of onboard marine maintenance

Dynamic QR code



- **Manual** analyser health status access
- Dynamically generated QR Codes on analyser display
- Analyser **Real time** information on system configuration and analyzer **health status**
- Manual tool to access data on site or sent to ABB expert to analyse remotely

Condition Monitoring



- **Automatic** analyser health status access
- MicroPC available as add on option
- The MicroPC uses data hardware encryption connecting each analyser to email or web
- **Automatic data updates provide client and ABB regular health status reports**
- Historical data provides service engineers with source data for predictive maintenance

Remote Insight



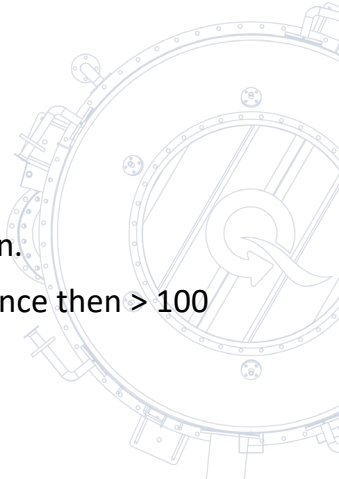
- **'Over the shoulder'** support between vessel technician and ABB expert
- Accessible via phone/tablet
- Augmented reality capability enables message and indications in screen view

ABB

The Scrubber Maker



- PureteQ was established in 2010 to invent and patent technologies that could transform Environmental issues into sustainable solution.
- Owned by a Danish Billionaire Erik Skjaerbaek and some of the employees.
- HQ situated in Svendborg, Denmark. Branches in:
 - PureteQ Japan KK, Tokyo
 - PureteQ GmbH, Hamburg
 - PureteQ China
- Since 2014 development of patented SOx scrubbers for maritime application.
- 1st Hybrid Scrubber system installed and commissioned in spring of 2015. Since then > 100 operational and approved scrubber
- Now also involved in numerous International CO2 Capture Project and PtX.



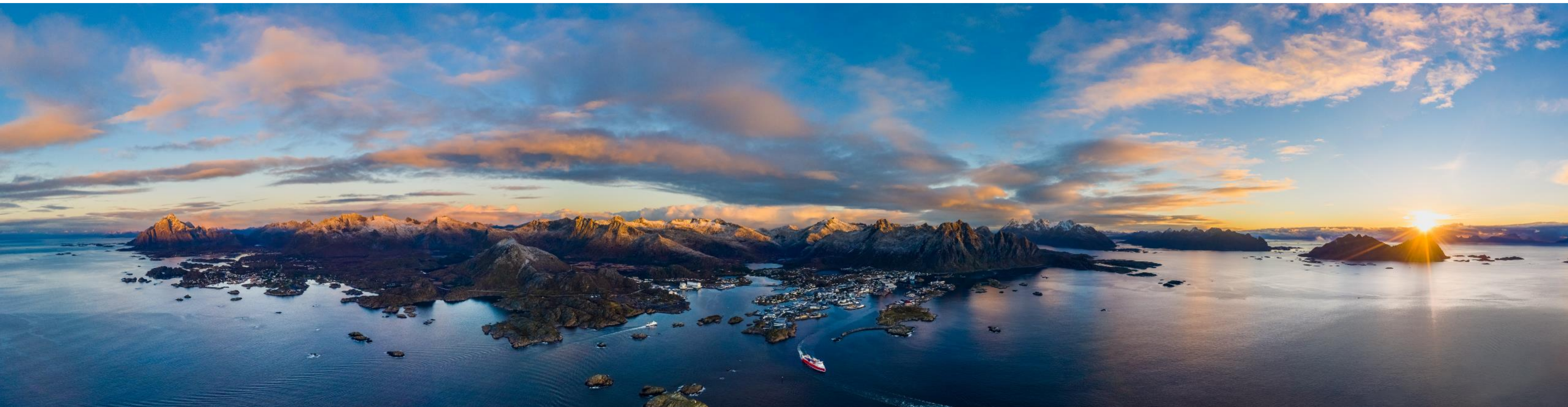
What we do



Gas Analysers and sensors – Operators/users

- The good news - Yes! they work, and they are quite robust when maintained
- Main reason for malfunction
 - Quality of installation
 - Quality of “instrument air”
 - Infrequent filter replacement
 - Service of air preparation units
 - Lack of cooling
- Total life cost of ownership varies a lot from make to make
 - Frequent filter replacement
 - Cell maintenance /replacements
 - Calibration





How remotely operated CEMS can transform compliance and onboard operations

SHIP **CEMS**

SHIP **CEMS**
COMPACT

SHIP **CEMS**
UPGRADES



EXPERIENCE
SINCE
1988



WORLDWIDE
DELIVERED TO 65+
COUNTRIES



1000 +
PROJECT EXECUTED
WORLDWIDE



CUSTOMERS
65 % - MORE THAN
1 PROJECT



IN-HOUSE
DESIGN &
ENGINEERING



IN-HOUSE
PRODUCTION &
LOGISTICS



IN-HOUSE
TRAINING &
EDUCATION



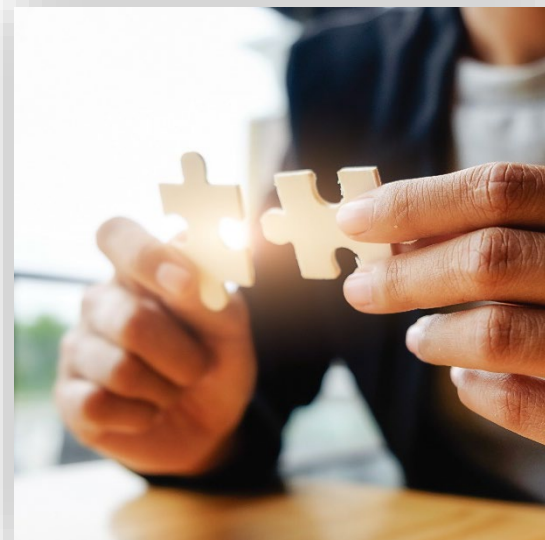
IN-HOUSE
WORLDWIDE
SERVICE



€ 60M
REVENUE



90+
EMPLOYEES
WORLDWIDE
AVAILABLE IN
17 LOCATIONS



QA/ HSSE
ACCORDING
9001 / 14001



TRIPLE A
D&B
RATING



EMISSION MONITORING

- SHIPCEMS CLASSIC
- SHIPCEMS COMPACT
- SHIPCEMS UPGRADE



FUEL GAS
MONITORING
SYSTEMS



LNG/GAS QUALITY
MEASSUREMENT
(METERING)



GAS
DETECTION

- PORTABLE
- FIXED



VAPOUR MONITORING
SYSTEM



CALIBRATION
EQUIPMENT



VOC
MONITORING



LEVEL ALARM
SYSTEM

- LNG
- LPG
- CRUDE

FPSO

- GAS & LIQUID QUALITY MEASUREMENT
- OIL IN WATER MONITORING
- COOLING/HEATING MEDIUM GAS DETECTION
- FLARE GAS MONITORING
- GAS DETECTION

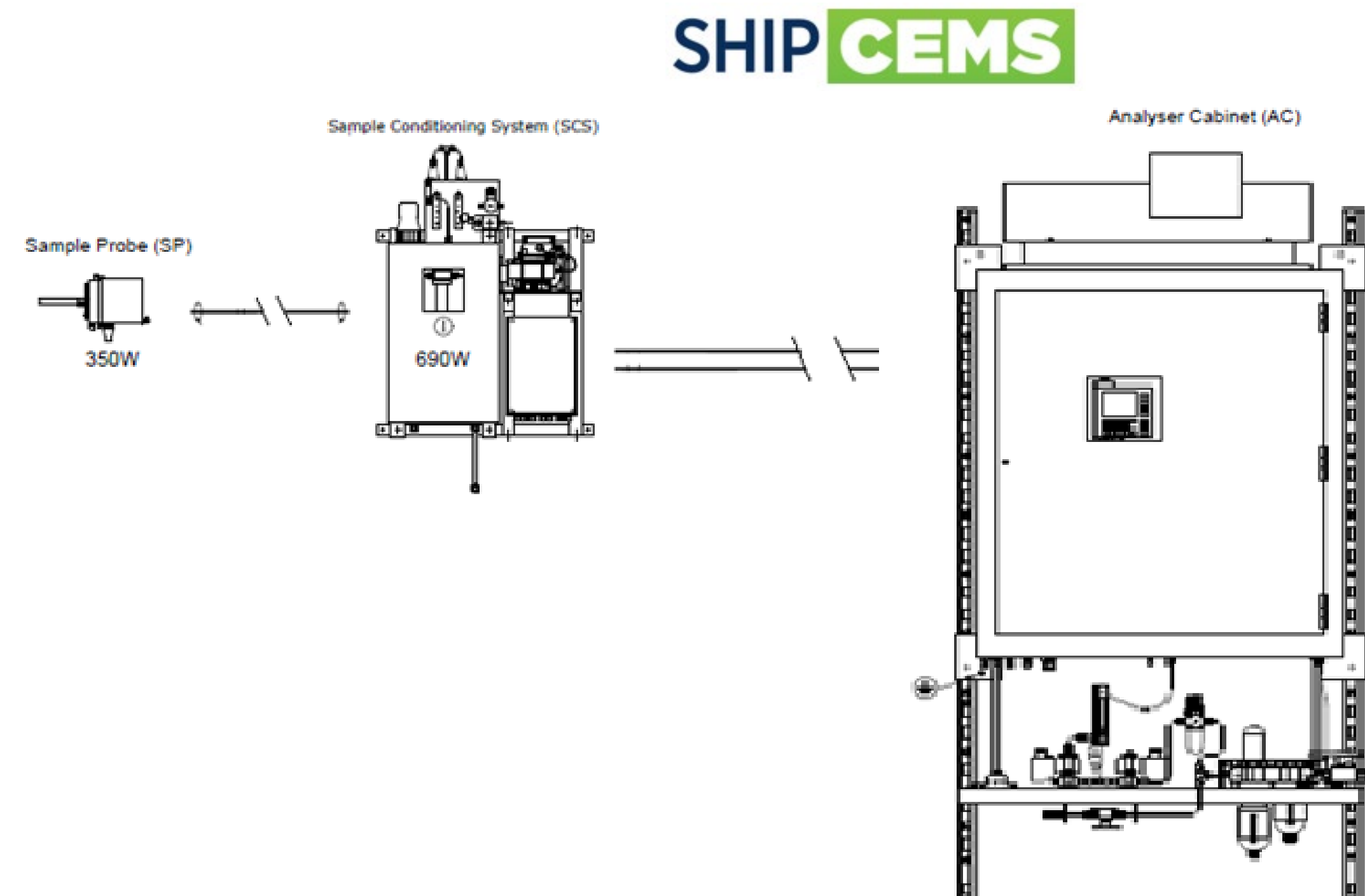
Land based is the easy part

Inaccessibility = > remote support essential

Fast response from service/support department (First line response within 12 hrs)

Short mobilization of S/E globally

Annual service by skilled engineers reduce MTBF

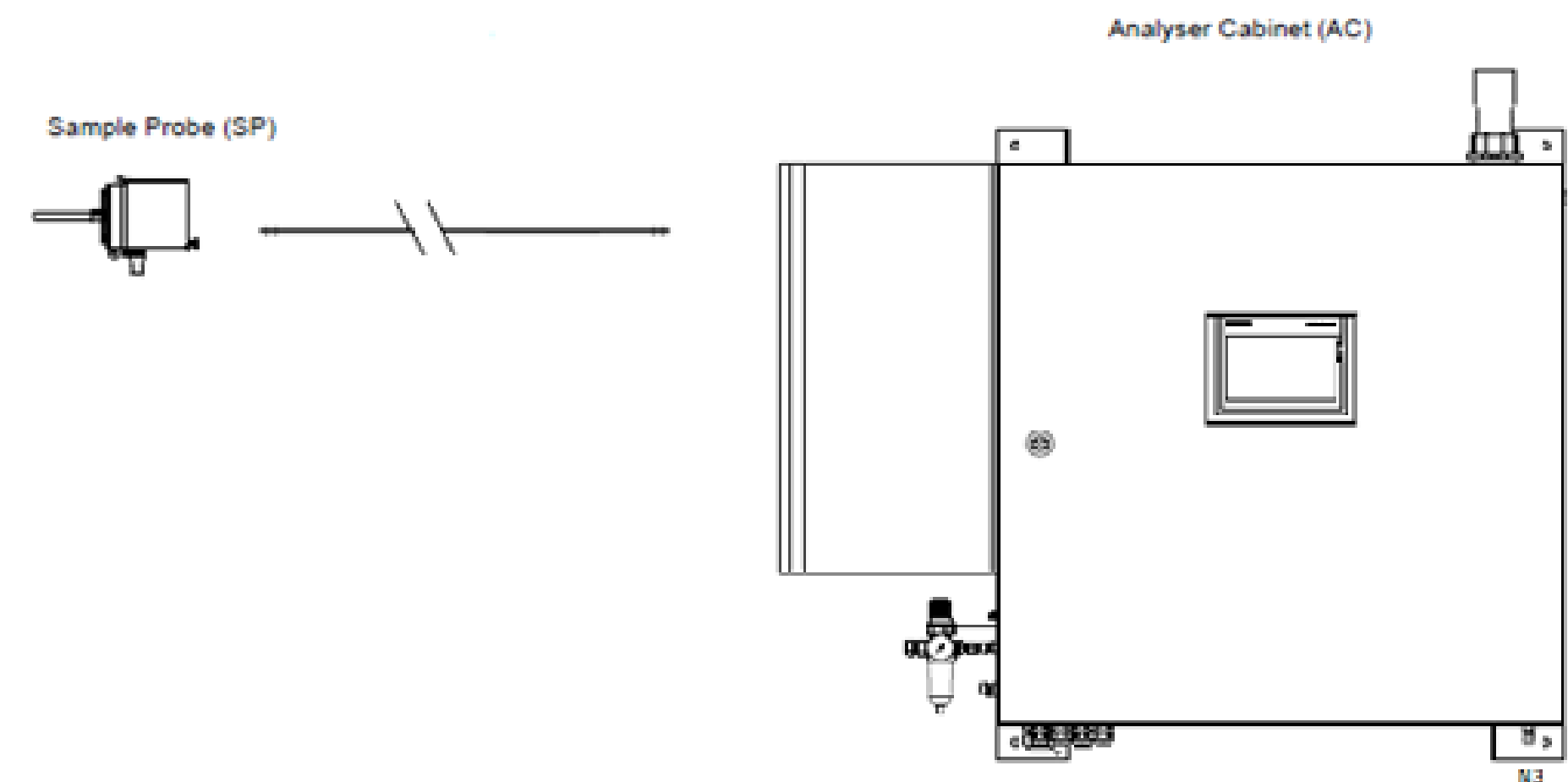


Norsk Analyse CEMS experience

- Land based – 250 + installations
- Oil & Gas – 1.100 + installations
- Marine – 1.600+ installations

SHIP CEMS COMPACT

- Training of key personnel onboard
- Understanding of the overall equipment
- Follow the minimum requirements of periodic maintenance
- Access to critical spare part onboard

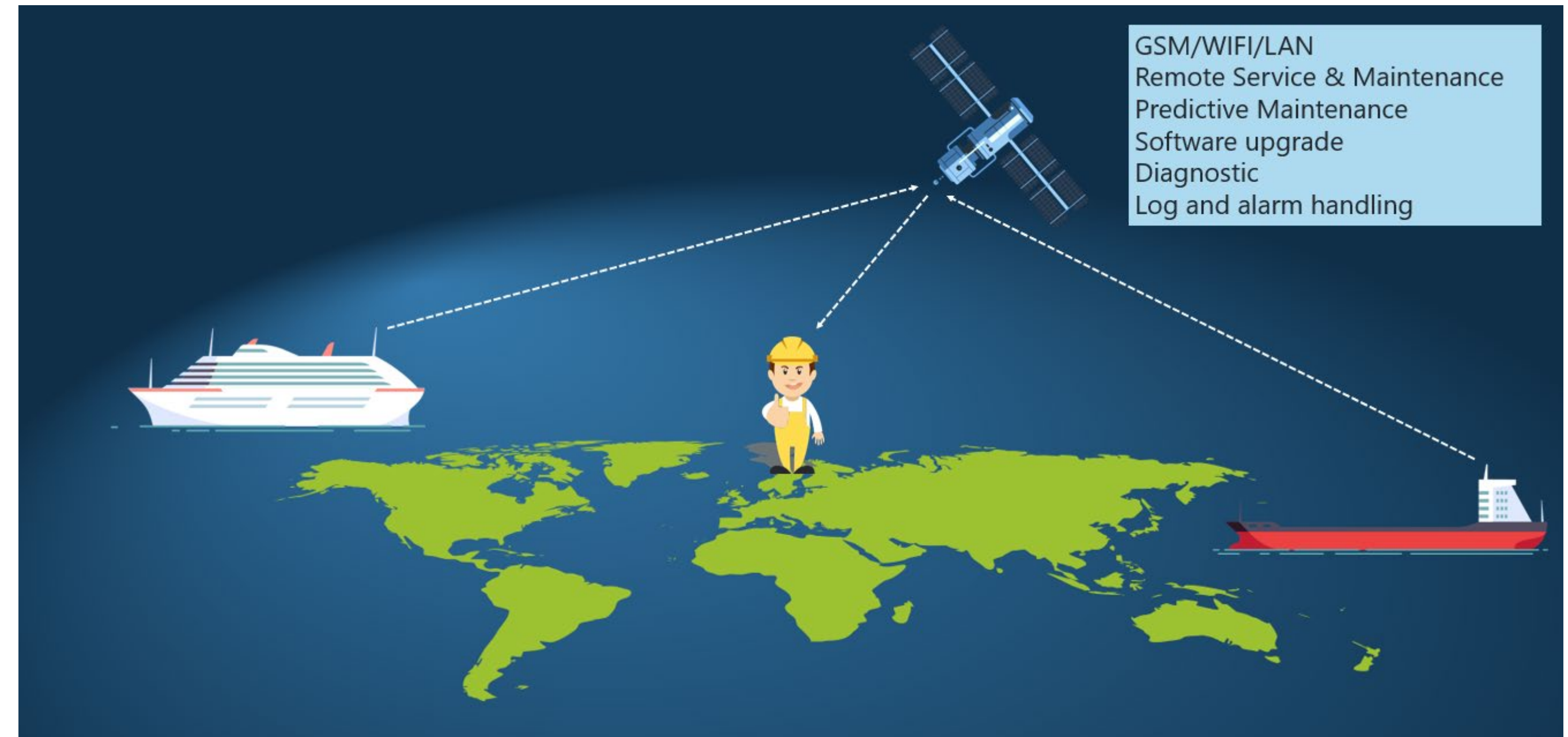


SHIP CEMS

Remote access available today

Self diagnostics are available today

Final answer to all operational difficulties?





“The preferred marine CEMS supplier”

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Maintain Ship Emission Compliance and Overview

Presented by Allan Skouboe

CTO, Chief Technical Officer

Riviera Webinar on Gas Analysers and Sensors, 7th April 2021



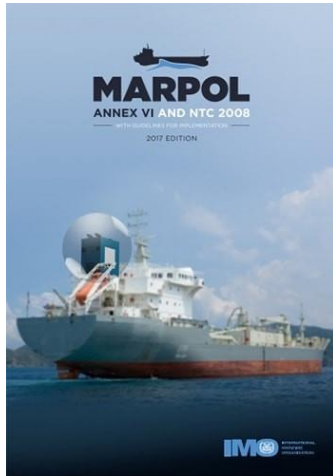
Regulations and how to manage Compliance

MARPOL Annex VI

- Regulation for Air Pollution of Ships

NTC2008 NOx Technical Code

- General Regulation related to NOx



- Current situation:
The maritime air emission regulations are focusing on what is coming out of the stack of the ships
- Consequence:
Ship owners and operators need to be in control of their emissions
- What to do...?

**“Measure
emissions”**

CEMS Product Portfolio

MES 1001

NOx and NH3 sensor



MES 1002

SO2/CO2 sensor



EmViz

Emission Visualization
Software



MES1001 - SCR application



MES1002 - Scrubber application

SCR Application – MES 1001

Open loop/closed loop

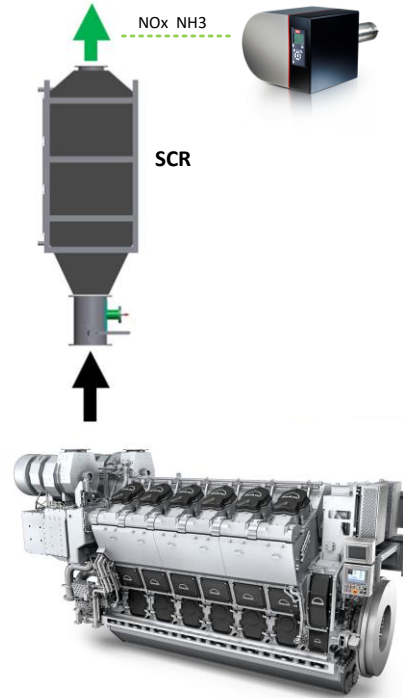
- Monitor SCR performance
- Monitor ammonia slip/early warning of SCR maintenance
- Avoid build-up of ABS (Ammonium BiSulfate) which eventually can foul the stack/boiler

Closed loop

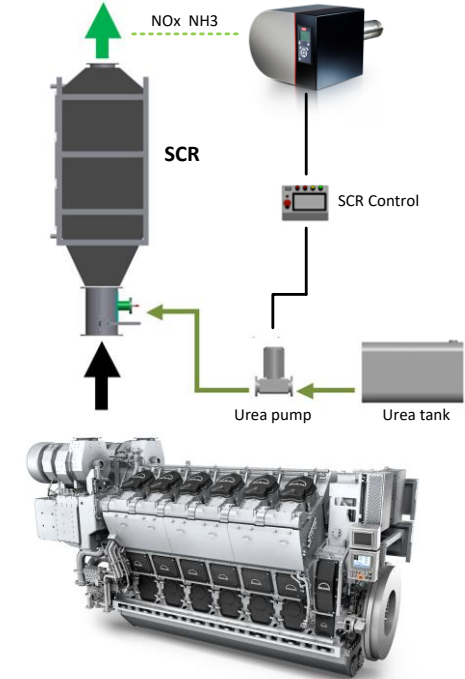
- All of the above + ...
- Optimize urea dosing
- Optimize NOx output
- Better transient load response

Note

- NOx Technical Code does not offer on-site threshold-based compliance monitoring – yet...



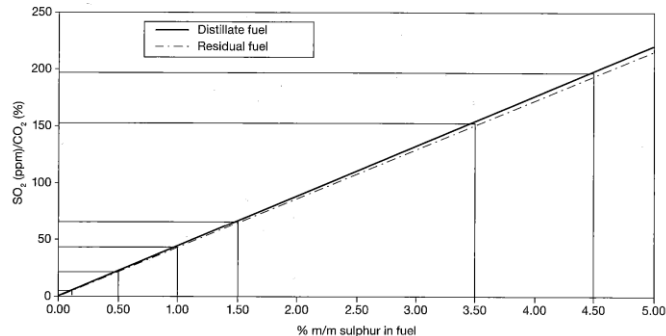
*Open loop controlled SCR
with emission sensor*



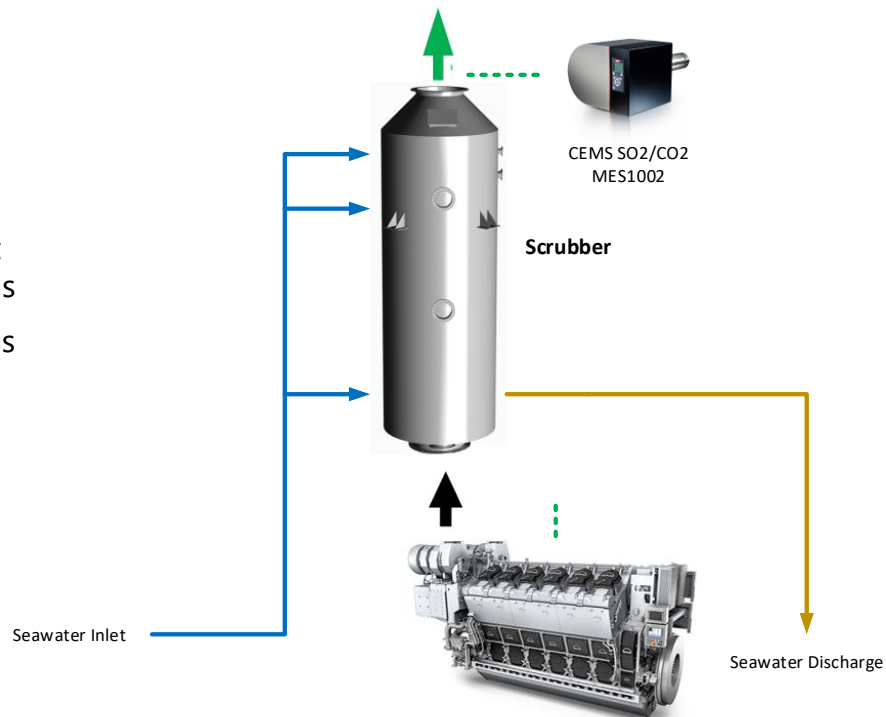
*Closed loop controlled SCR
with emission sensor*

Scrubber Application – MES 1002 (Scrubber CEMS)

- Sensor measures SO₂/CO₂ ratio in accordance with MEPC.259(68)
- Emission must stay below a certain threshold
- Sensor quality and performance is key, as the ship is not allowed to operate the scrubber without correct readings
- Data must be recorded and stored for at least 18 months



Relationship between equivalent sulphur content in fuel and SO₂/CO₂ ratio

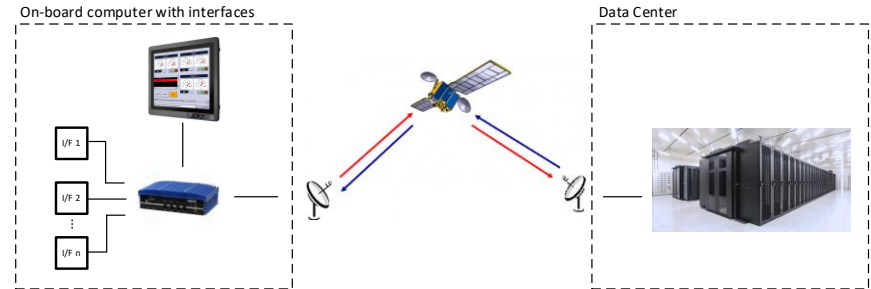


Scrubber installation with MES 1002 Continuous Emission Monitoring

EmViz – Maintain overview of Compliance

General

- Data is collected on board from various sensors
- Satellite link for transfer of data
- Data is stored in a data center on shore
- Data can be accessed from “everywhere”

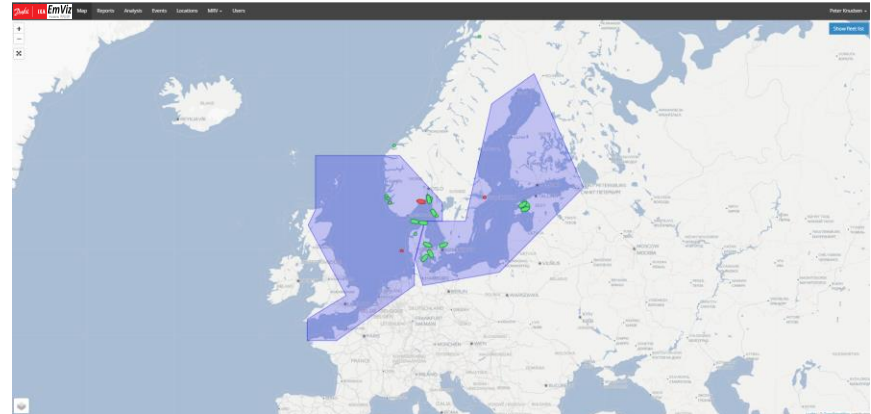


System features:

- Emission overview per ship or across your fleet
- User defined reports
- Pre-defined ECA zones
- Special overview panel for the crew on board

Interesting fact

- Despite having advocated for EmViz over the past years market interest has just now picked up



Lessons learned from the Field

- Yards must observe correct installation – too many yards neglect manufacturer's instruction.
- The stack is a very unfriendly place – nothing is maintenance free – too many yards do not train in proper use and maintenance of the NOx sensor.
- When going to US waters the crew is particular aware of the NOx sensor performance and maintenance condition (due to NOx ECA).
- SO2/CO2 sensor (scrubber) gets much more attention from the crew than the NOx sensor (SCR).
- A “not to exceed limit” set by the MARPOL on NOx emissions is desirable as this will ease in-field compliance measurements and interpretations.



Danfoss

IXA