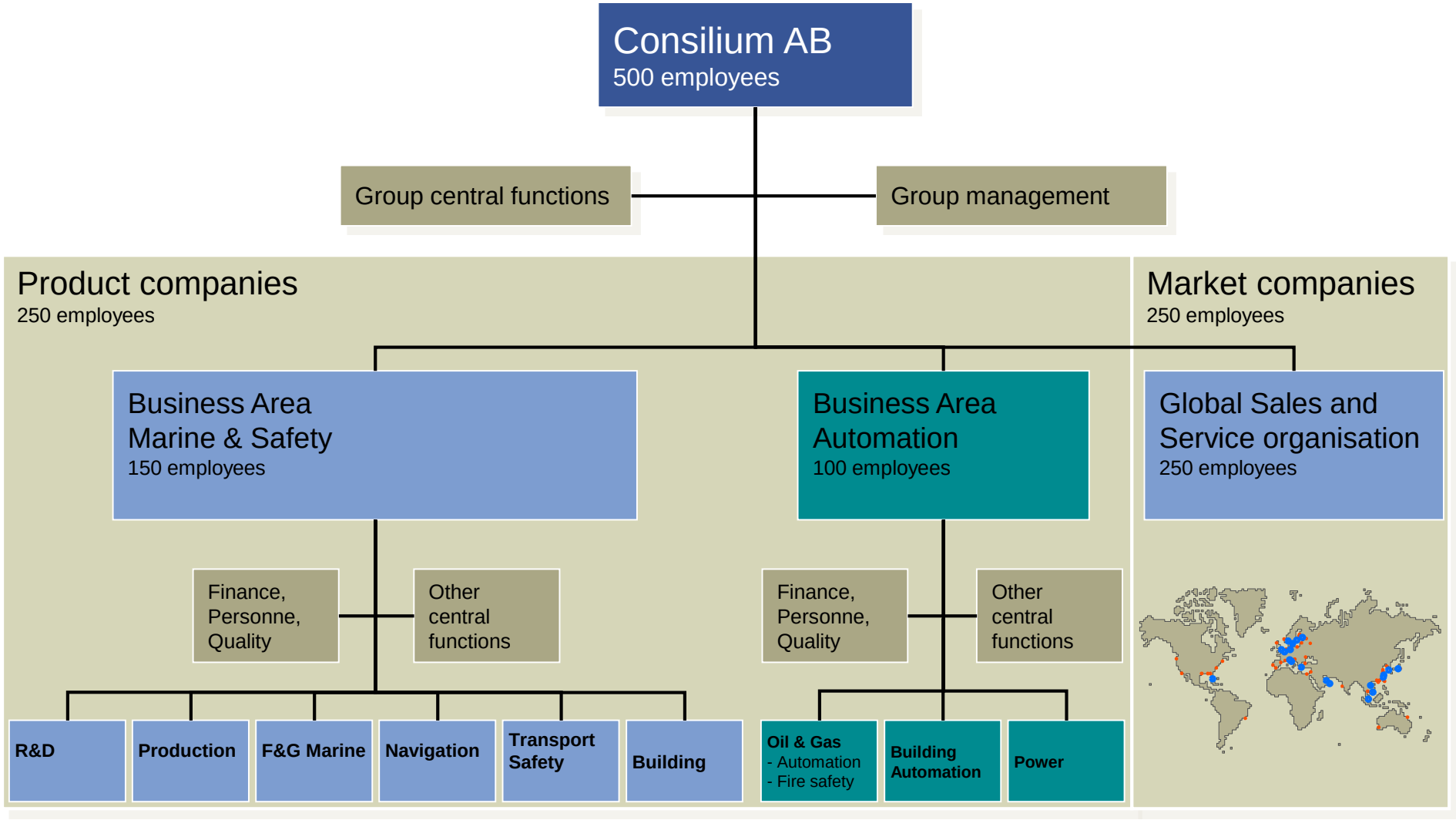
When Safety Matters

Consilium – When Safety Matters

- Protecting lives, investments and the environment
- Consilium products on every 2nd ship sailing in the world
- Global market leader in marine fire and gas detection
- Leading supplier of navigation products and sensors
- 96% of our sales are export
- 35 sales and service offices in 20 countries world wide
- 100 years in business 2012


Consilium AB
500 employees
Group central functions
Group management
Product companies
250 employees
Market companies
250 employees
Business Area
Marine & Safety
150 employees
Business Area
Automation
100 employees
Global Sales and
Service organisation
250 employees
Finance,
Personne,
Quality
Other
central
functions
Finance,
Personne,
Quality
Other
central
functions
R&D
Production
F&G Marine
Navigation
Transport
Safety
Building
Oil & Gas
- Automation
- Fire safety
Building
Automation
Power

Market segments

Consilium Marine & Safety AB

- OEM Solutions

- Offshore Solutions

- Cargo Solutions

- Cruise & RoPax Solutions

- Navy Solutions

- Retrofit Solutions

Fire & Gas Marine Product range

Fire & Gas Marine Division

Gas Detection

Emission Monitoring

Fire Detection

Consilium navigation products

Navigation Division

Speed Log

AIS

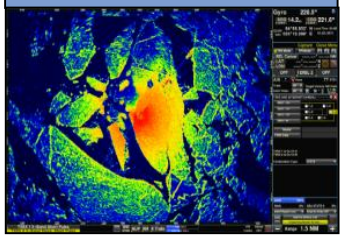
Radar

ECDIS

Echo Sounder

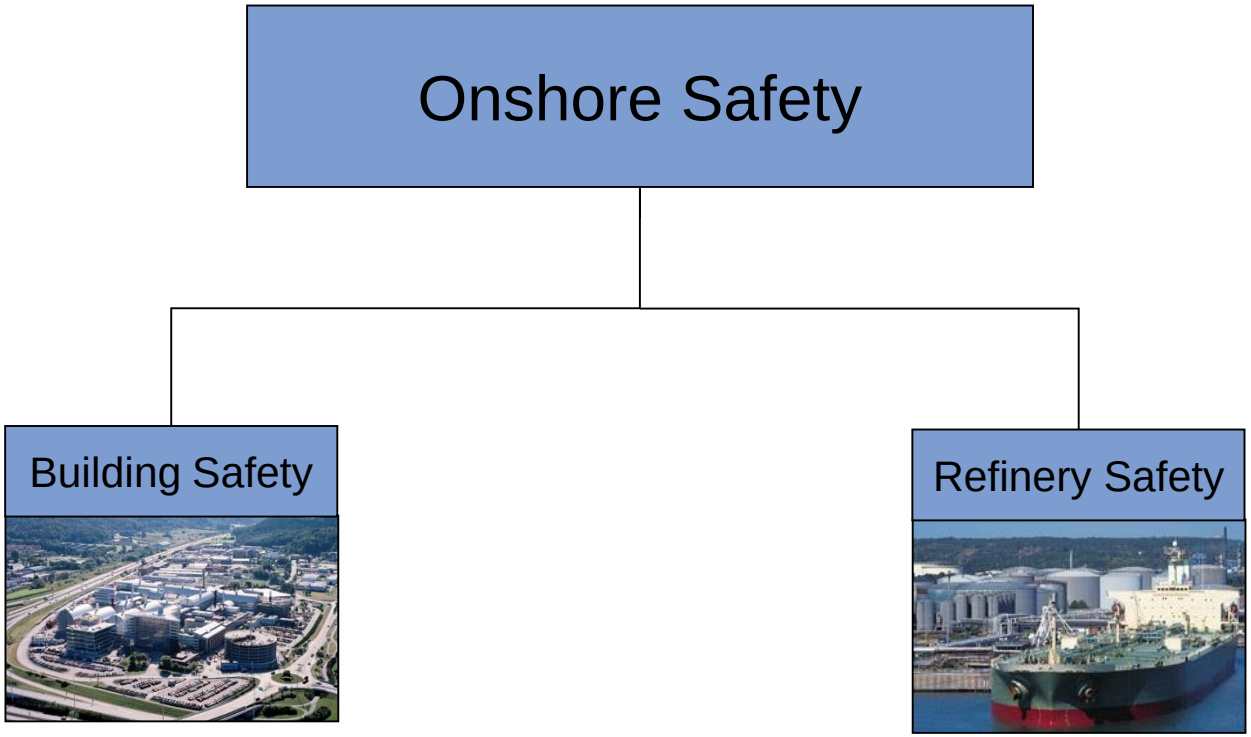
Components

Special Radar

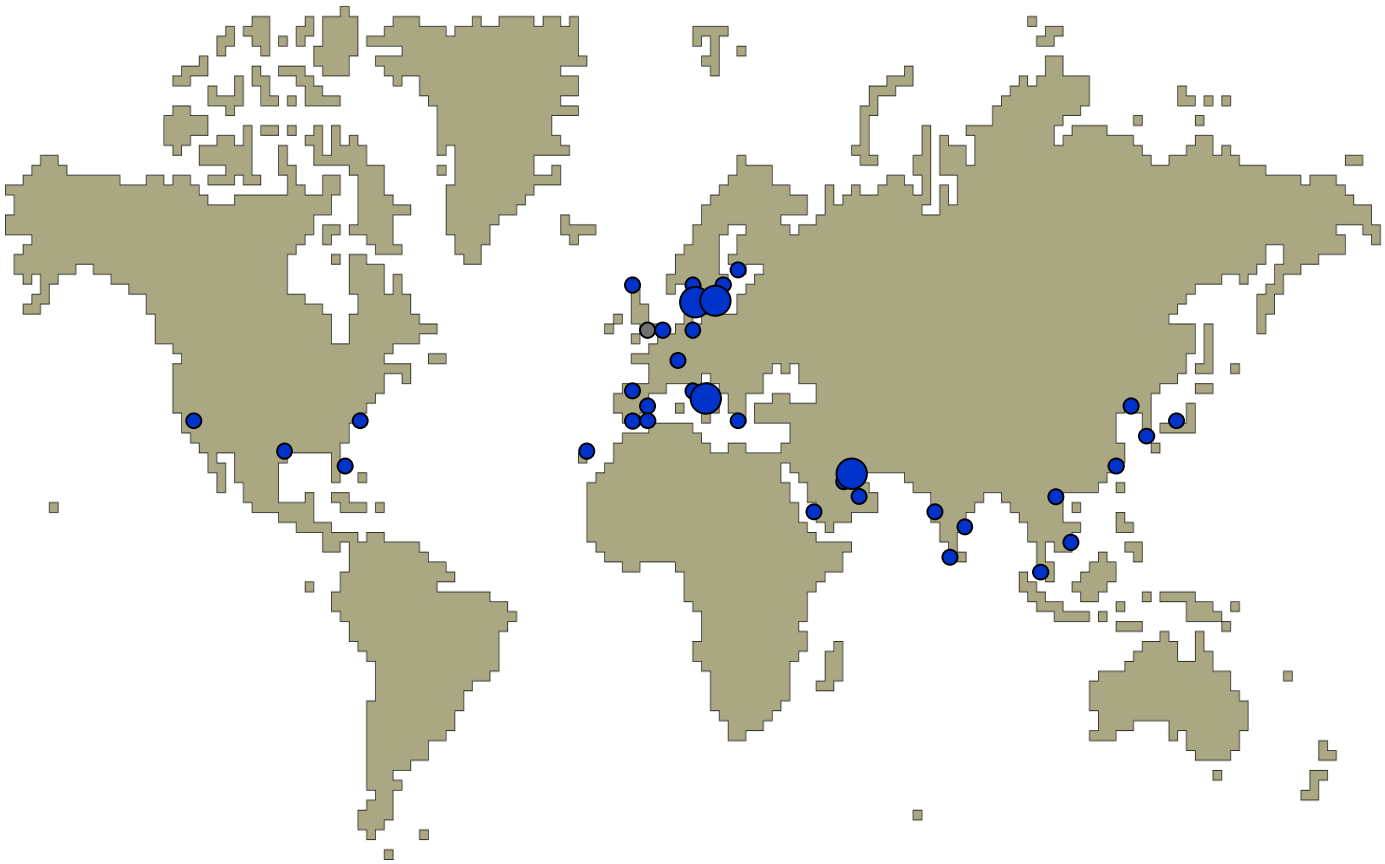


VDR

Consilium segments



Consilium Global Organization



Consilium Group companies

Europe
Stockholm, Gothenburg - Sweden
Oslo – Norway
Helsinki - Finland
Hamburg - Germany
Rotterdam – Holland
Zeebrugge - Belgium
Folkstone, Glasgow – UK
Bilbao, Barcelona - Spain
Florens, Genua, Naples – Italy
Pireus - Greece

Asia
Shanghai, Dalian, Qingdao, Hong Kong – China
Pusan, Cink - Korea
Singapore
Tokyo - Japan
Hanoi, Ho Chi Minh – Vietnam
Mumbai, Vizhakapattana, Cochin – India

Middle East
Abu Dhabi, Sharja - UAE
Doha – Qatar
Dammam - Saudi Arabia

North America
Fort Lauderdale, Huston,
New York, Long Beach – USA

Consilium Group companies in 20 countries and 36 locations

More than 50 sales and service representatives world wide

OPSIS M800 System

Continuos emission monitoring (CEM) for scrubber applications

Consilium

Tiers

Table 1. MARPOL Annex VI NOx Emission Limits

Tier	Date	NOx Limit, g/kWh		
		n < 130	130 ≤ n < 2000	n ≥ 2000
Tier I	2000	17.0	$45 \cdot n^{-0.2}$	9.8
Tier II	2011	14.4	$44 \cdot n^{-0.23}$	7.7
Tier III	2016†	3.4	$9 \cdot n^{-0.2}$	1.96

† In NOx Emission Control Areas (Tier II standards apply outside ECAs).

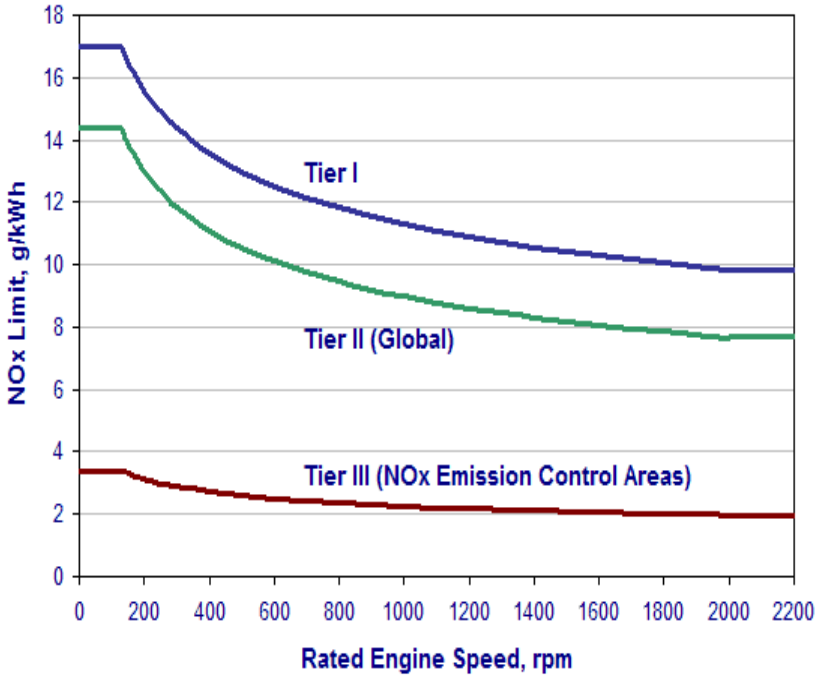


Figure 1. *MARPOL Annex VI NOx Emission Limits*

Table 2. MARPOL Annex VI Fuel Sulfur Limits

Date	Sulfur Limit in Fuel (% m/m)	
	SOx ECA	Global
2000	1.5%	4.5%
2010.07	1.0%	
2012		3.5%
2015	0.1%	
2020[a]		0.5%

a - alternative date is 2025, to be decided by a review in 2018

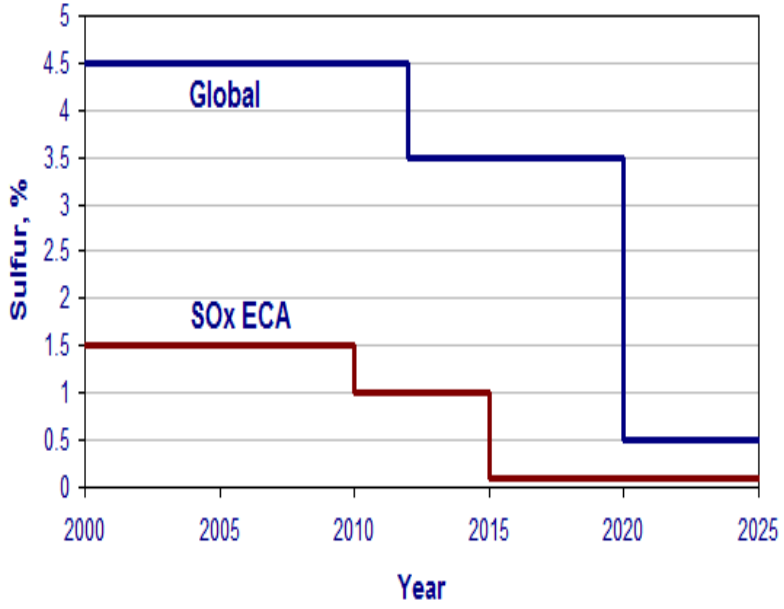
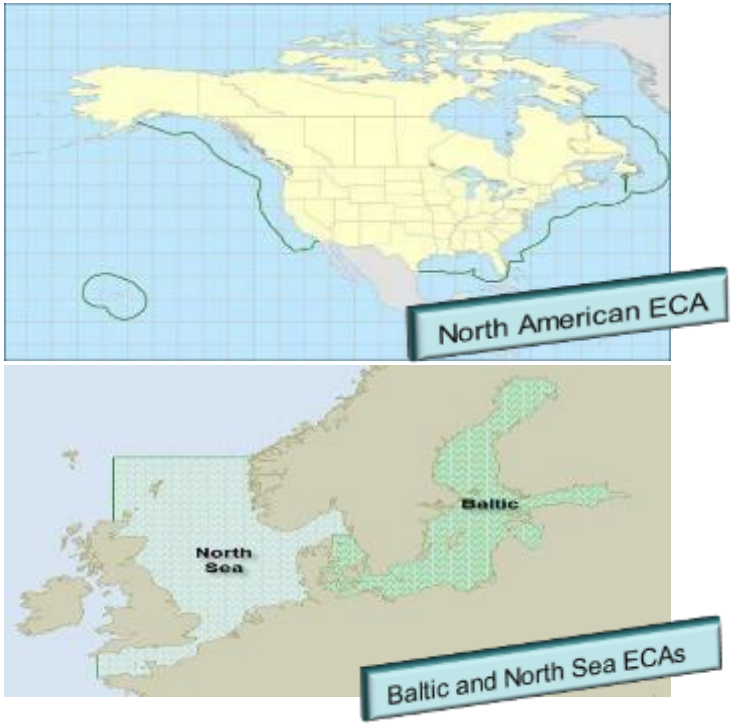


Figure 2. *MARPOL Annex VI Fuel Sulfur Limits*

Upcoming regulations

- North Sea and English Channel
- 2012 North America (200nm off coast line)
- 2014 Puerto Rico and US Virgin Island
- .. More to come…..



Class Notations

- BV – Clean ship & Clean ship Super
- DNV – Clean & Clean Design
- Lloyds – EP Notation (Environmental Protection)
- RINA – Green Star
- GL – EP Notation (Environmental Passport)
- ABS – ENVIRO & ENVIRO+
- RMRS – ECO & ECO-S

Class Notations

- Common for all these Class notations is that is often one “light” class and one “super” class.
- All of them wants to reduce emissions to air and to sea.
- Requirements is open for interpretations but if you ask the classes monitoring is always a good thing.
- Some of them demands CEM
- All of them is amended on annual basis or when new rules enters in to force
- More ship owners gets the notations in order to get charters from the cargo holders, EP Notation will make it easier to compete for charters!

How to achieve new sulphur regulations?

- LNG Convertion
- Methanol Convertion
- Exhaust Gas Cleaning Systems (Scrubbers)
- Marine Gas Oil

Pre/After treatment devices

- Scrubbers – removal of sulphur in fuel
- SCR **S**elective **C**atalytic **R**eduction – Removal of NOx
- EGR **E**xhaust **G**as **R**ecirculation – Reduce NOx

+ many other things that can be made to meet regulations...

Consilium Salwico EMS will verify that you show compliance

CEMS Methods/Techniques

- **Methods :**
  - In Situ
  - Dilution extractive
  - Wet-hot extractive
  - Dry extractive

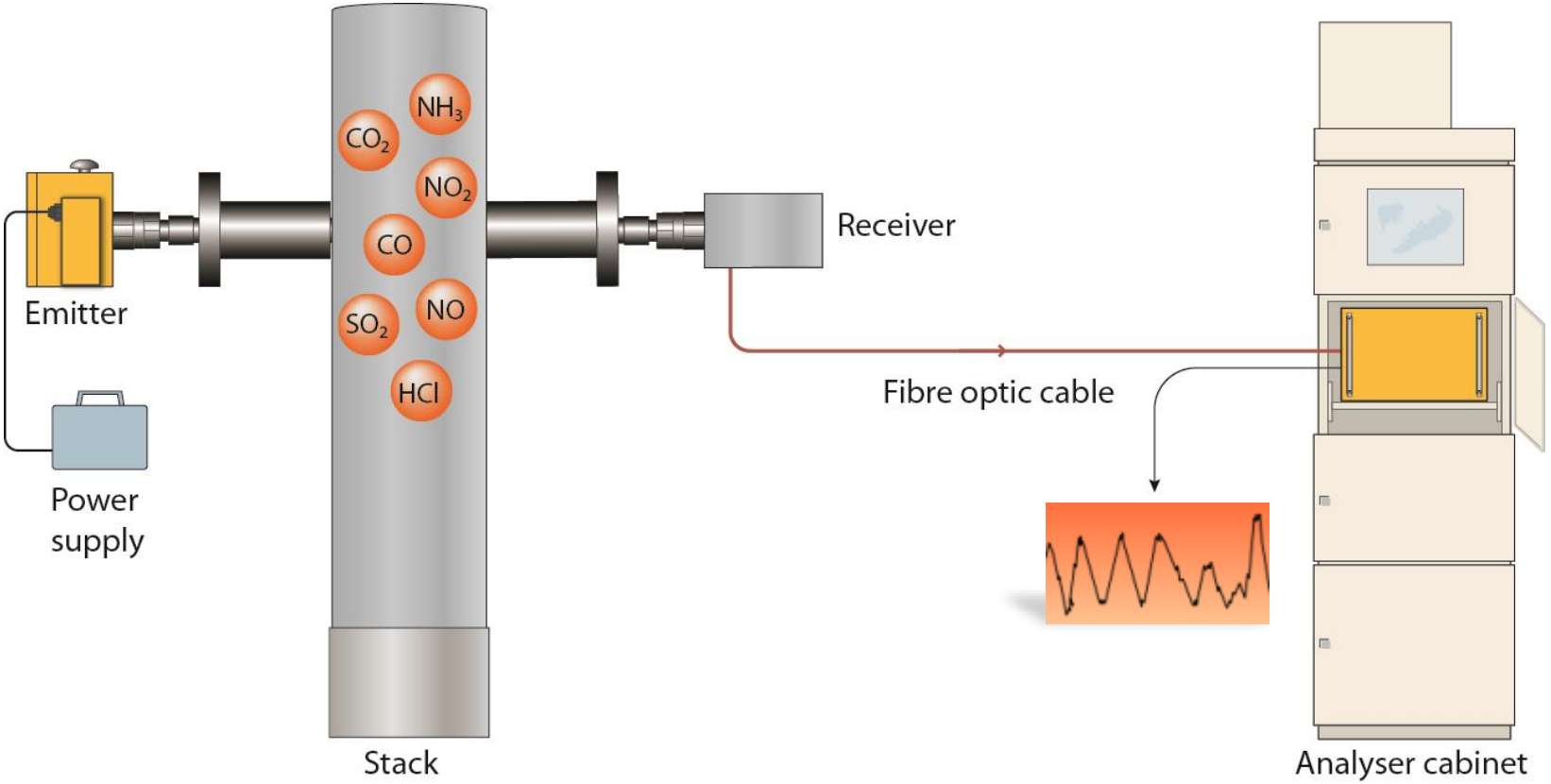
- **Techniques:**
  - DOAS
  - FTIR
  - IR absorption
  - UV absorption
  - Chemiluminescense
  - UV-fluorescense
  - and more

Challenges with extractive systems.

- Owner/crew complaining about high maintanance.
- Complicated system, hard to learn.
- How to measure all stacks within 286 seconds (when installing scrubbers)?
- Different analyzers for different gases.
- Extractive gas is currosive and highly reactive, lower lifetime.

OPSIS M800 System

Non contact gas monitoring solution



Opsis **M800**

Used for monitoring industrial emissions for more than 25 years !

Cross Stack In Situ Methods

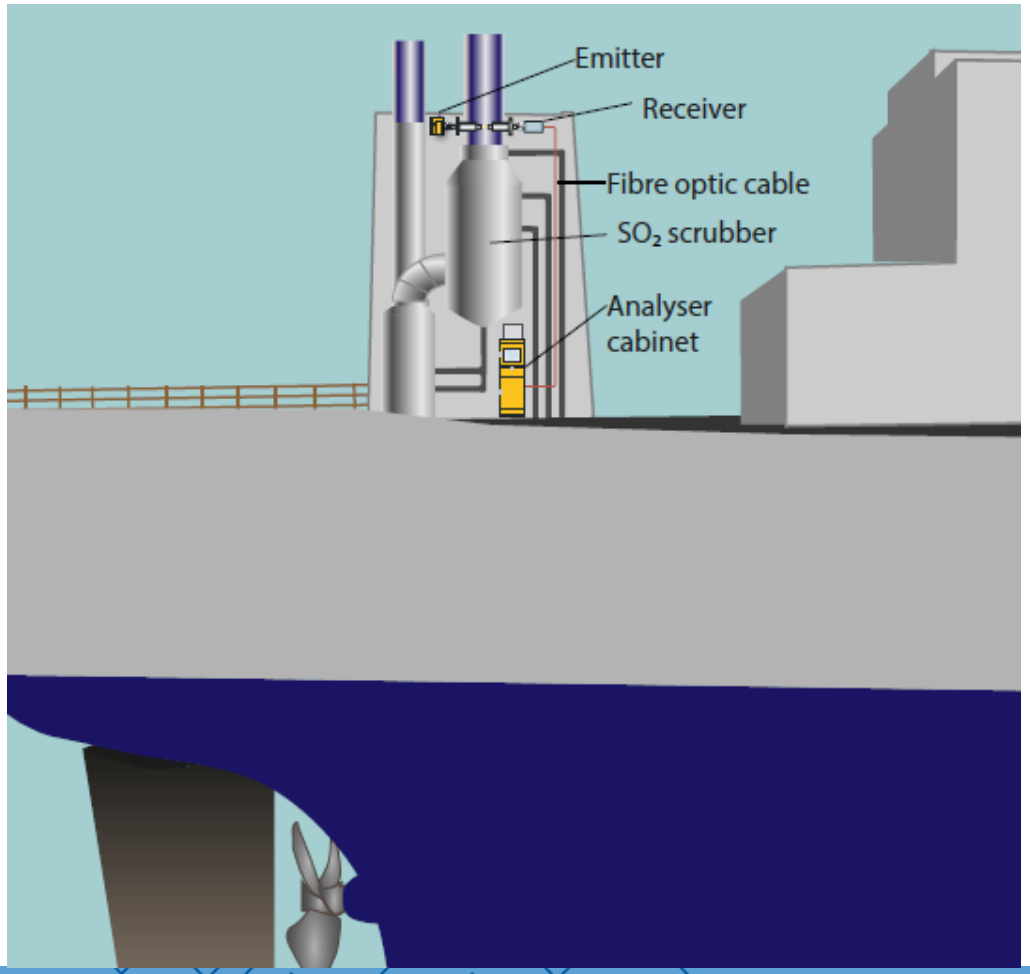
+ No sampling system
+ Non-contact system
+ Normally multi-gas analysers
+ Fast Response time
+ Low maintenance
+ Low operational costs
+ Long lifetime
+ Fast Response

Extractive Methods

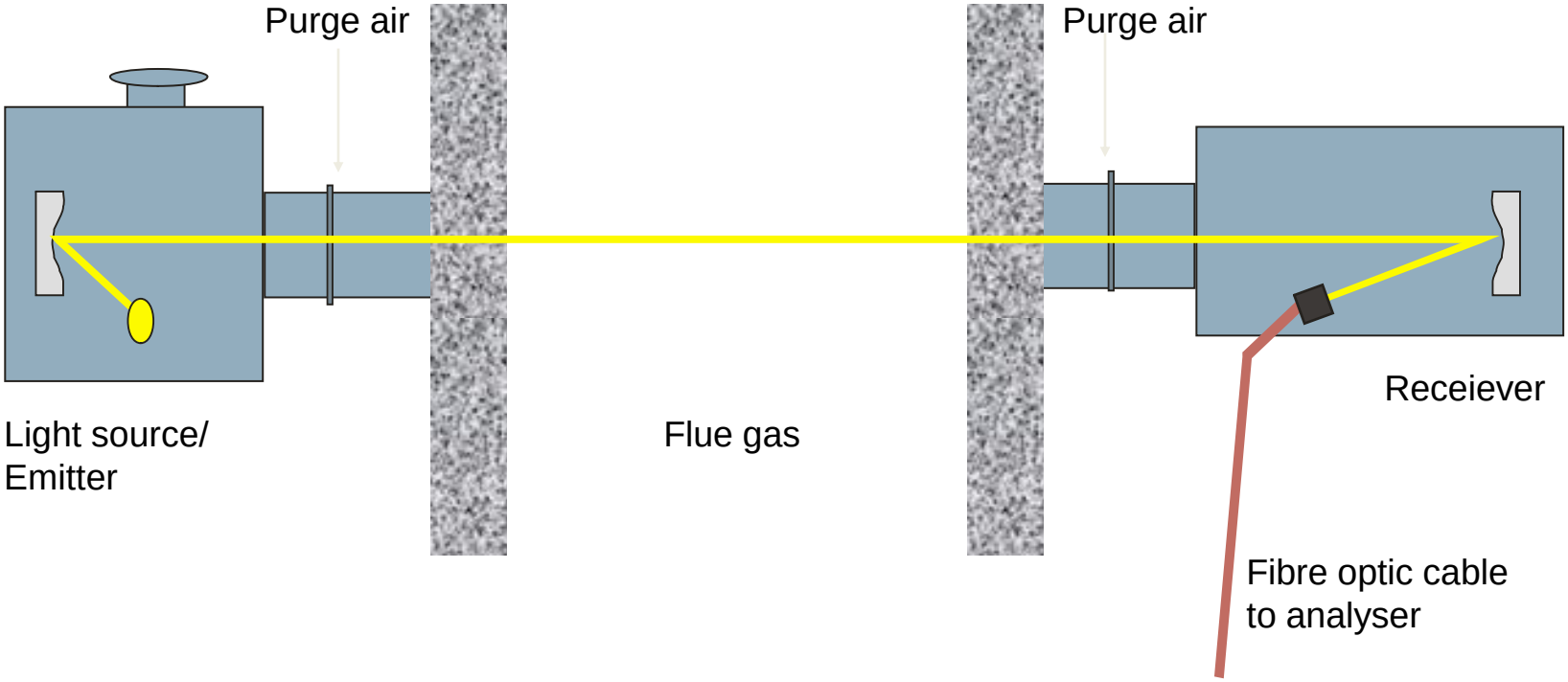
– High maintenance
– High operational costs
– Short lifetime
+ Cheaper Initial cost ???

OPSIS M800 System

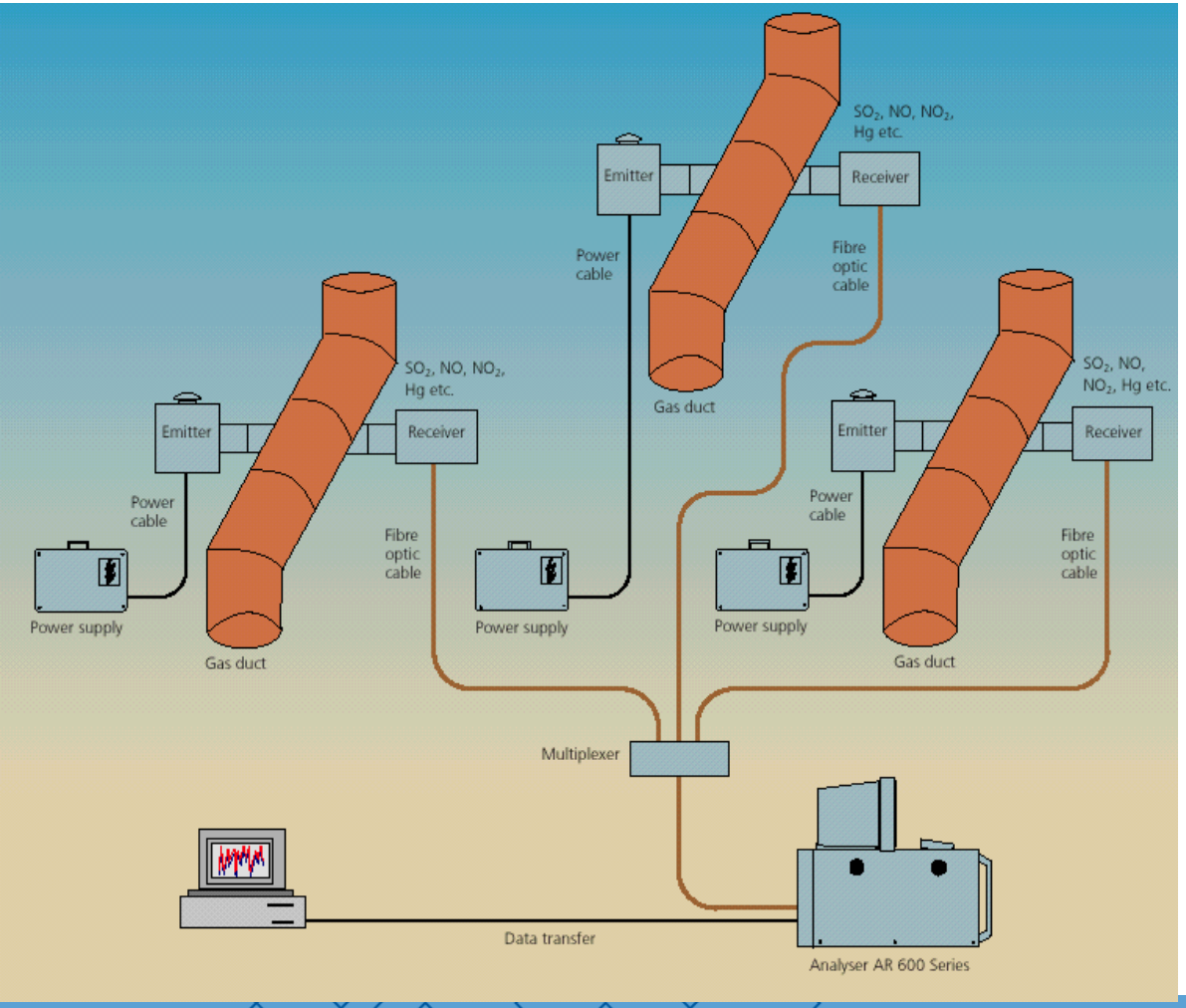
for SO_2 scrubbers on ships



- No contact with gases (sample free)
- One Analyzer for multiple ducts
- Long life time
- No heated cable needed
- Low maintenance
- Easy installation


Purge air
Purge air
Light source/
Emitter
Flue gas
Receiever
Fibre optic cable
to analyser

Scalable - Multiple ducts



- One analyser
- Fast response
- No heated cable
- No cooling
- Only fiber optic cable needed

No sampling = Low lifetime cost

No pumps, filters, scrubbers, valves/heated lines

No chemical reactions in the sample line

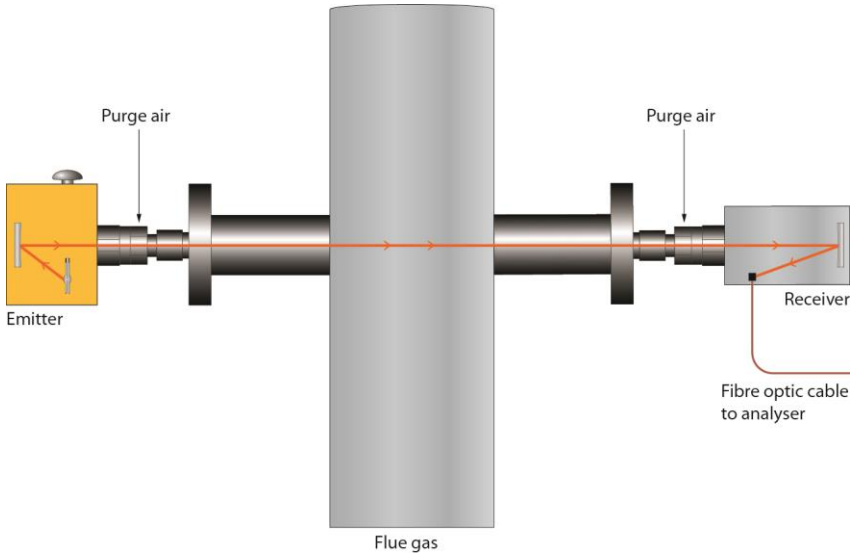
Easy to install

Low energy consumption

Low maintenance

Low lifetime cost

Specifications



- Dimensions (W x D x L): 600 x 800 x 2140 mm
- Weight: 250 kg
- Power consumption: 1,5 kW (standard setup)
- Voltage supply 230 V (+6%-10%) / 115 V (±10%) 50/60Hz
- Ambient temperature: 0 to +55 C°

Reports

- g/kWh
- ppm
- kg
- %
- % m/m
- **SO2/CO2 ratio (ppm/%)**
- Other reporting available

Consilium OPSIS M800 System

for use in seawater scrubber systems on RCCL Liberty of the Seas

Consilium OPSIS M800 analyser for SO2/CO2 installed at Liberty of the Seas.

OPSIS M800 System

for use in seawater scrubber systems

OPSIS M800 analyser for SO2/CO2 installed at Hamworthy/Wärtsilä full scale test scrubber system in Norway, 2012.

The OPSIS M800 system with its non-contact measurement solution has been proven reliable and accurate in comparison with other monitoring systems.

Approved for marine use

DET NORSKE VERITAS

TYPE APPROVAL CERTIFICATE

CERTIFICATE NO. A-13221

This is to certify that the
Gas Detector

with type designation(s)
M1040-42 Compact NOx Gas Analyser, M800 Gas Analyser System

Manufactured by
OPSIS AB
FURULUND, Sweden

is found to comply with
Det Norske Veritas' Rules for Classification of Ships, High Speed & Light Craft and Det Norske Veritas' Offshore Standards

Application
Location classes:

Type	Temperature	Humidity	Vibration	EMC	Enclosure
M1040-42 Compact NOx Gas Analyser	A	B	A	A	C (probe), B (cabinet)
M800 Gas Analyser System	A	B	A, B (EROSION)	A	B

Why Consilium's OPSIS M800 System?

- High-performance, cross-duct monitoring using DOAS
- Cost effective multi-gas and multi-path capability (combined CEM and process control)
- Fast response time for control of scrubber function (dry and semi dry systems)
- Can operate in high dust and high temperature conditions
- No sampling!
- Low energy consumption
- Low maintenance
- Upgrade capability for meeting future demands (NO_X etc)
- Hundreds of systems installed worldwide (onshore)
- High reliability, with many systems operating for more than 15 years
- DNV approved and certified for the new EC regulations (AR600/650) Cross stack, non-contact design for use in salt water scrubbers

www.consilium.se