OLDENDORFF EO

VDR / MARIKO WORKSHOP
“ALTERNATIVE KRAFTSTOFFE”
HAMBURG & LEER
5-6 JUNE 2019

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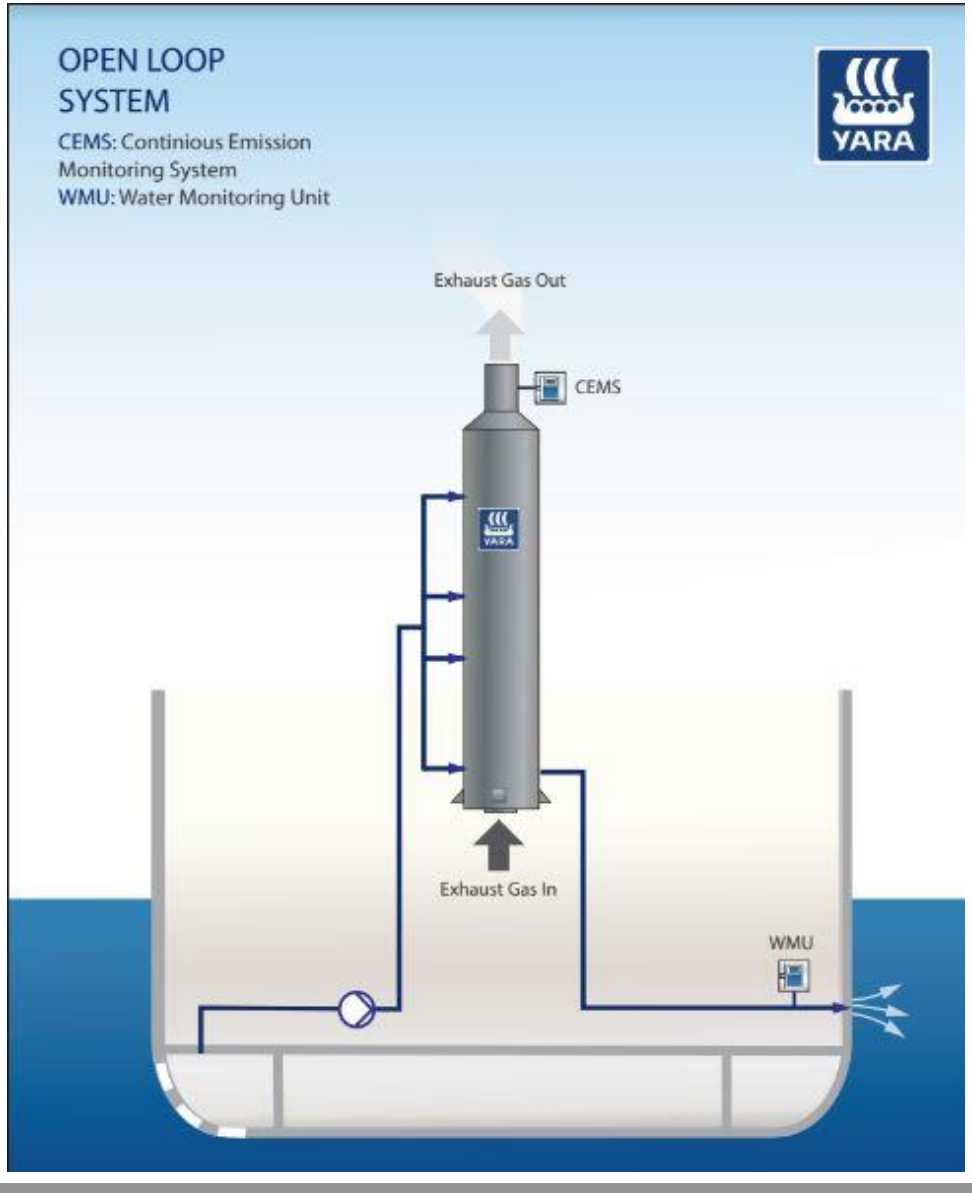
PART 1

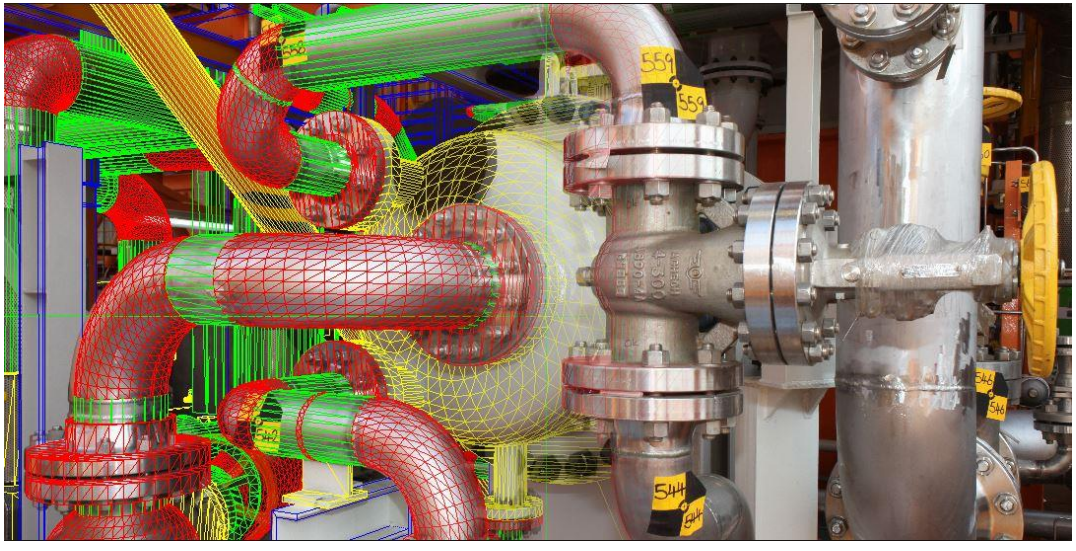
OUR RETROFIT PROGRAMME

Scrubber installations in China

Open-loop scrubber system (typical basic diagram)

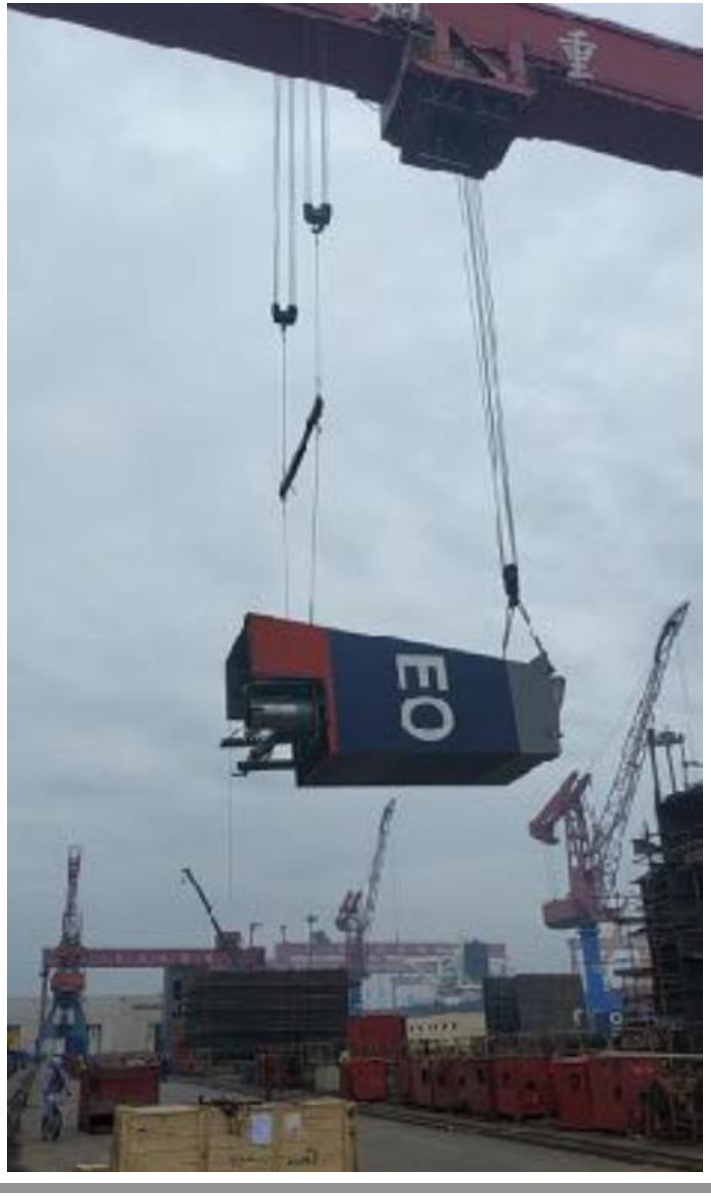


Before you start: 3D scanning and collision check



Oldendorff‘s retrofit programme currently under way in China

Old funnel off.



New funnel on.

Giant puzzle pieces

Look like a rockets – but it certainly isn‘t rocket science!

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Scrubber tower

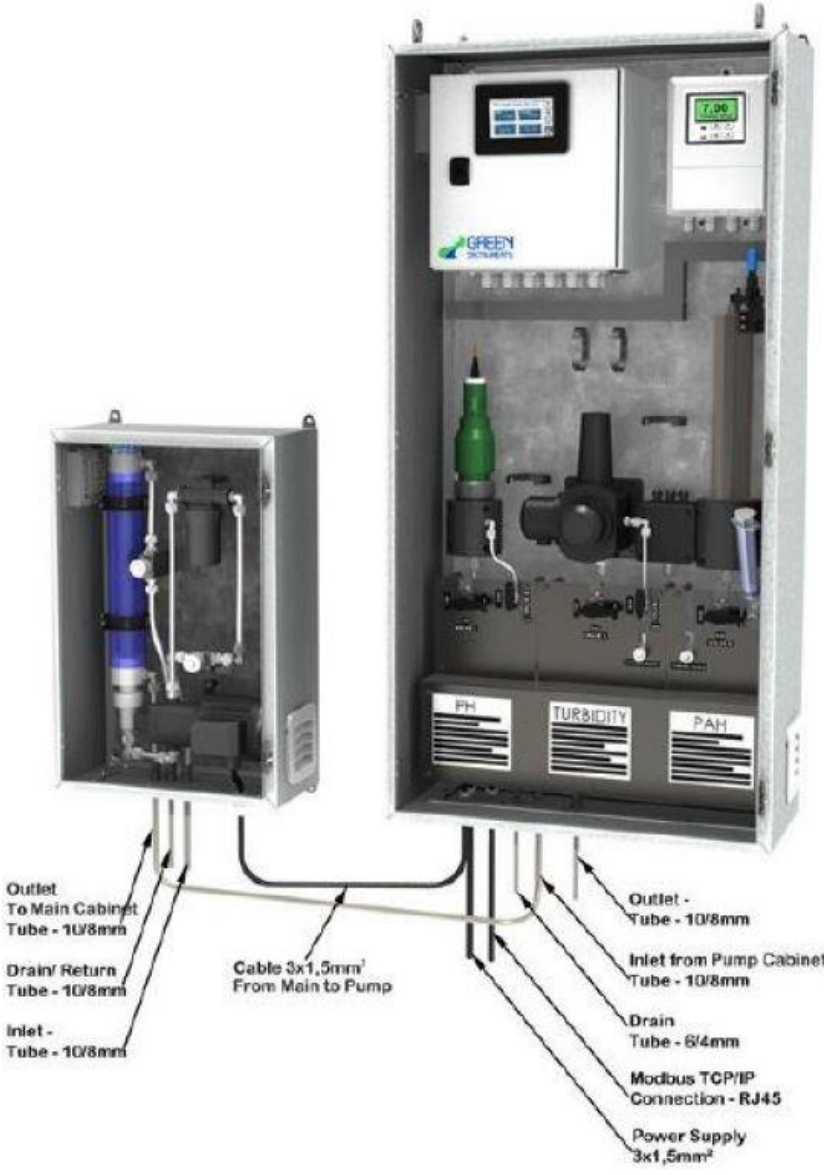
Scrubber seawater process pumps

Scrubber seawater piping (galvanised steel)

Scrubber tower spray lances and nozzles

Scrubber washwater discharge piping (GRE)

Scrubber water monitoring unit (WMU)



Scrubber overboard discharge valve

Scrubber overboard discharge outlet (Belzona 4311 coating)

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Scrubber continuous emissions monitoring system (CEMS)

Things to keep in mind, to name just a few…

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TECHNICAL CONSIDERATIONS

- Correct type of scrubber for your vessel and trade;
- Sufficient sea-chest capacity;
- Back pressure effect on consumers;
- Redundancy of sea water pumps;
- Electrical load analysis to confirm enough power available;
- Physical space on board;

COMMERCIAL CONSIDERATIONS

- Purchase price of scrubber systesm (CAPEX);
- Yard costs to install;
- Other commissioning costs (Class, design, 3D scanning, etc…)
- OPEX
- Offhire, positioning and repositioning costs;
- Manufacturer track record and reference list;
- Correct type of scrubber for your vessel and trade;
- Manufacturer lead time (order books filling up);
- Yard slot availability (slots at preferred yards are limited);
- Hybid/Closed-Loop: logistics for supply of neutralizing agent;
- Hybid/Closed-Loop: logistics for disposal of residues;

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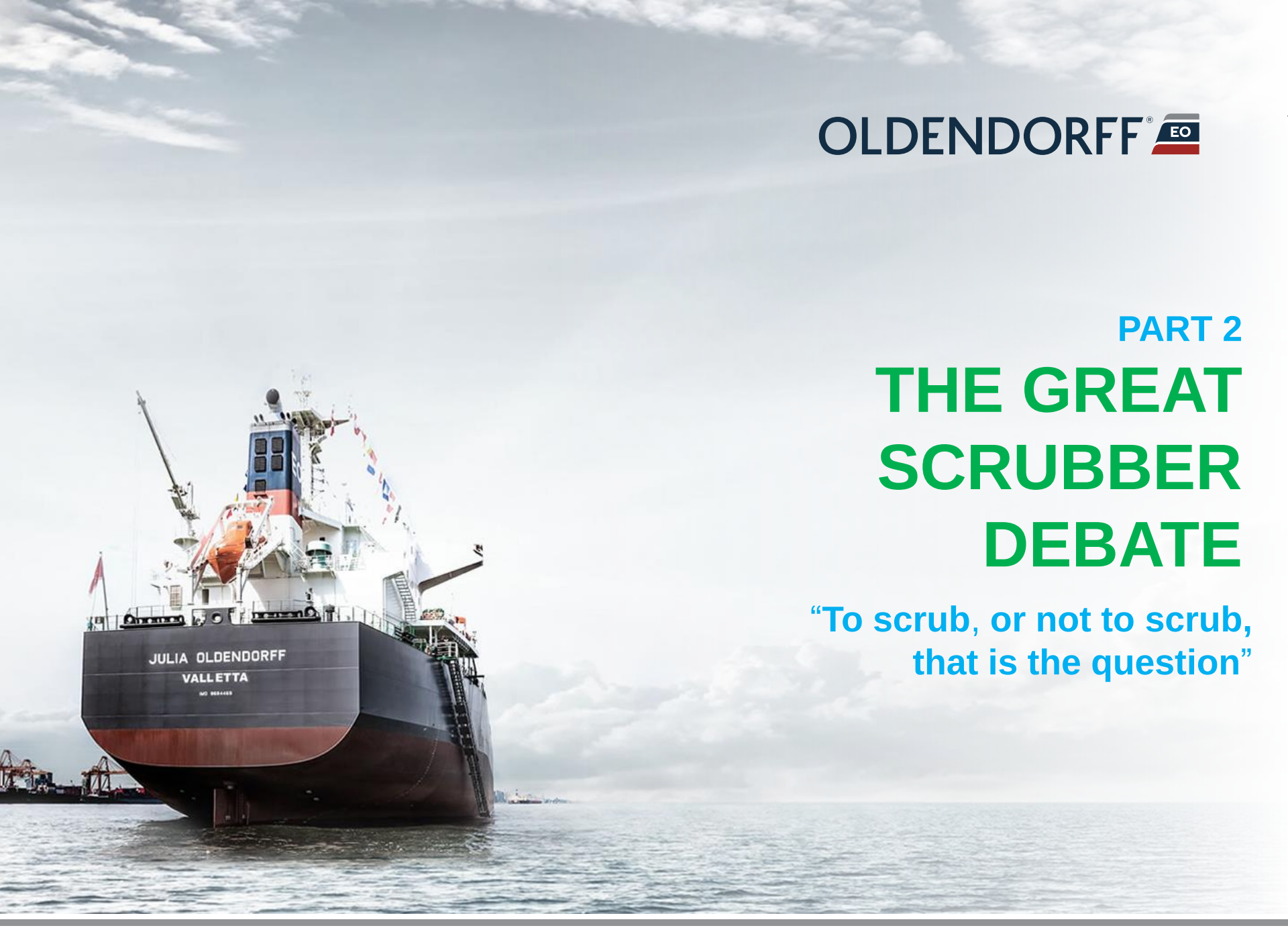

PART 2

THE GREAT SCRUBBER DEBATE

"To scrub, or not to scrub, that is the question"

THE **BIG** QUESTION TO ASK

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DO OPEN-LOOP SCRUBBERS HAVE A POSITIVE OR NEGATIVE NET ENVIRONMENTAL IMPACT TAKING INTO ACCOUNT BOTH AIR EMISSIONS AND WATER DISCHARGES?

BASELINE: VERY LOW SULPHUR FUEL OIL 0.50 % (VLSFO)

DID YOU KNOW ?

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92%

of the world‘s population

lives in places where

air pollution levels exceed the

WHO Ambient Air Quality Guidelines !

https://www.who.int/en/news-room/detail/27-09-2016-who-releases-country-estimates-on-air-pollution-exposure-and-health-impact

DID YOU KNOW ?

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1 in 8

premature deaths in the world

are linked to air pollution

(7 million deaths in 2012)!

https://www.who.int/en/news-room/detail/27-09-2016-who-releases-country-estimates-on-air-pollution-exposure-and-health-impact

DID YOU KNOW ?

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The WHO “safe“ limit for fine particulate matter is **10µg/m3**

PASS

ONLY **24** COUNTRIES

FAIL

171 COUNTRIES !

(representing 92% of the world‘s population)

☹

This means that **7.1 billion** people around the world are breathing in unsafe air !

https://www.who.int/en/news-room/detail/27-09-2016-who-releases-country-estimates-on-air-pollution-exposure-and-health-impact

HOW CAN SCRUBBERS HELP ?

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Scrubbers can capture and remove…

- ✓ UP TO 99% OF SULPHUR DIOXIDE
- ✓ UP TO 94% OF PARTICULATE MATTER
- ✓ UP TO 60% OF BLACK CARBON
- ✓ SIGNIFICANT AMOUNTS OF PAH

…from ships' exhaust gases!

SULPHUR DIOXIDE (SO_2)

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Colourless, toxic gas with a burnt match smell. Released naturally by volcanic activity. Produced as a by-product of the burning of fossil fuels contaminated with sulfur compounds.

- Chronic or long-term exposure to high levels of SO_2 leads to **breathing problems**, **respiratory illnesses** and even **heart disease**.
- Further oxidation of SO_2 causes **acid rain** which harms the environment, particularly forests and lakes; as well as damaging infrastructure, such as buildings and monuments.

PARTICULATE MATTER (PM)

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Sum of all solid and liquid particles **suspended** in the air, many of which are hazardous. When inhaled, some particles can get deep into your **lungs** and some may even get into you **bloodstream**

- Increased risk of **respiratory diseases**, such as asthma, bronchitis and flu.
- Increased risk of **lung diseases**, such as emphysema, chronic bronchitis and lung cancer.
- Increased risk of **cardiovascular conditions**, such as heart attacks and strokes.
- Increased risk of **dermatological diseases** and other cancers.

https://www.epa.gov/pm-pollution

BLACK CARBON (BC)

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Sooty black material emitted from gas and diesel engines, coal-fired power plants, and other sources that burn fossil fuels. Comprises a significant portion of particulate matter, which is an air pollutant. Significant negative impact on both **human health** and **climate change**.

HUMAN HEALTH

Estimated 4.9 million premature human deaths preventable annually by utilizing available mitigation measures to reduce BC in the atmosphere.

CLIMATE CHANGE

BC deposits itself on ice and snow. The absorbed heat increases surface temperature, thereby increasing the rate of melting and contributing to rising sea levels!

POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)

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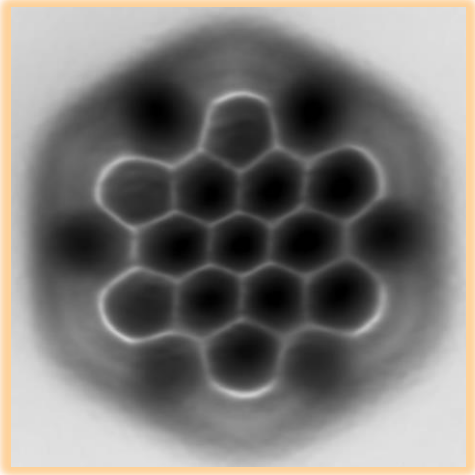

Organic compounds containing only carbon and hydrogen. Found in coal and in tar deposits. Produced by thermal decomposition of organic matter (e.g. in engines, incinerators or when biomass burns in forest fires).

CANCERS

- Lung
- Bladder
- Gastrointestinal
- Skin

DERMATOLOGICAL

- Irritation
- Inflammation
- Allergic reaction

OTHER CONDITIONS

- Decreased immune function
- Cataracts
- Kidney damage
- Liver damage
- Breathing problems

https://www.sciencedirect.com/science/article/pii/S1110062114200237

DID YOU KNOW ?

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Vessels running on
HSFO with a SCRUBBER
generate cleaner air emissions
than running on
VLSFO or MGO !

Samples 1, 2, and 3 below are taken from Sampling Point A (post-turbochargers) burning MGO.

MGO

Sample 1

Sample 2

Sample 3

Samples 4, 5, and 6 below are taken from Sampling Point C (post-DeSOx Tower) burning HFO.

HSFO + SCRUBBER

Sample 4

Sample 5

Sample 6

What about discharges into the sea?

DID YOU KNOW ?

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"If the sulphur in the sea were spread out as an even layer, the total ocean area of the world would be covered by a **5-foot thick (1.5 meter)** layer of sulphur.

If all the sulphur in all the known oil and coal reserves were added to this layer, the thickness would only increase by the thickness of a **sheet of paper."**

Source: Nyman and Tokerud (1991)

NOT A NEW TECHNOLOGY

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UNIVERSITY OF BERGEN
conducted a benthic survey before and after the deployment of a seawater scrubber at Norway's
MONGSTAD REFINERY
Investigations were carried out from March 1989 to October 1990.

- ✓ **No evidence of harmful impact on the marine bottom fauna at the seawater scrubber outlet was found;**
- ✓ **The bottom fauna was rich, with a moderate-to-high diversity and evenness in both sampling periods;**
- ✓ **The content in the sediment was within natural variations;**
- ✓ **The concentrations of all metals were within natural variations.**

PLENTY OF OPERATIONAL EXPERIENCE

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A scrubber was successfully fitted on the ro-ro vessel `**FICARIA SEAWAYS**` of DFDS back in July 2009 and now boasts **in excess of 10,000 operating hours, with SOx emissions well below the strict legal requirement of 0.1% applicable to the European ECAs**.

Are there any reputable independent studies available supporting the use of SCRUBBERS?

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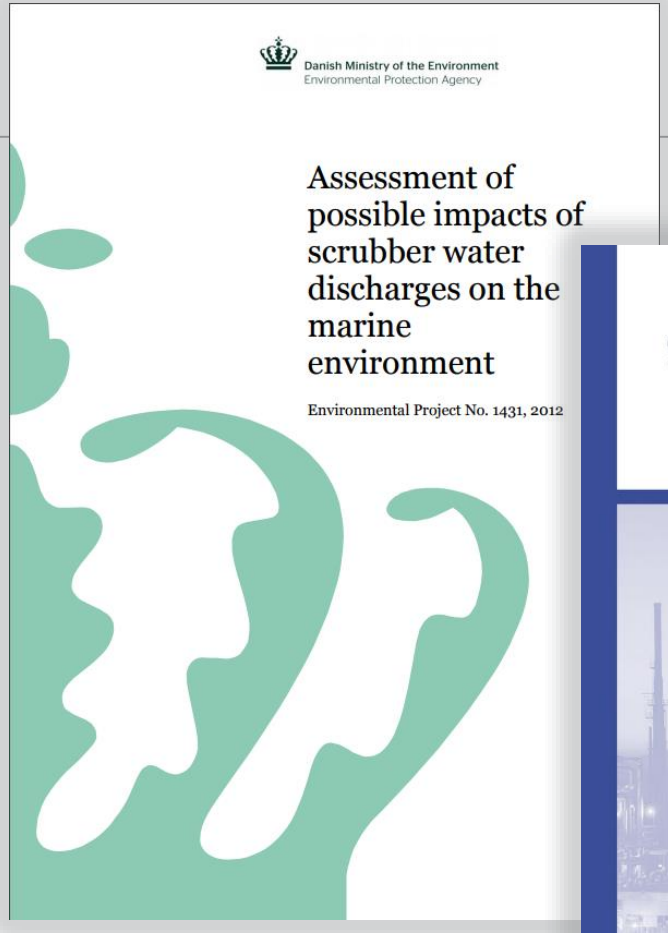

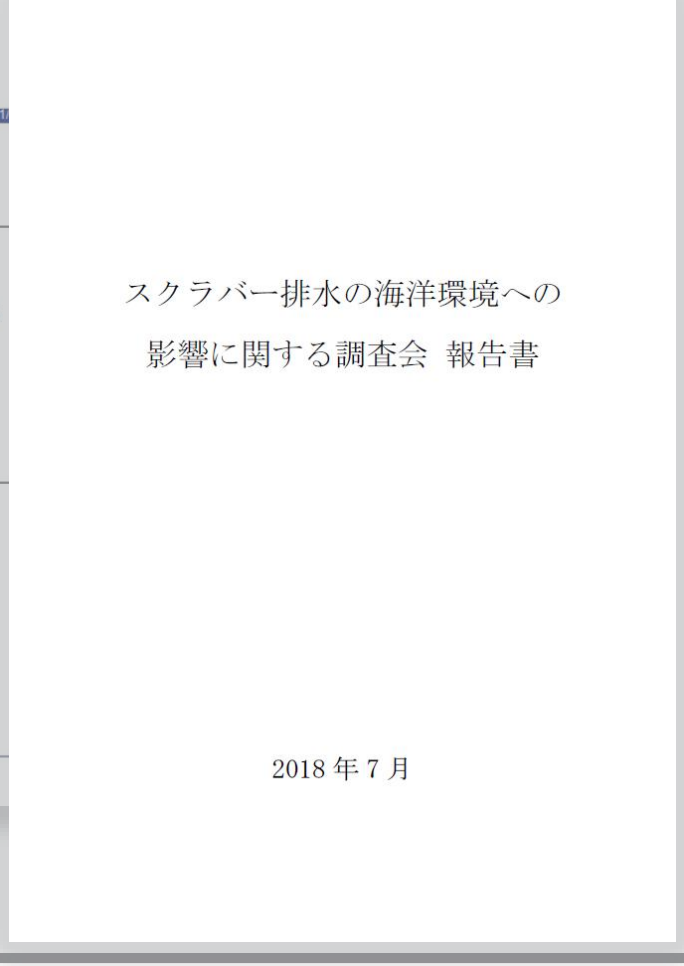

Where do other Administrations stand on SCRUBBERS?

UNITED KINGDOM

"The Government has not seen any evidence that the use of scrubbing technology would have any significant effect on the marine environment."

Parliamentary Under-Secretary of State for Transport - UK

JAPAN

"The probability of it (scrubber wash water) affecting marine life and water quality is extremely low both in the short term and the long term."

Ministry of Land, Infrastructure, Transport and Tourism (MLIT) - JAPAN

SAUDI ARABIA

"Saudi Arabia accepts the discharge wash water parameters as per section 10 of IMO RESOLUTION MEPC.259(68)."

MAWANI - Saudi Ports Authority

AUSTRALIA

"EGCS to be operated in compliance with the International Maritime Organization's (IMO) 2015 Guidelines for Exhaust Gas Cleaning Systems (MEPC.259(68)) … and allow for the discharge of wash water in Commonwealth waters."

Australian Maritime Safety Authority (AMSA)

APPROVALS RECEIVED THUS FAR

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- ✓ Australia (AMSA)
  - ✓ Northern Territory
  - ✓ Queensland
  - ✓ South Australia
  - ✓ Tasmania
  - ✓ Victoria
  - ✓ Western Australia
- ✓ Canada
- ✓ Chile
- ✓ Colombia
- ✓ Estonia
- ✓ Finland
- ✓ India
- ✓ Italy
- ✓ Marshall Islands
- ✓ Norway
- ✓ Poland
- ✓ Saudi Arabia
- ✓ South Africa
- ✓ Trinidad & Tobago
- ✓ United Arab Emirates
- ✓ United Kingdom

ACCEPTED BY THE IMO

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" While ships are within SOx emission control areas, at least one of the following conditions shall be fulfilled…

…an exhaust gas cleaning system, approved by the Administration

…is applied to reduce the total emission of sulphur oxides from ships"

MARPOL Annex VI, Chapter 3, Regulation 14, Section 4

Always consider the big picture. Full life cycle comparison of each fuel.

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“The production of fuels with lower sulphur will lead to increased CO2 emissions from the refining industry. Making use of on-board scrubbers will result in lower overall CO2 emissions versus desulphurization of fuels in refineries.”

Page IV, CONCAWE Report No. 1/18

COMING BACK TO THAT **BIG** QUESTION…

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DO OPEN-LOOP SCRUBBERS HAVE A POSITIVE OR NEGATIVE NET ENVIRONMENTAL IMPACT TAKING INTO ACCOUNT BOTH AIR EMISSIONS AND WATER DISCHARGES?

ANSWER = POSITIVE NET ENVIRONMENTAL IMPACT

BASELINE: VERY LOW SULPHUR FUEL OIL 0.50 % (VLSFO)

CLEANSHIPPINGALLIANCE2020

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- UK-registered not-for-profit organisation representing 37 leading shipowners, operators and charterers, advocating for the wider acceptance of EGCS technology;
- Goal is to promote the use of EGCS as the most viable and sensible option for full and reliable compliance with the IMO 2020 Global Sulphur Limit;
- Engage with the broader shipping community to ensure the facts prevail over the fiction, concerns are appeased, and the many advantages EGCS offer to improving air quality are known and merited.
- www.cleanshippingalliance2020.org

Thank you very much
for your attention

Scrubber calibration requirements

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No.	Item	Calibration intervals
1	Continuous Emissions Monitoring System (CEMS)	Validation with zero gas: automatically performed daily Internal adjustment: automatically performed monthly
2	Washwater Monitoring System (WMU)	Every 3 months
3	pH Sensor (stand alone sensor)	Every 3 months
4	Pressure Transmitter	Check during commissioning
5	Temperature Transmitter	Check during commissioning
6	Level Switches	Check during commissioning

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After completion of all technical and survey office aspects, the Classification Society informs the Flag State Administration on the approval to enable them to notify IMO, in accordance with Regulation 4.2 of Annex VI of MARPOL 73/78, of the installation of an “Equivalent” SOx Exhaust Gas Cleaning System for Compliance with Regulation 14 of Annex VI.

The following letters, statutory documentation and supporting documentation are submitted to Flag:

- ✓ Flag Notification Letter
- ✓ Statutory Approval letter
- ✓ EGC Technical Manual (ETM-B)
- ✓ On-Board Monitoring Manual (OMM)
- ✓ SOx Emission Compliance Plan (SECP B)
- ✓ EGC Record Book
- ✓ pH Analysis of Discharged
- ✓ Marpol Test Plan
- ✓ CEMS and WMU Validation
- ✓ Surveyor Report