

Scrubbers: Closing the Loop

Activity 4: Ship – Shore Guidelines



Working together
for a safer world

SOx Scrubber : Inflows & Outflows – MEPC Guidelines

1997

MARPOL ANNEX VI

Reg 14(4)(b)

Total SOx - 6.0g/kWh

Waste streams not to be discharged into enclosed ports, harbours or estuaries unless it can be thoroughly documented by the ship that such will have no adverse impact on those ecosystems



Scrubbed Exhaust Gas
Meeting Emission Ratio

Discharge Water
Meeting pH, PAH &
Turbidity criterion

2017

MARPOL Annex VI

Reg 4 Equivalents

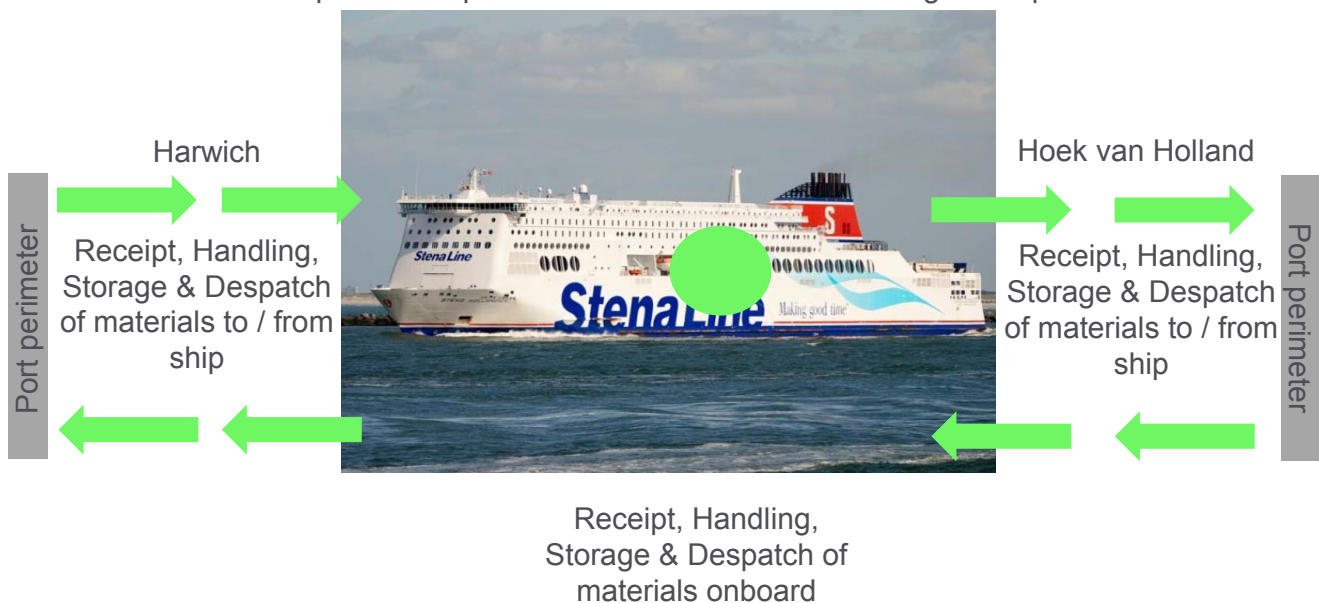
At least as effective as the given means without generating other unacceptable by-products

MEPC.259(68)

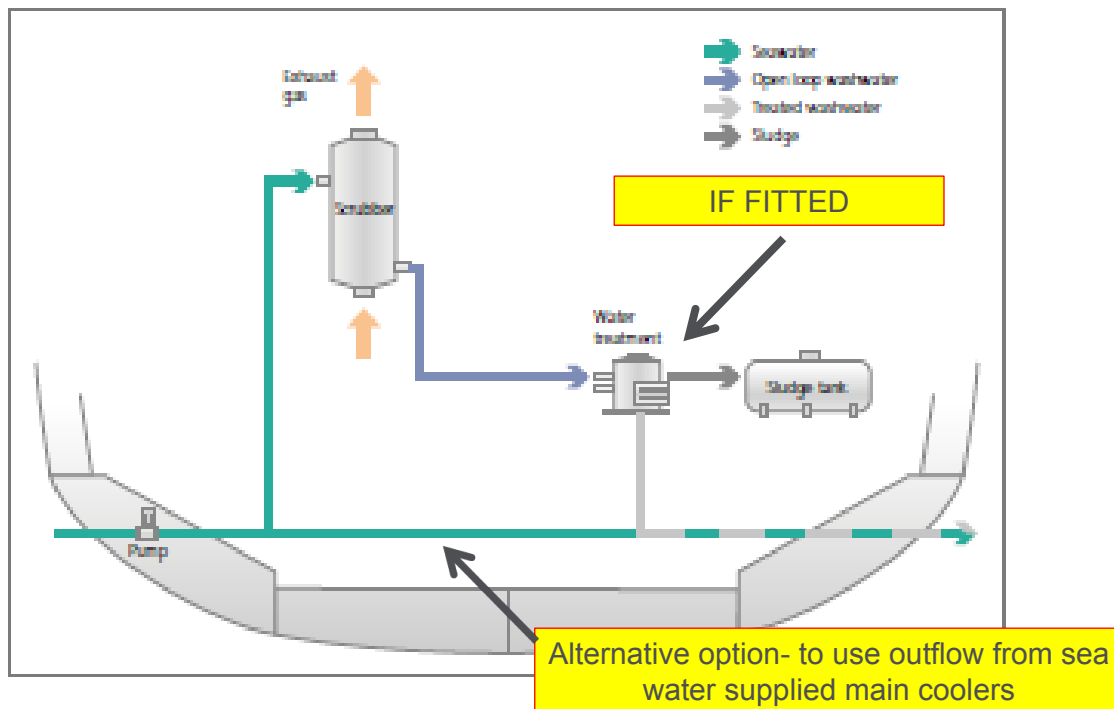
(MEPC.71/9/1)

Closing the Loop - Activity 4: Guidelines Ship – Shore Inflows & Outflows :Consumables used – Products generated

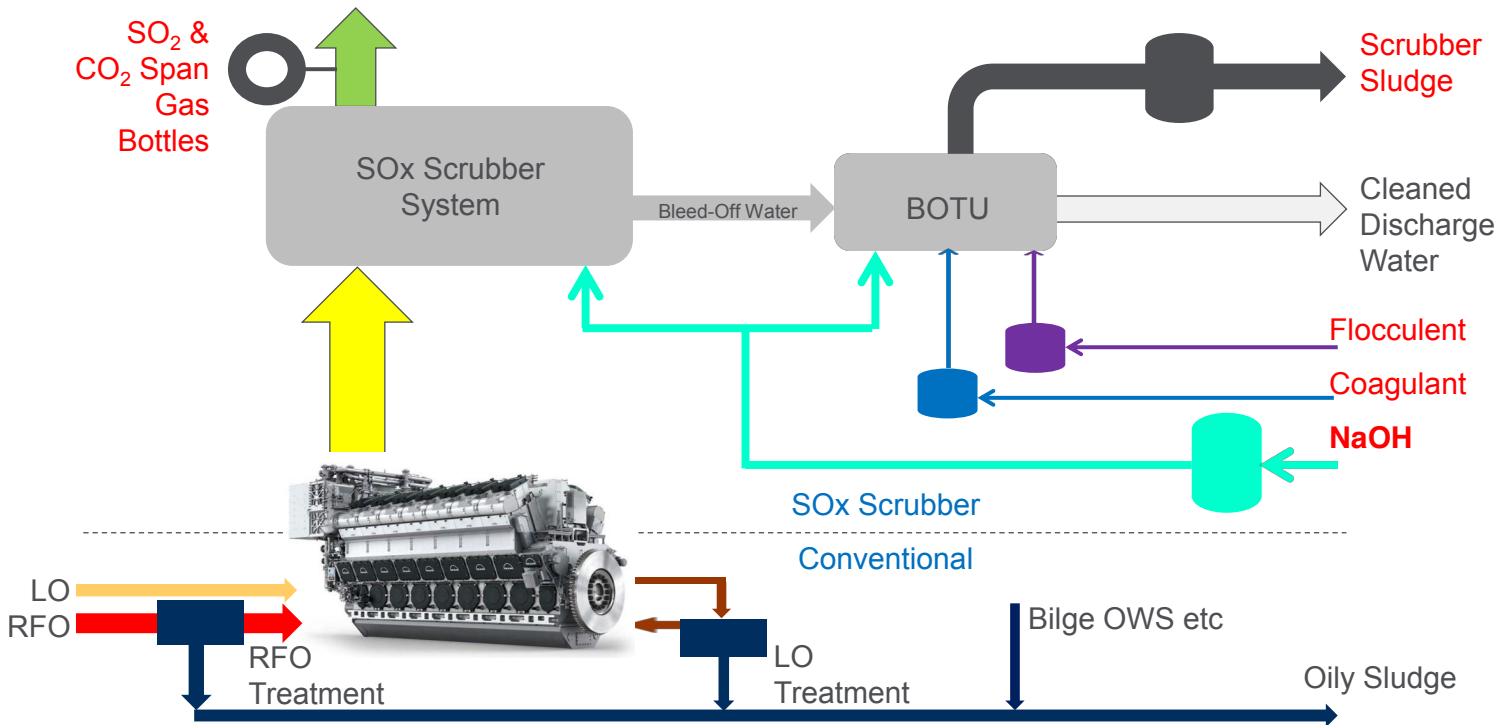
Risk Assessments of consumables used / products generated to develop the required best practice chemical and waste management procedures



Open Loop Scrubbers



Project – Closed Loop Scrubber, Consumables and Products



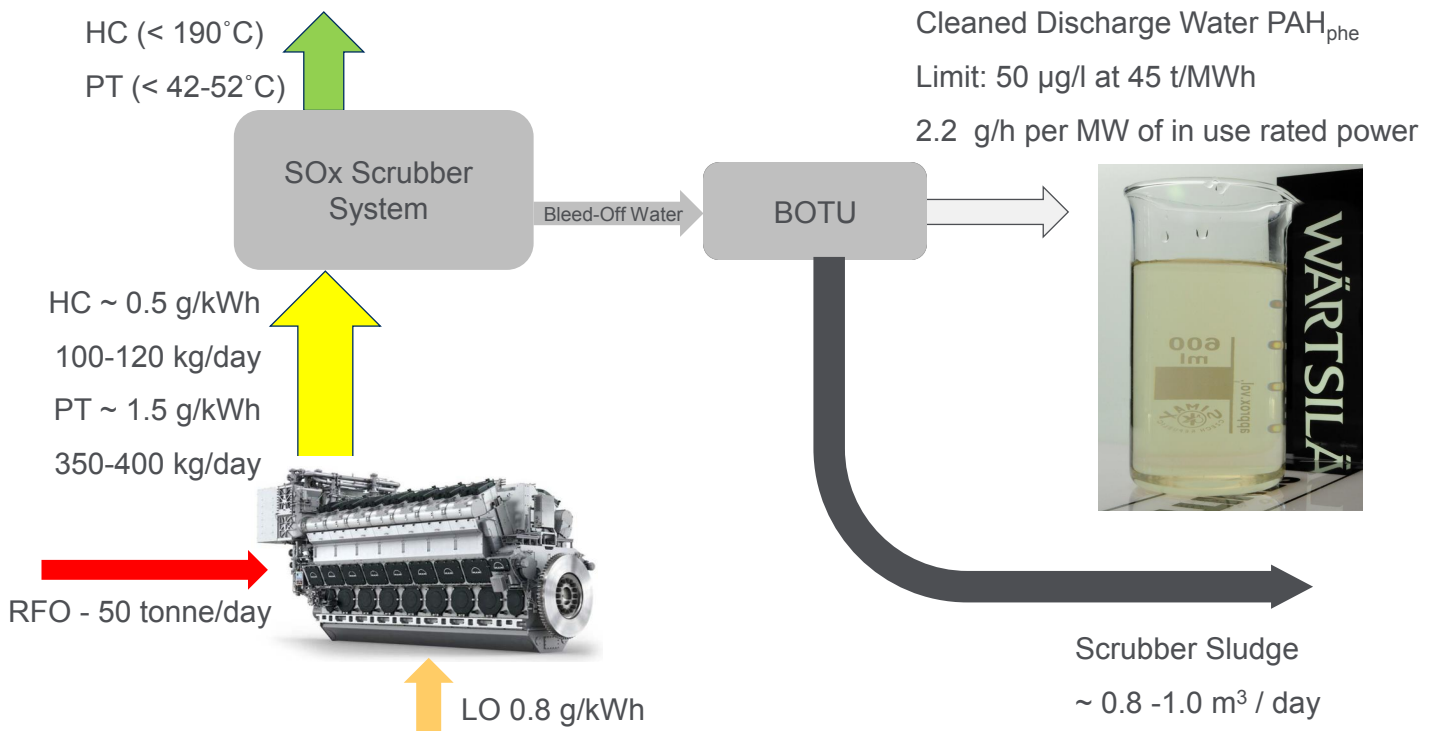
Consumables: Caustic Soda – NaOH – 50% solution

Consumption	5 litre / MWh x S % 50 tonne 2-3% sulphur fuel oil / day ~ 2.5 – 4.0 m ³ / day
Properties	Odourless, colourless and non-flammable pH 14 Density 1.5 – 1.53 at 20° C Freezing point: 12-14 °C
Hazards	Highly corrosive and reactive Burns skin or eye on contact or internal organs on ingestion Inhalation – lung damage Exothermic with water – H ₂ yield with base metals ie Al, Zn etc



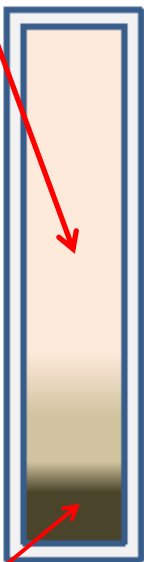
Activity 4 Guidelines to cover supply, loading, on board storage and use
Usual and other in-service conditions
Emergency situations

Products: Scrubber Sludge – Hydrocarbon Routing



Products: Scrubber Sludge - Composition

~ 80 – 90 % water



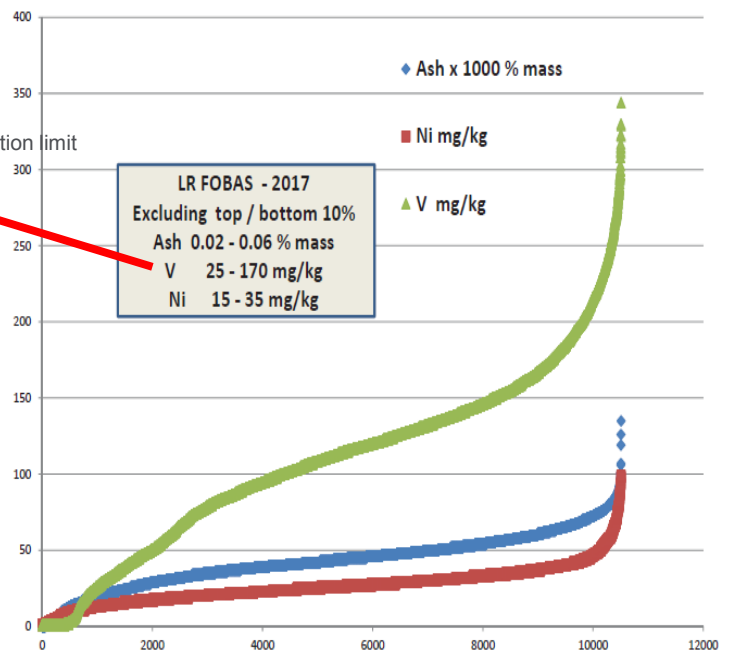
~20 – 10 % residue

Example of 'Dry' Sludge Composition

Sulphur	79 g/kg
Hydrocarbons	111 g/kg
PAH	230 mg/kg
Dioxins / furans	26 ng/kg
PCB	> 1 µg/kg detection limit
Vanadium	12 g/kg
Nickel	5.4 g/kg
Copper	1.1 g/kg

DMA Environmental Project No. 1431
COWI 2012

In view of hydrocarbon, vanadium and nickel components scrubber sludge, as an operational waste, is classified as hazardous and must be stored, handled and disposed of accordingly



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