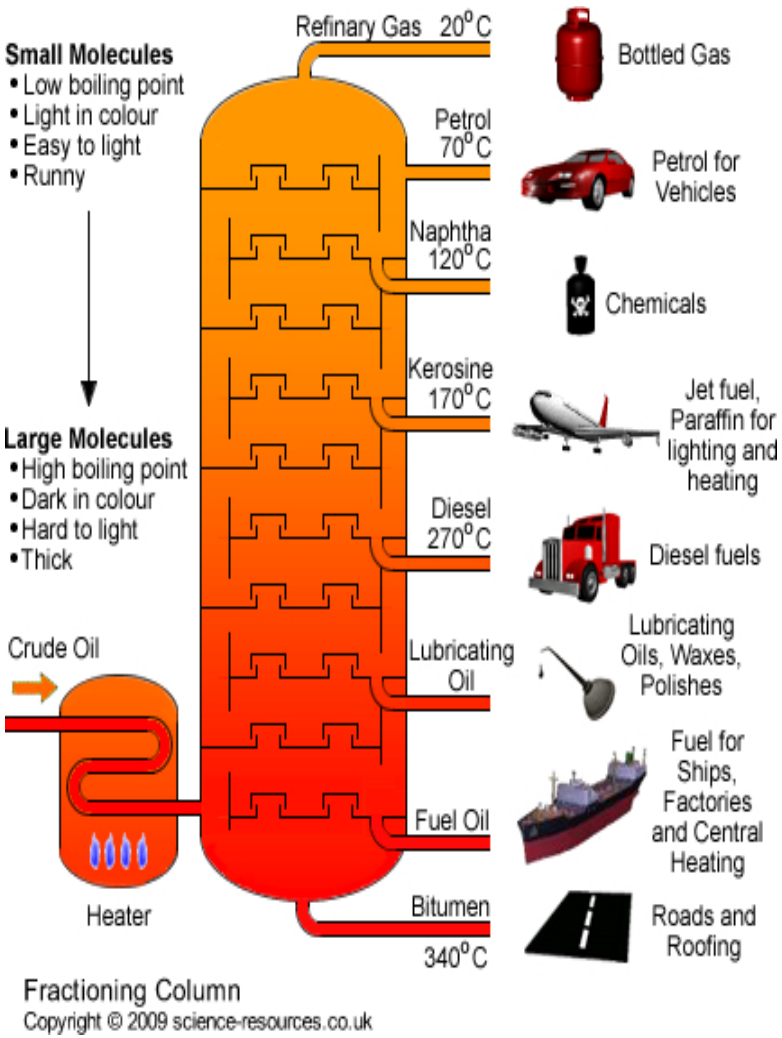
Methanol as Ship Fuel Handling of Safety Matters

Lund

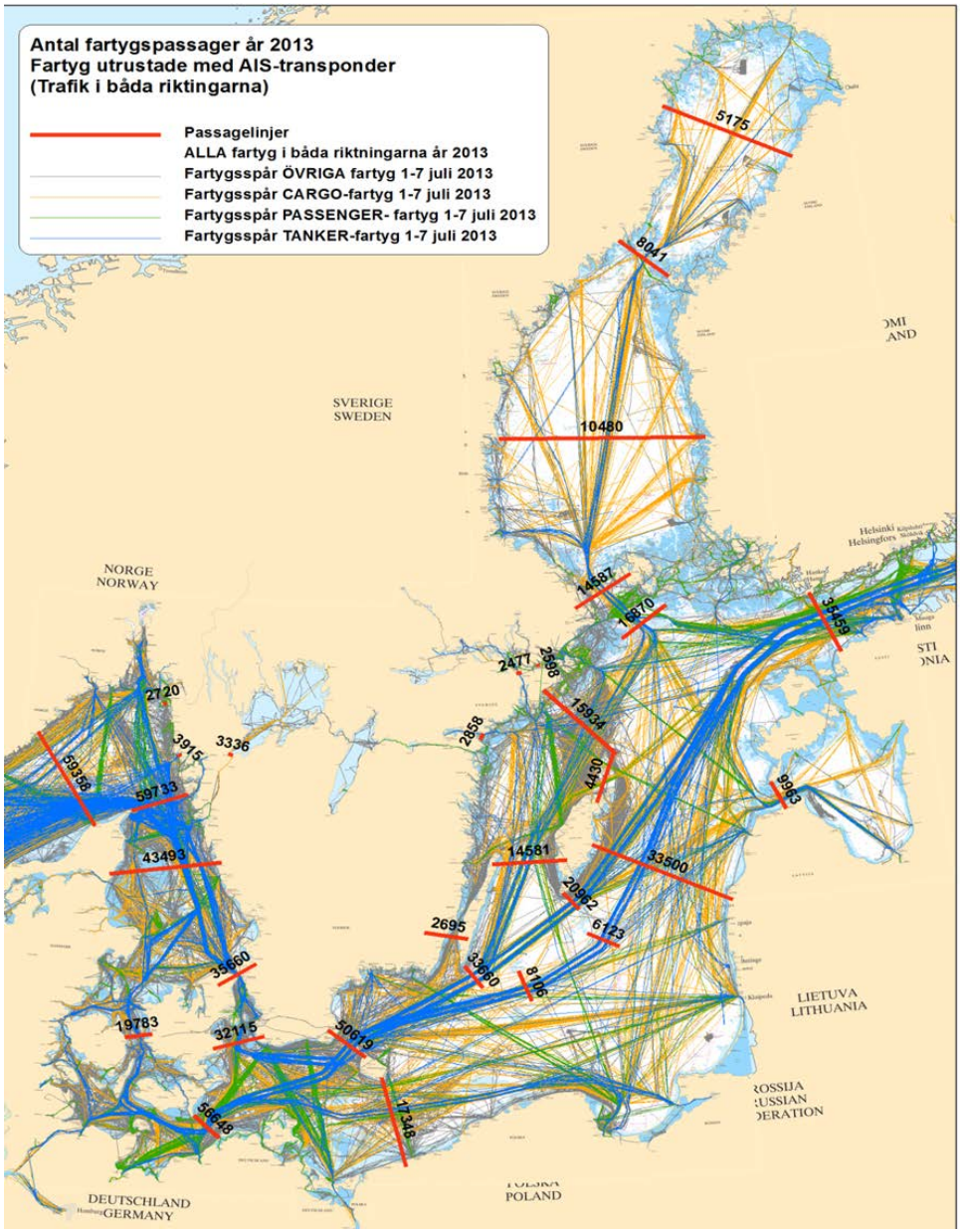
17th March 2015

Ulf T Freudendahl

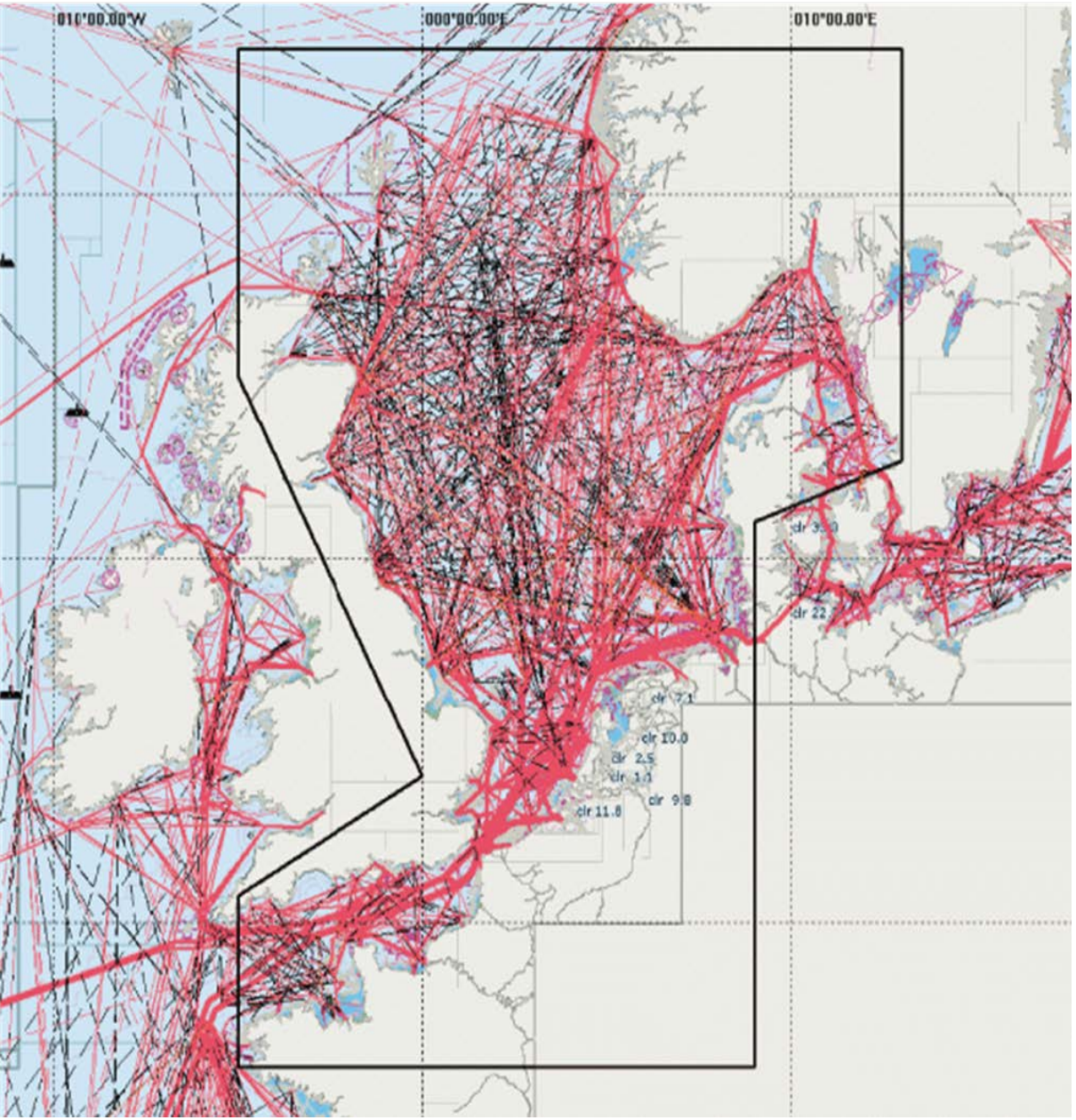
Ship Fuel today – Flashpoint > 60 deg C



Heavy Fuel Oil – max 3.5% sulphur
Marine Gas Oil – max 0.1% sulphur
(Truck Diesel – max 0.001% sulphur)

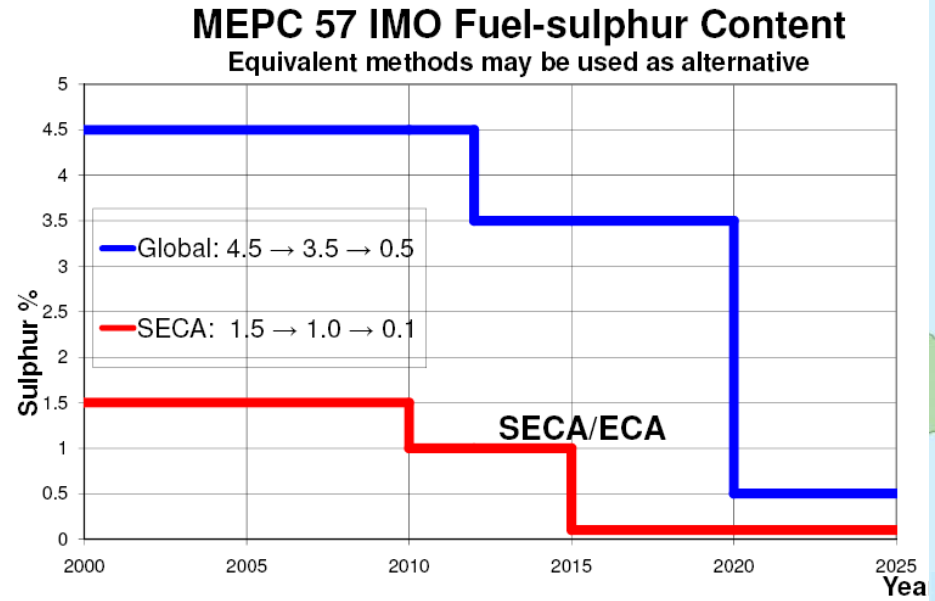


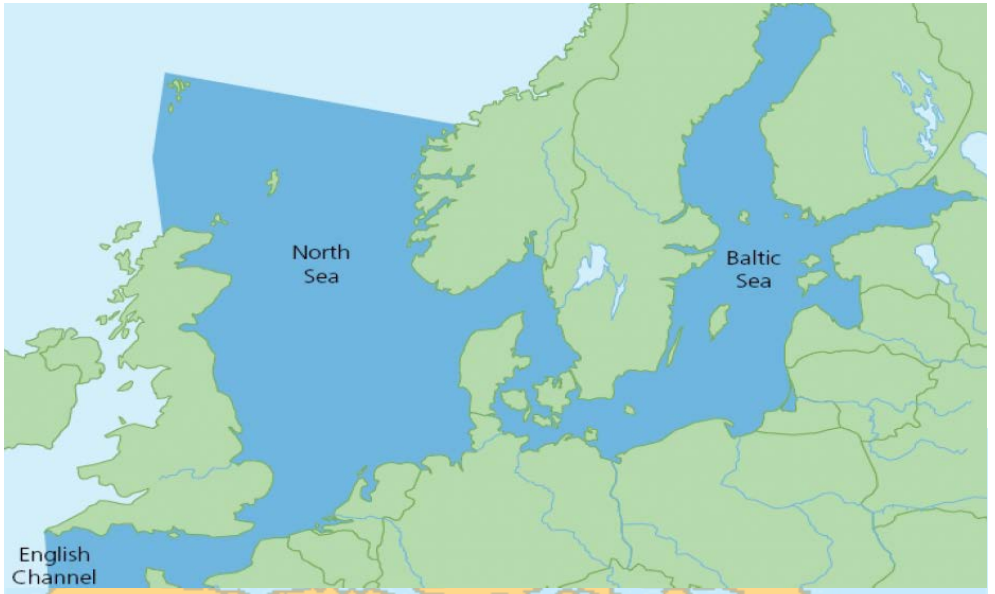
- At least 2000 ships move in the Baltic at any moment.
- Around 20 Mill ton fuel per year is consumed
- 20 Mill ton fuel containing 2.5% sulpur equals 500.000 ton

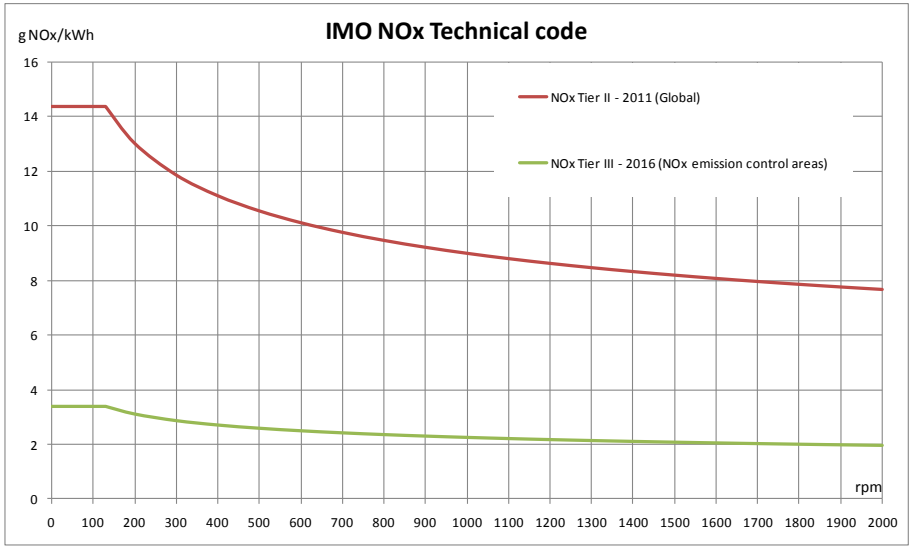


- The North Sea is even more traficated than the Baltic Sea

Max 0.1% sulphur in fuel 1st Jan 2015



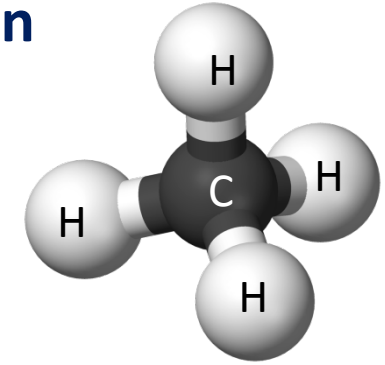




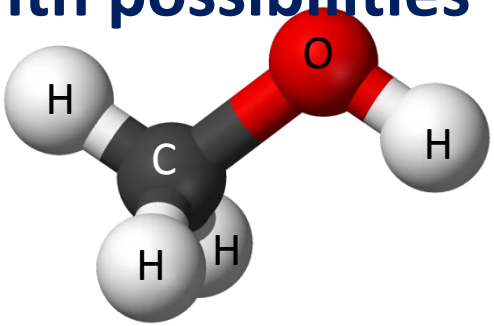
Heavy Fuel Oil + Scrubber or Marine Gas Oil max 0.1% Sulphur

Low flash point fuels - LNG & Methanol

- **Liquefied Natural Gas –LNG-has potential to be an important energy source for marine propulsion**
- Flashpoint : -188 to -135 deg C
- Boiling Point: -163 deg C



- **Methanol is also an efficient energy carrier with high potential for marine propulsion and with possibilities to be renewable**
- Flashpoint: 11 deg C
- Boiling point: 65 deg C



The world fleet

- Around 90.000 ships.

Continously improved safety records

- Around 400 LNG Carriers

Excellent safety records

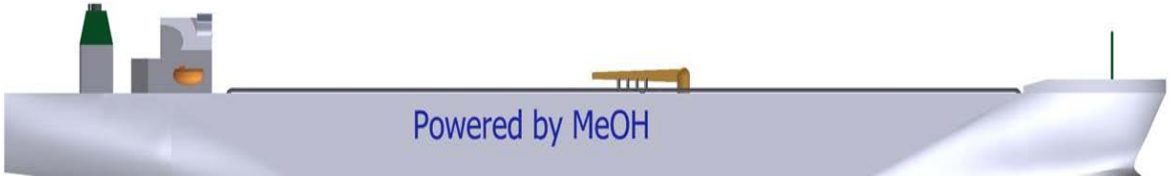
- 57 LNG Fuelled ships

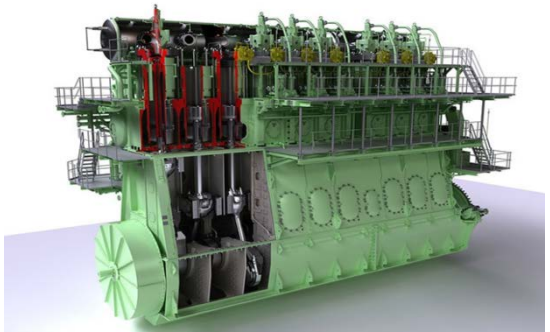
Excellent safety records

Methanol fuelled ships

- One very large Ro-Pax under conversion
- STENA GERMANICA

- Seven x 50.000 tdw on order





Rules and regulations for transportation of gases and low flashpoint liquids

- International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk. **The IGC Code**

- International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk**. The IBC Code**

Existing Rules & regulations for low flash point fuels.

- IMO Res MSC.285(86). INTERIM GUIDELINES ON SAFETY FOR NATURAL GAS-FUELLED ENGINE INSTALLATIONS IN SHIPS. The ”IGF-Code”. Adresses only natural gas as fuel.
- LR. Rules and Regulations for the Classification of Natural Gas Fuelled Ships. Adresses natural gas and natural gas in combination with oil.
- DNV. Gas Fuelled Ship Installations. Adresses natural gas as fuel and gives opening for other fuels after special consideration.
- Other Class Societies Rules.

The DRAFT INTERNATIONAL CODE OF SAFETY FOR SHIPS USING GASES OR OTHER LOW FLASH POINT FUELS (IGF CODE). Part A-1 soon ready.

Intended fuels:

- **Natural Gas (LNG) CH4** IGF Code Part A-1 Norway
- Propane C3H8
- Butane (i and n) C4H10
- Propane/Butane mixtures
- Ethyl alcohol C2H5OH IGF Code Part A-2
- **Methyl alcohol CH3OH** IGF Code Part A-2 Sweden
- Hydrogen H2
- Dimethyl-ether CH3OCH3

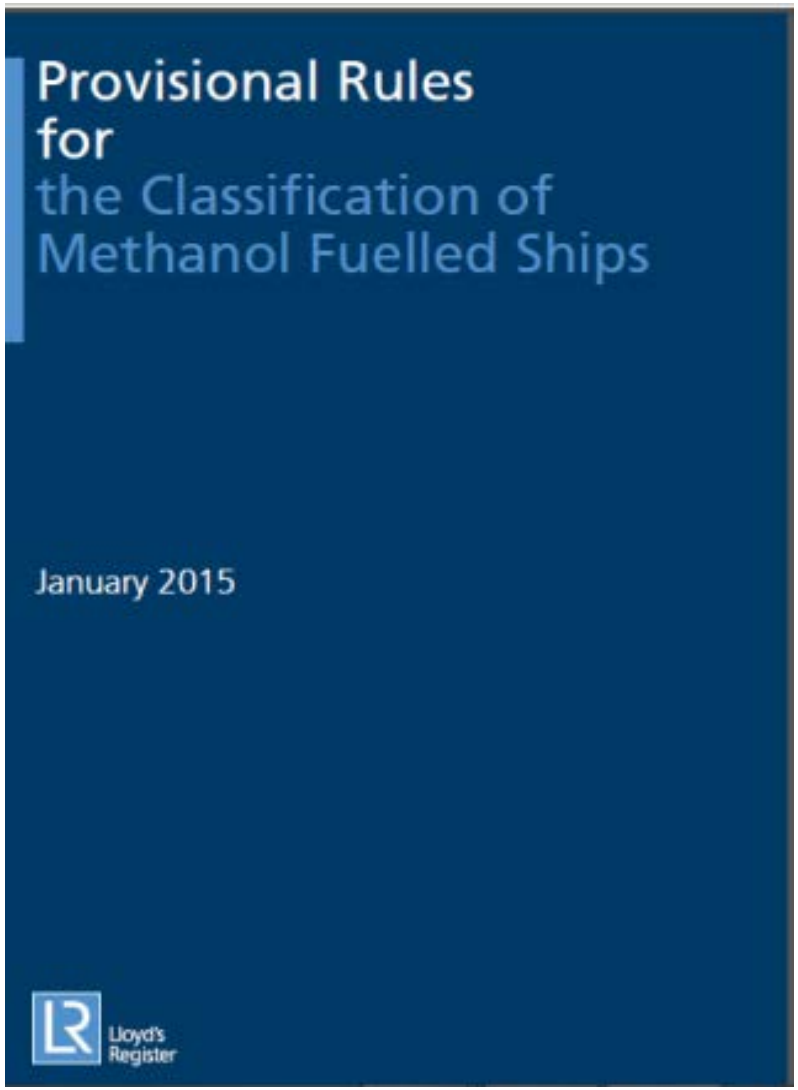
Draft IGF Code. Gap LNG - Methanol

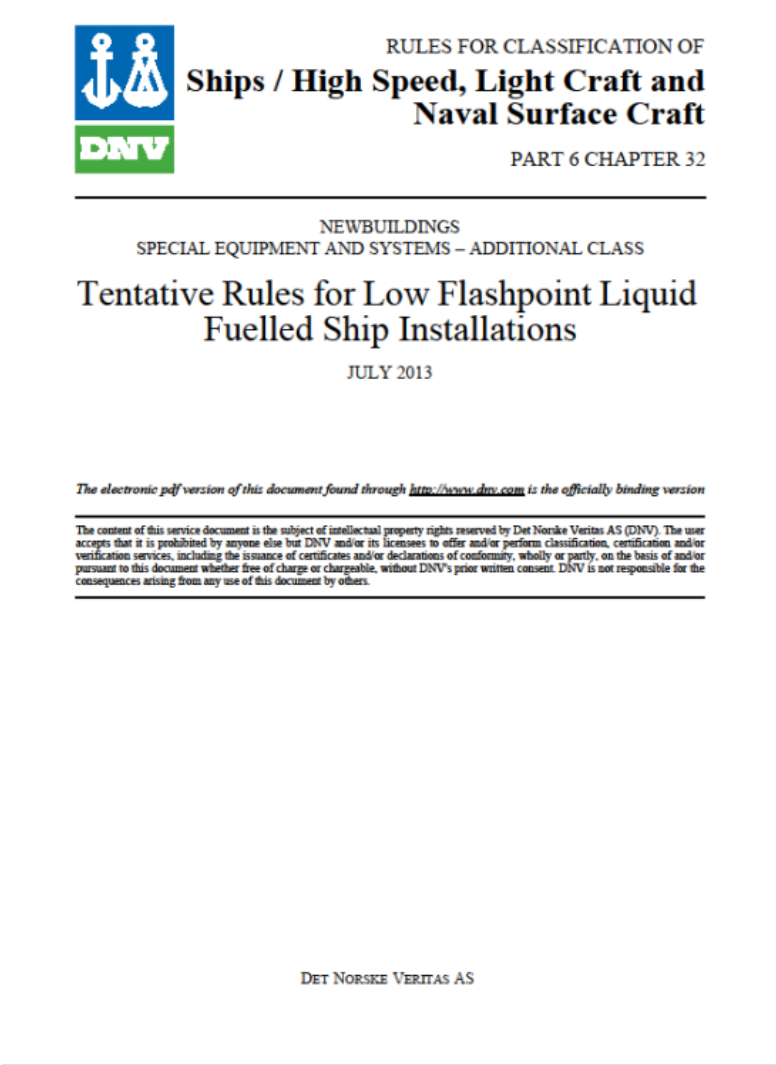
GAP Matrix LNG and Methanol

A	A	A	A	A-1	A-1	A-1	A-1	A-1	A-1	A-1	A-1	A-1	A-1	A-1	A-1	B	B	B
Preamble	General & Def.	Goal & funct. req.	General requir.	Ship deasign and arr.	Fuel containment syst	material & gen pipe design	Bunkering	Fuel supply to consumers	Power generation	Fire safety	Explosion protection	Ventilation	Electrical installation	Control, monitoring & safety syst	Alternative design	Manufacture, workmanship & test	Training an op requirement	Op requirements (bunkering)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
				5.1	6.1	7.1	8.1	9.1	10.1	11.1	12.1	13.1	14.1	15.1	16.1	17.1	18.1	19.1
				5.2	6.2	7.2	8.2	9.2	10.2	11.2	12.2	13.2	14.2	15.2	16.5	17.2	18.2	19.2
				5.3	6.3	7.3	8.3	9.3	1)	11.3	12.3	13.3	14.3	15.3		17.3	18.3	19.3
				5.4	6.4	7.4	8.4	9.4		11.4	12.4	13.4		15.4		17.4	18.4	19.4
				5.5	6.5		8.5	9.5		11.5	12.5	13.5		15.5		17.5	18.5	19.5
				5.6	6.6		8.6	9.6		11.6		13.6		15.6		17.6	18.6	19.6
				5.7	6.7			9.7		11.7		13.7		15.7			18.7	
				5.8	6.8			9.8		11.8		13.8		15.8				
				5.9	6.9			9.9				13.9		15.9				
				5.10										15.10				
				5.11														
				5.12														
				5.13														

Valid for LNG as well as methanol
Partly valid for methanol or valid after interpretration
Not valid for methanol
Additional requirements for Methanol

Classification Societies Rules for Methanol fuelled Ships





RULES FOR CLASSIFICATION OF

Ships / High Speed, Light Craft and Naval Surface Craft

PART 6 CHAPTER 32

NEWBUILDINGS
SPECIAL EQUIPMENT AND SYSTEMS – ADDITIONAL CLASS

Tentative Rules for Low Flashpoint Liquid Fuelled Ship Installations

JULY 2013

The electronic pdf version of this document found through http://www.dnv.com is the officially binding version

DET NORSKE VERITAS AS

Threat to Safety - Fire

- A considerable part of all total losses start with fire in the engine room.
- 80% of all fires in the engine room start with fuel coming in contact with hot surface. Usually the fuel comes from damaged fuel pipes.
- The figures comes from oil fuelled ships with fuels having a flashpoint above 60 degrees C
- So far the low flash point fuelled (LNG) ships have an extremely good fire safety record.

80% of all engine room fires… Double walled pipes

- Ventilated annular space.
- 30 air changes per hour.
- Gas and liquid detection in the annular space.
- Alarm and automatic shut down of fuel system.

Fire fighting onboard

- CO_2

- Water mist

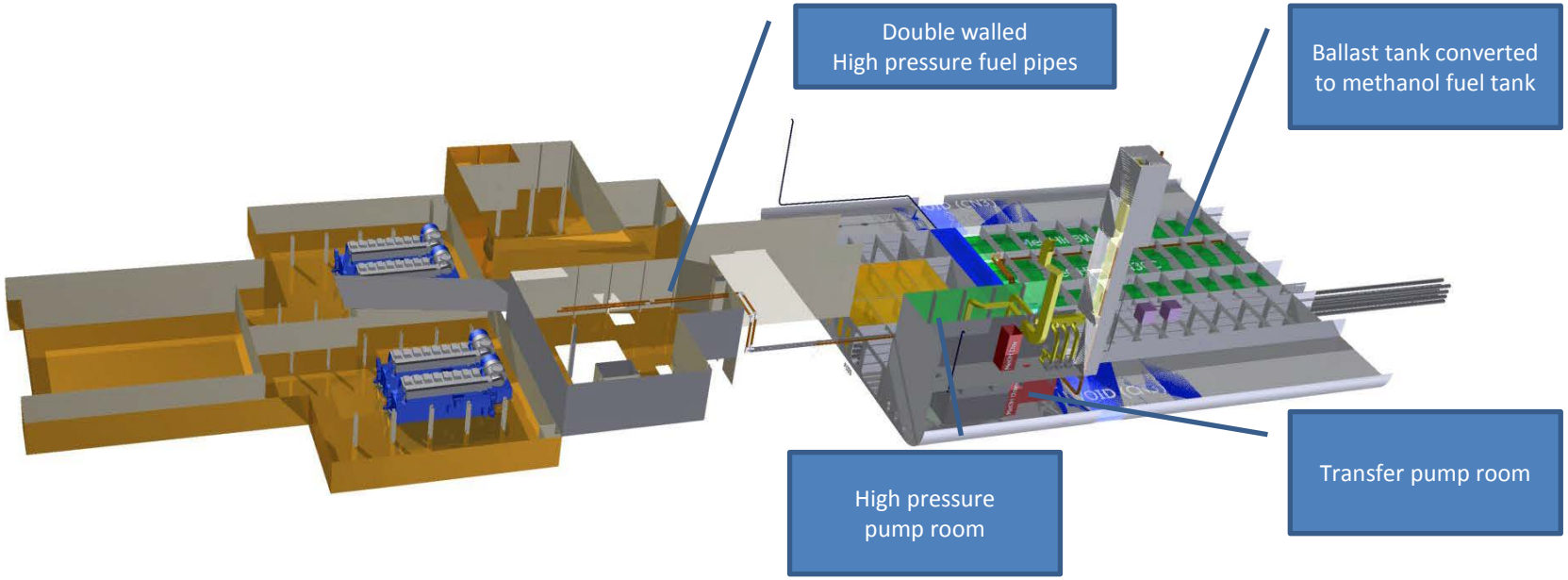
- Alcohol resistant foam

Methanol tank at Perstorp
100.000 ton per year

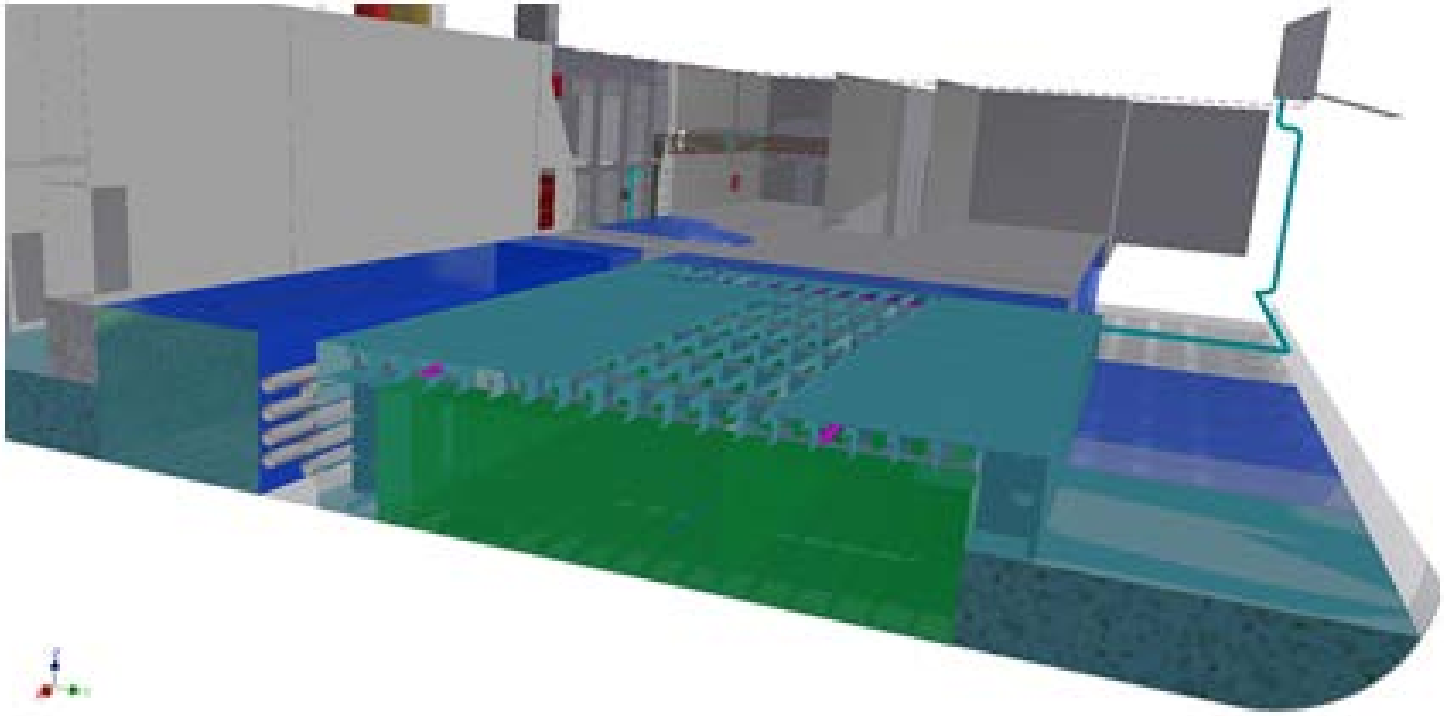
Ships – other than chemical carriers - <u>transporting</u> methanol

- DNV Pt 5 Sec 8 B 102. Where not bound by bottom shell plating or pump room, the tanks shall be surrounded by cofferdams.


Making good time
Stena Line


Double walled
High pressure fuel pipes
Ballast tank converted
to methanol fuel tank
High pressure
pump room
Transfer pump room

Where not bound by bottom shell plating or pumproom, the tanks shall be surrounded by cofferdams



Threat to safety - Explosions

Explosion ranges

- Methanol 6.7 – 36 %

- Methane 5.0 - 15 %

- Petrol 1.4 - 7.6 %

Methyl alcohol tanks shall be inert. Nitrogene is preferred.

Nitrogene Generator

Nitrogene Bottles

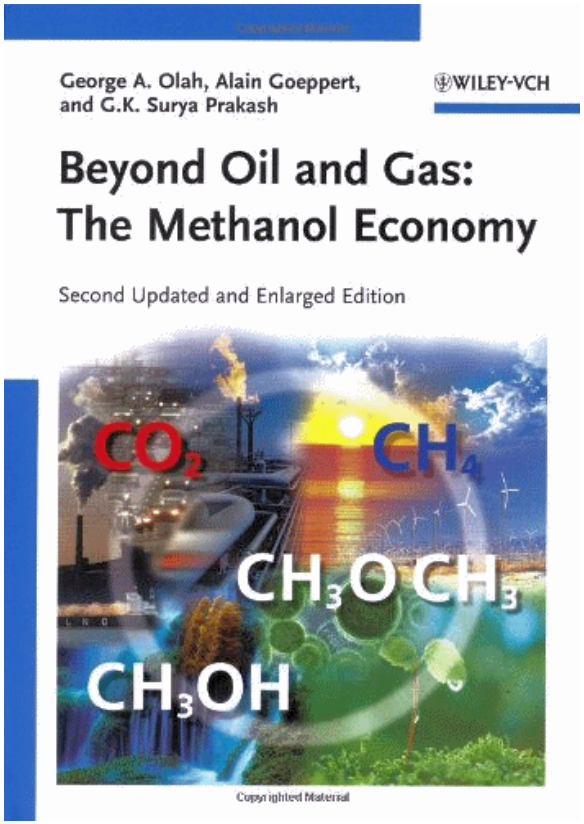
Fuel storage onboard

- Methyl alcohol is relatively simple to store onboard.
- We can use double bottom tanks which cannot be used for anyhing else than water ballast.
- Methyl alcohol is totally diluteable in water and biodegradeable.

Summary

- Methanol is a clean low flash point fuel fullfilling upcoming requirements.
- The methanol fuel containment system onbord and the infra structure ashore are considerably less expensive than for LNG
- Rules and regulations exist to a large extent and are under further development. In many parts similar requirements as for LNG.
- There is no doubt we can handle safety issues re methanol onbord used for fuel
- The existing methanol industry can coop with an increase in demand of 20 mill ton.

Georg A. Olah
Nobel Price Chemistry 1994



Thank you for listening.