MethaShip – Methanol as long term solution for climate neutral shipping

Research & Development
Daniel Sahnen

1st Sustainable Shipping Technologies Forum (SSTF)
Graz, September 27th 2019

MEYER WERFT
PAPENBURG 1795

MEYER Group

MEYER WERFT
PAPENBURG 1795

NEPTUN WERFT
ROSTOCK 1850

MEYER TURKU
SHIPYARD 1737

MEYER Group ships

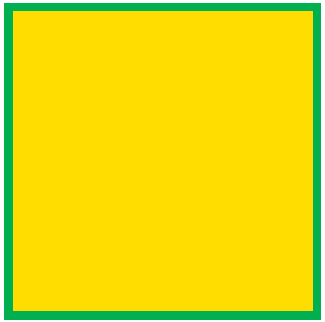
Content

- Methanol ship design
- Properties
- Feasibility & Readiness
- Renewable Methanol

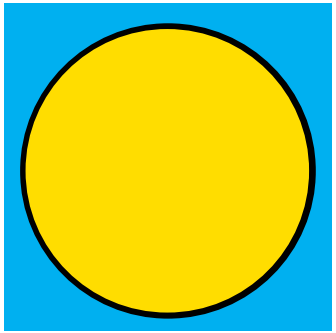
Space for Energy Storage

Equal amount of energy:

Diesel/
Heavy Fuel Oil



Methanol
incl. secondary barrier

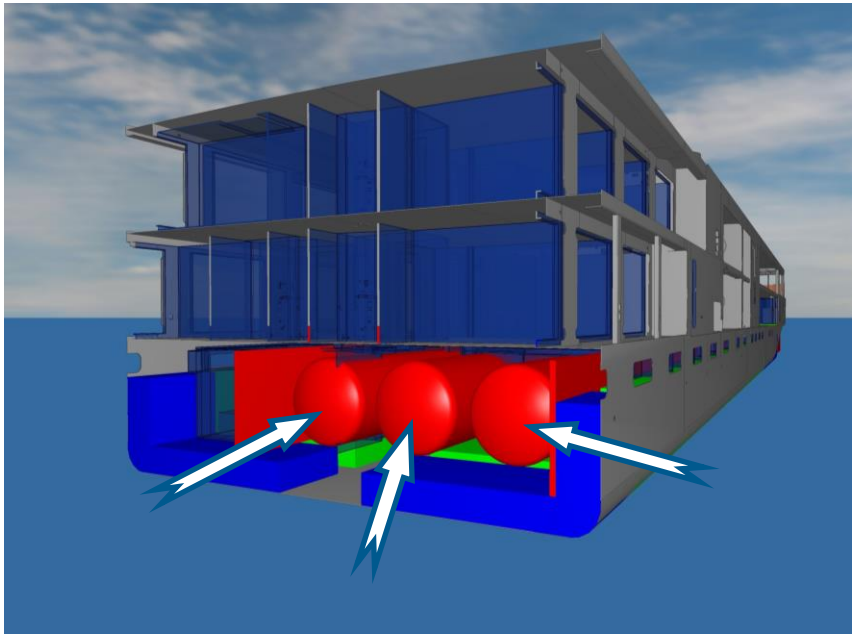


LNG (@-162°C)
incl. insulation and
tank holding space

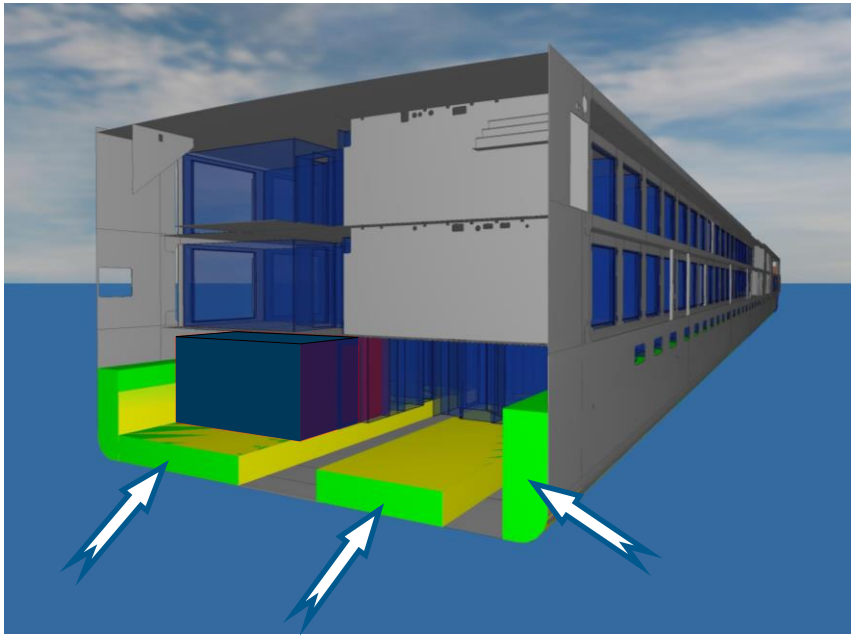
Space demand for the whole system needs to be looked at

Energy Storage on Board

Methane (LNG)



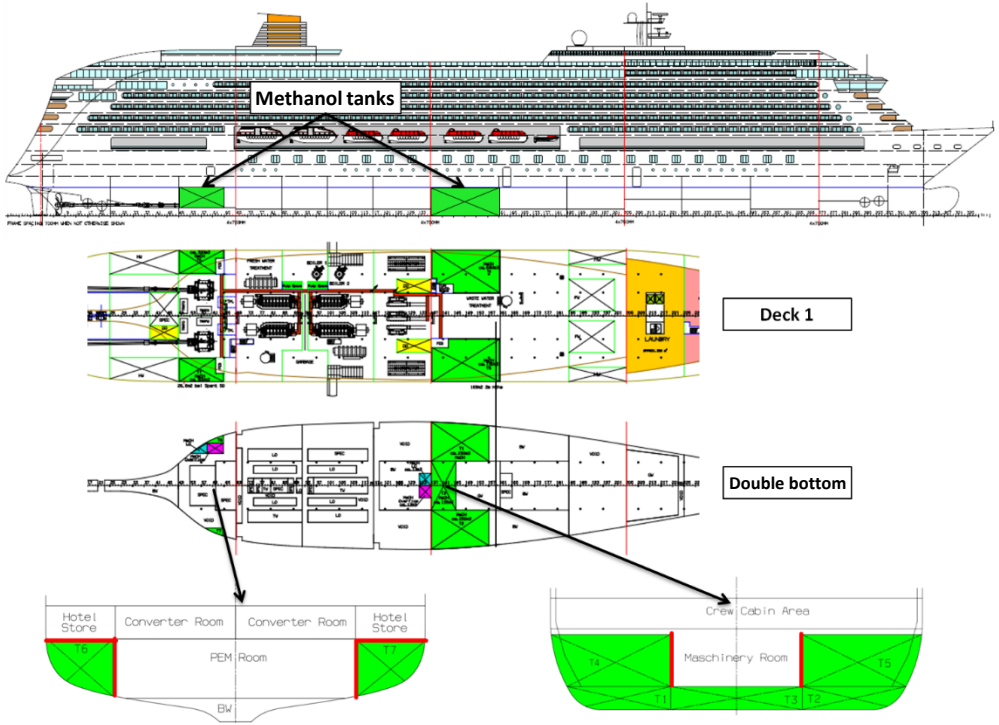
Methanol



Methanol allows nearly random tank arrangement

Methanol Cruise Ship

- Storage at ambient pressure & temperature
- No pressure build-up
- Structural tanks from mild steel
- Storage in hull & double bottom
- Relatively easy liquid fuel system
- Easy handling



Methanol is very advantageous for the ship design

Tanks:
Methanol

Lethal dose for fish

LC50, LC=Lethal Concentration:
Concentration in water, at which half the population died within a specified test duration.

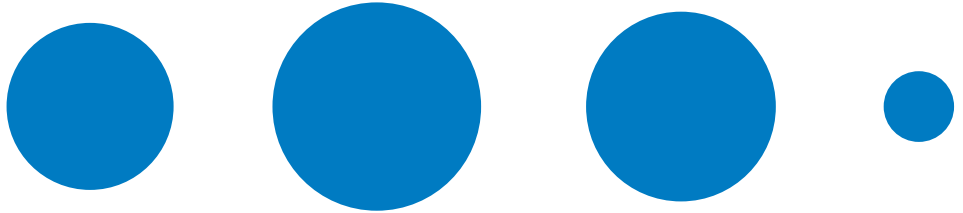
Methanol[1]
15400 (mg/l)

Methane[5]
49,9 (mg/l)

Heavy Fuel Oil[3]
79 (mg/l)

Diesel[4]
65 (mg/l)

Gasoline[2]
8,2 (mg/l)



[1] ECHA, European Chemicals Agency, registration dossier Methanol; [2] Petrobras/Statoil ASA, Safety Data Sheet, ECHA registration dossier Gasoline; [3] GKG/ A/S Dansk Shell, Safety Data Sheet; [4] ECHA, European Chemicals Agency, registration dossier Diesel; [5] ECHA, European Chemicals Agency, registration dossier Methane

Methanol better than
- Diesel by factor 240
- Gasoline by factor 1900

… Methanol Properties

- For the environment far less hazardous than gasoline, diesel or heavy fuel oil
- Rapid mixing and dilution with water
- Aquatic plants and bacteria biodegrade Methanol without residue

- Methanol is not more dangerous than diesel, gasoline or LNG
- Poisoning reliably treatable by simple means
- In particular, it is not carcinogenic

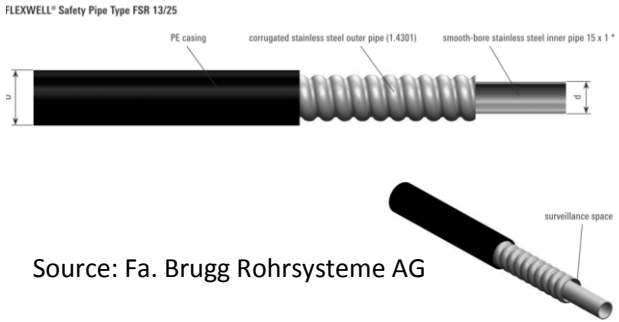
- Methanol itself has no Global Warming Potential (unlike Methane)

Methanol features unsuspected positive properties

Components & Solutions

Use of standard equipment:

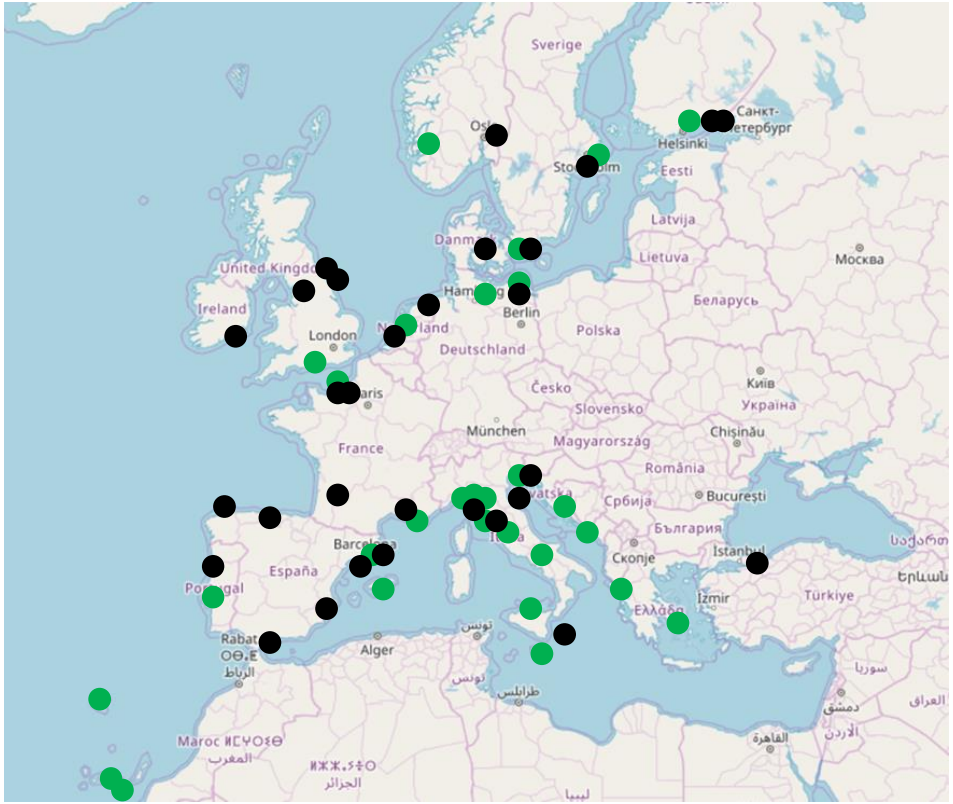
- Couplings and tank equipment
- Pumps, filters, valves
- Double walled piping
- Inerting
- ATEX conformity
- etc.



Source: Fa. Brugg Rohrsysteme AG

Methanol technology is onshore established since decades

Availability of Methanol



Costal near Methanol supply net, Source Helm AG

- Prominent ports
- Methanol storage facility

All bigger ports can be supplied already today

Infrastructure

Methanol is extensively available

→ Conversion of existing fuel depots easily possible

Source: B. Dettmar Reederei

Methanol supply to ship investigated

→ Inland waterway Methanol carriers suited for bunkering operations

A world wide spread fleet is practically existent

New-build & Conversion

Methanol suited for all converters

- Combustion engines
- Gas turbines
- Fuel cells

Engine availability

- ☑ Low speed (2-stroke)
- ☒ Medium speed
- ☑ High speed engines

Tank and fuel systems are easy

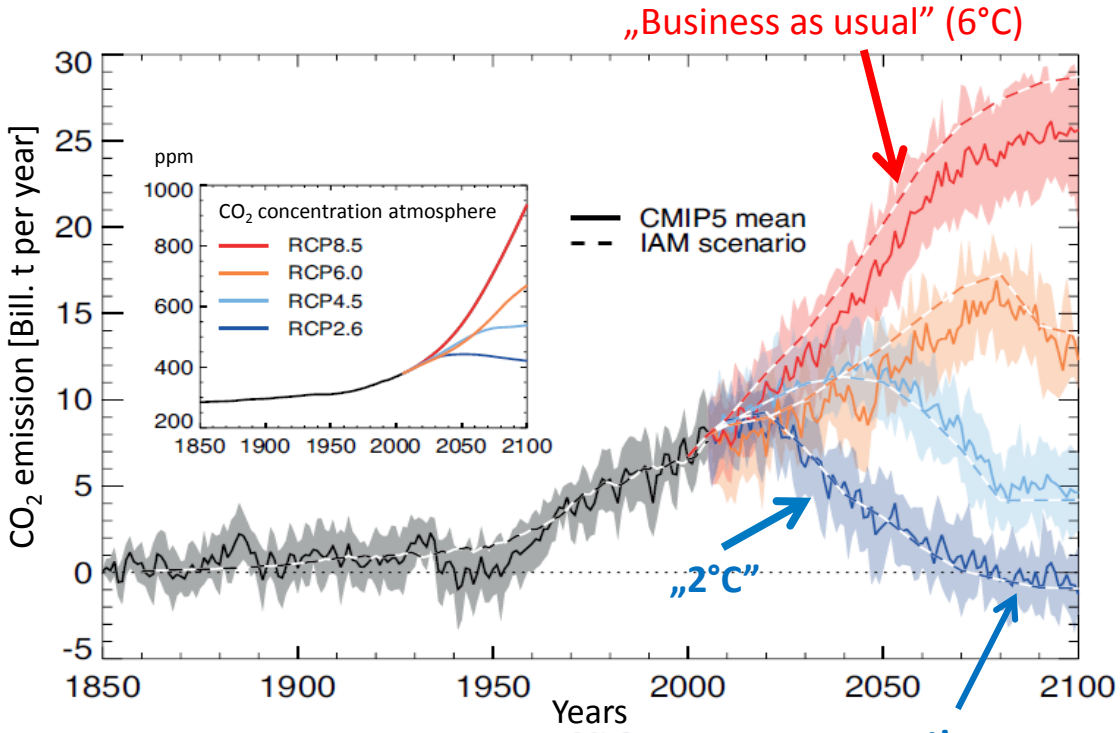
- Therefore new-build & conversion of existing ships simple

Major challenge „Climate Crisis“

2°C goal demands:

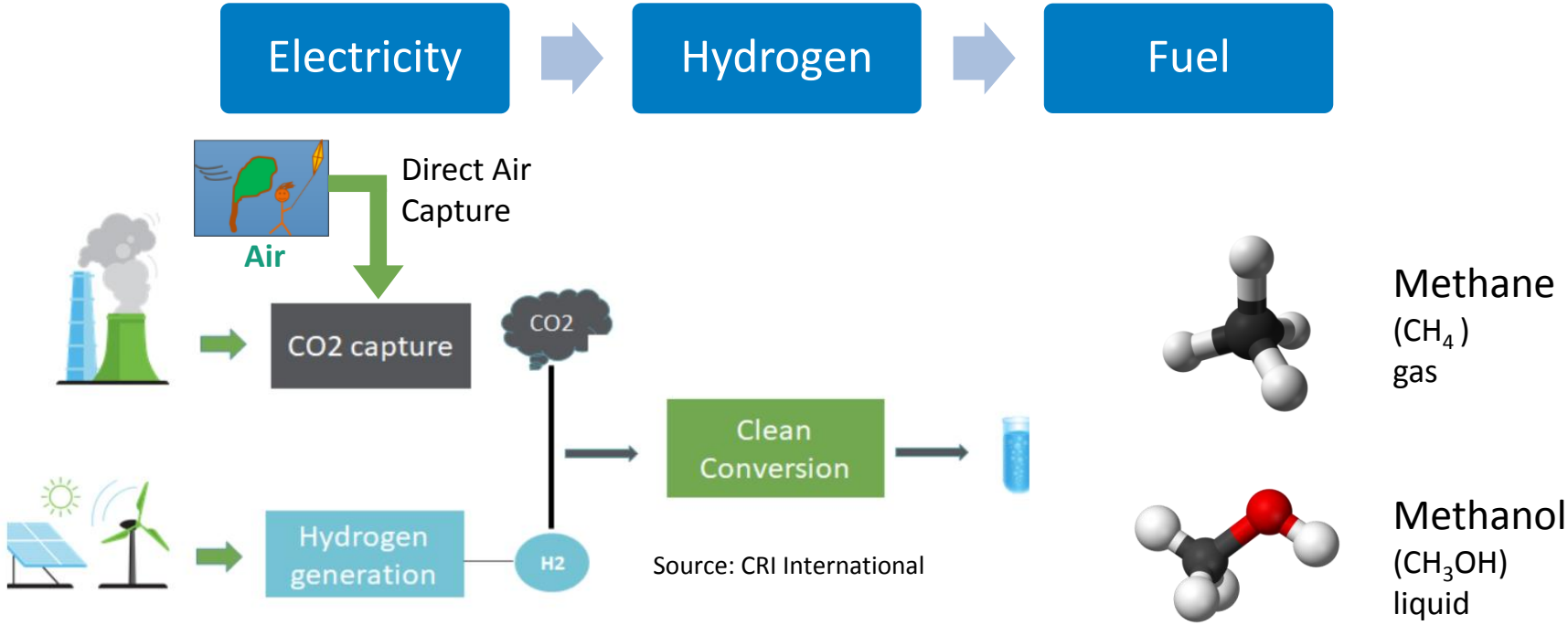
- max CO_2 release: 2020
- > 2070: actively extract CO_2

Source: IPCC 2013 (WGI), SPM, page 27



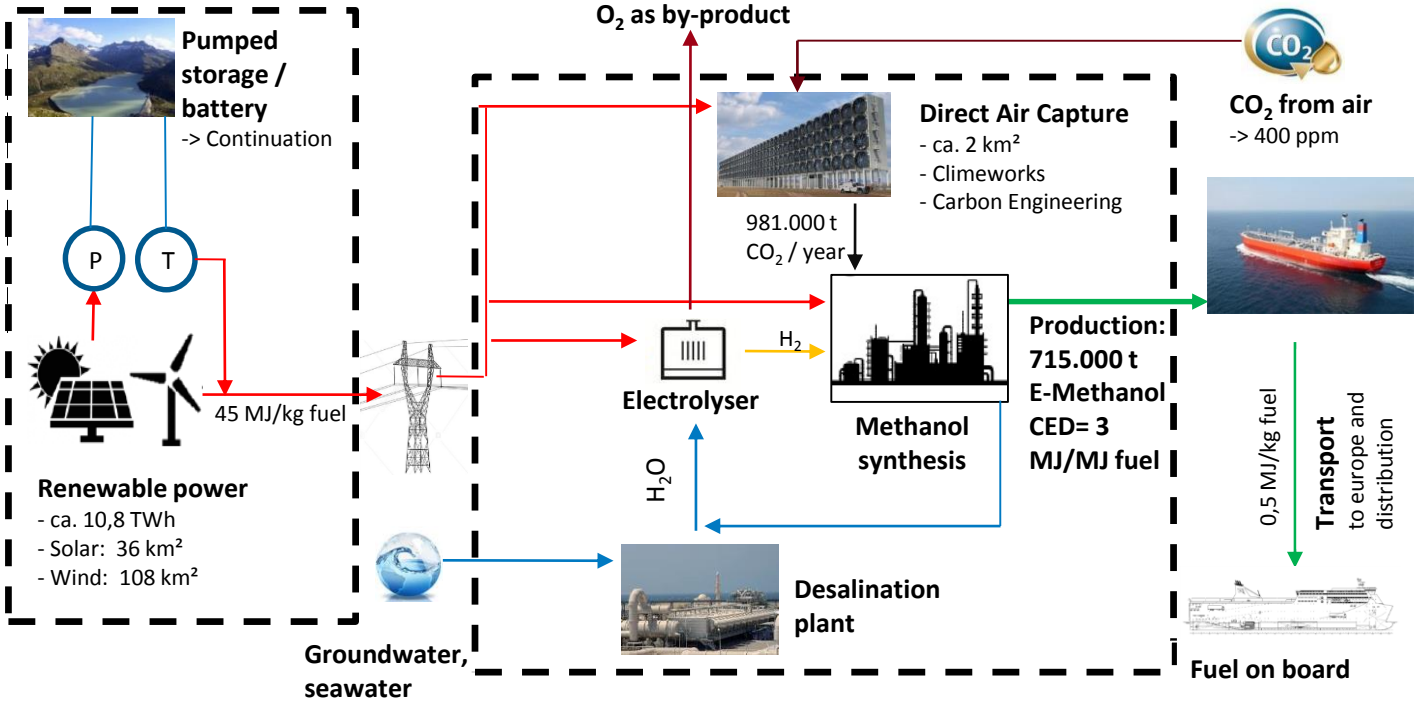
Renewable Fuels urgently needed

Production of E-Fuels



The easiest energy carrier will be the cheapest one

Renewable Methanol



Effort ≈ 3 MJ renewable energy per 1 MJ fuel

Conclusion

- ☑ Environmental properties (pollutants, no GHG potential, spillage)
- ☑ Technical maturity
- ☑ Infrastructure and Ship supply
- ☑ Converter technology
- ☑ Rules & Regulations
- ☒ Short-term Economics
- ☑ Long-term Economics (great potential for renewable Methanol)

Methanol has the potential to become first choice fuel

Supported by:

on the basis of a decision
by the German Bundestag

Acknowledgement

Project partners:

MEYER WERFT, Papenburg

Flensburger Schiffbau-Gesellschaft, Flensburg

Lloyd's Register EMEA, Hamburg

Associated partners:

Caterpillar Motors, Kiel

HELM AG, Hamburg

MAN Diesel & Turbo, Augsburg

MEYER WERFT GmbH & Co. KG

Industriegebiet Süd
26871 Papenburg
+ 49 4961 81-0

Daniel Sahnen
+49 4961 81-7278
daniel.sahnen@meyerwerft.de
www.meyerwerft.de

MEYER WERFT
PAPENBURG 1795