# Aktivitäten rund um alternative Kraftstoffe

Workshop „Alternative Kraftstoffe“

14. & 15. Februar 2018

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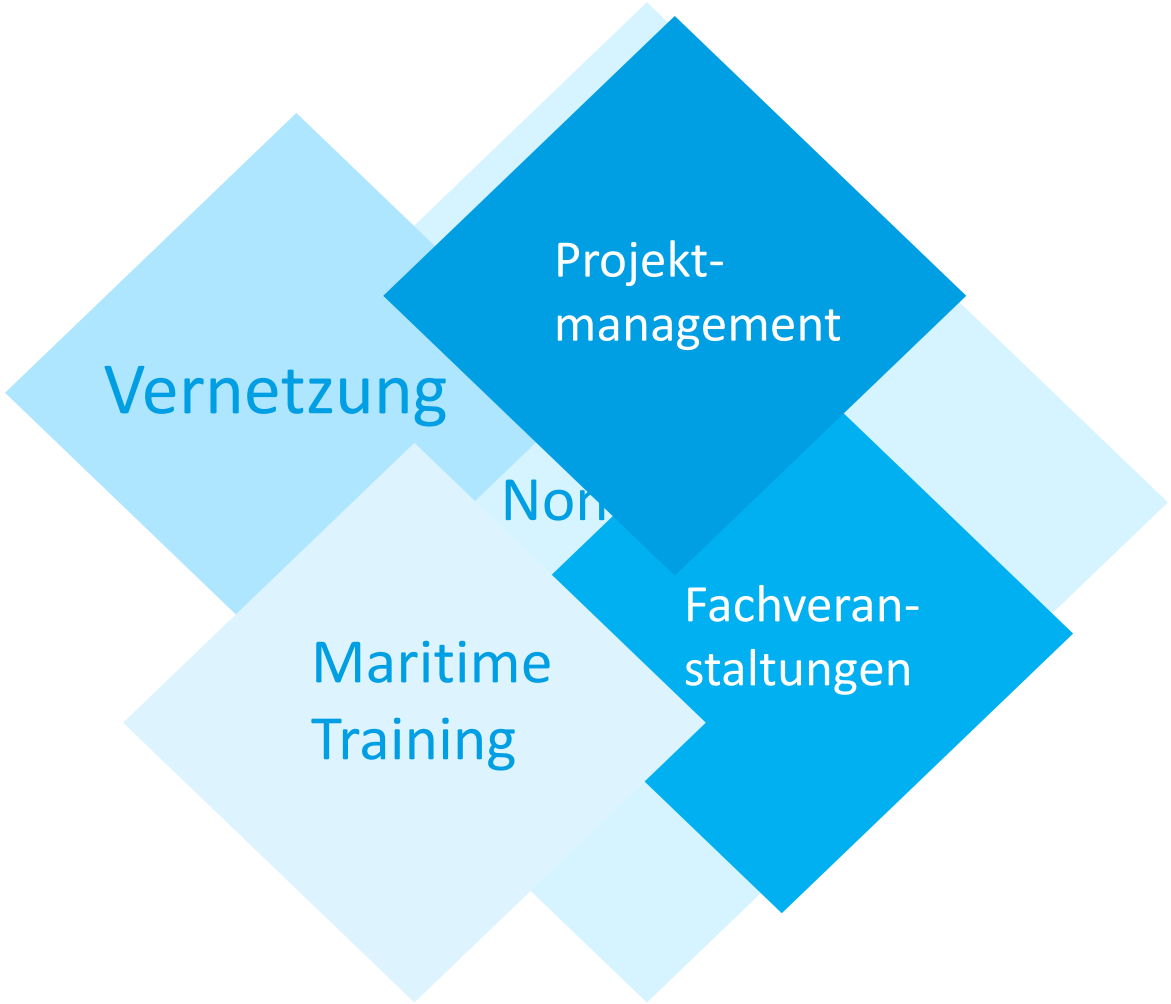
# Tätigkeitsfelder

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# Update zu Projektaktivitäten

- Alternative Kraftstoffe
  - LNG
  - Wasserstoff
- Alternative Antriebe
  - Windantriebe
- Carbon Capture

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D-ZIB Deutsches Zentrum für innovative Binnenschifffahrt
EIBIP | European Inland Barging Innovation Platform

GreenShipping Niedersachsen

LNG Initiative Nordwest

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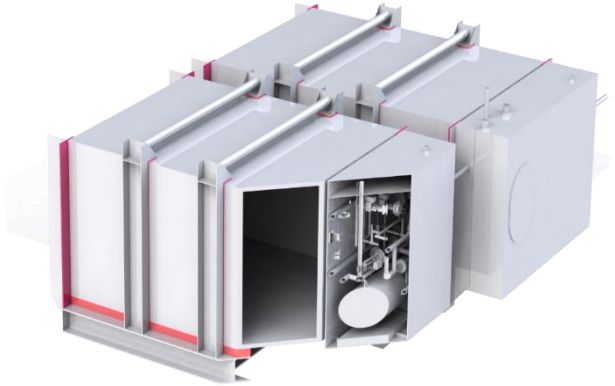
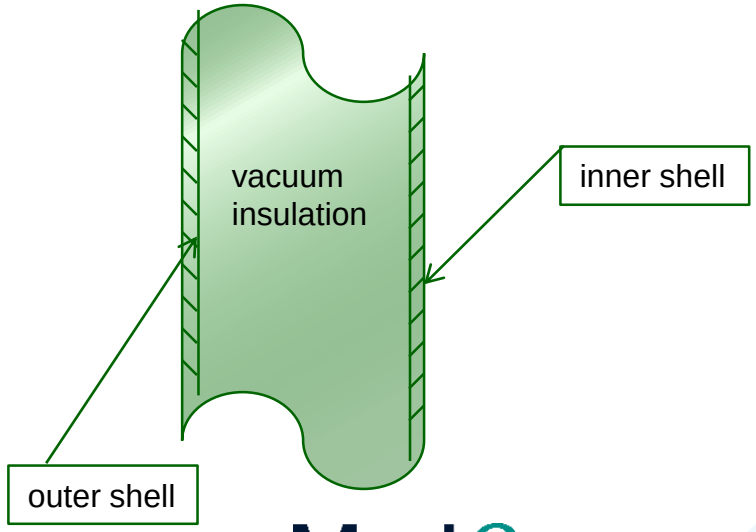
# Low Pressure LNG Tank

- Tankspezifikationen:
  - Konstruktion aus Edelstahl (innen: 1.3912  außen: 1.4301)
  - Blechstärke ca. 1 mm
  - Isolierung wiedersteht Druck von ca. 10 t/m2, durch die das Vakuum

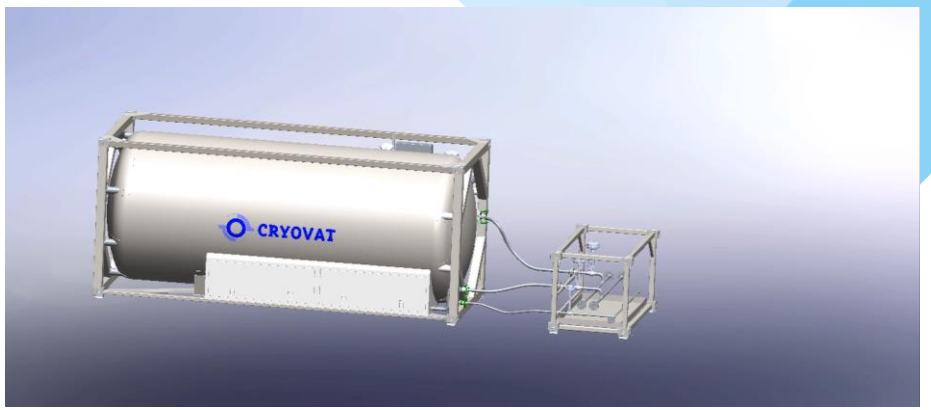




# Standard Modular LNG Tank Container Concept

## Projektziele:

- Machbarkeitsstudie des LNG (Kraftstoff/Transport) Tankcontainers mit verschiedenen Modulen
- Konstruktion und Bau eines Prototypen des LNG Tankcontainers und Testphase




| | LNG fuel tank container | Standard ISO tank container |
|---|---|---|
| Standard ISO frame | ✓ | ✓ |
| Compliance with transportation regulations (IMDG, ADR, RID, CSC among others) | ✓ | ✓ |
| Compliance with rules for use as LNG fuel tank on board ships: | ✓ | – |
| IMO Type-C tank | ✓ | – |
| Water spraying system (optional on ship) | ✓ | – |
| Connection to external vent mast | ✓ | – |
| LNG leakage detection and protection | ✓ | – |
| Class approved equipment & design | ✓ | – |
| Stainless steel outer shell | ✓ | – |
| Dry disconnect quick couplings | ✓ | – |
| Connections at end for connecting to ship | ✓ | – |
| Connection to automation system on the ship | ✓ | – |
| Connection to safety systems on the ship | ✓ | – |

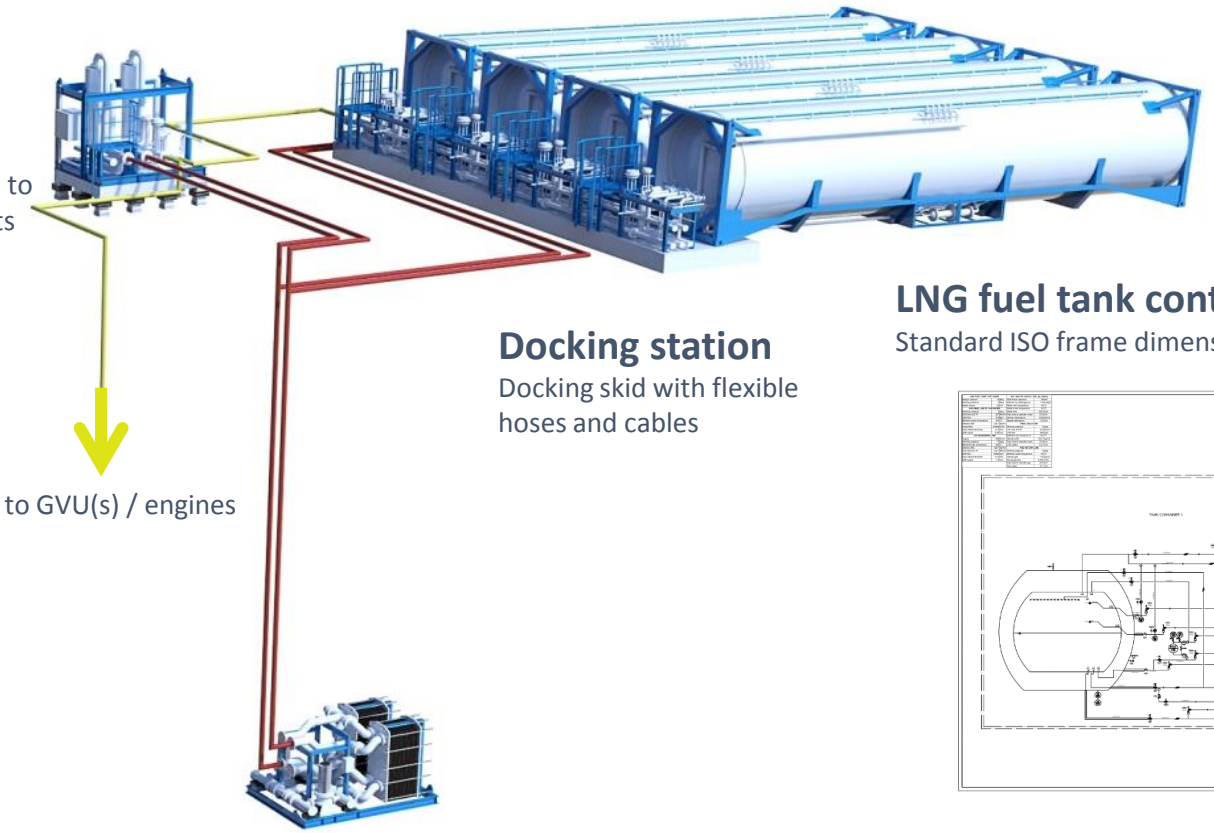
CRYOVAT

WÄRTSILÄ

CONOSHIP INTERNATIONAL

KOOIMAN MARINE GROUP

# Standard modular LNG tank container concept



## Evaporator skid

Preparation of the LNG (evaporation and heating) to meet the gas requirements to the engine

## Vent mast

Common outlets from safety relief/vent valves in the docking station and the evaporator skid shall be connected to a vent mast.

## LNG fuel tank containers

Standard ISO frame dimensions

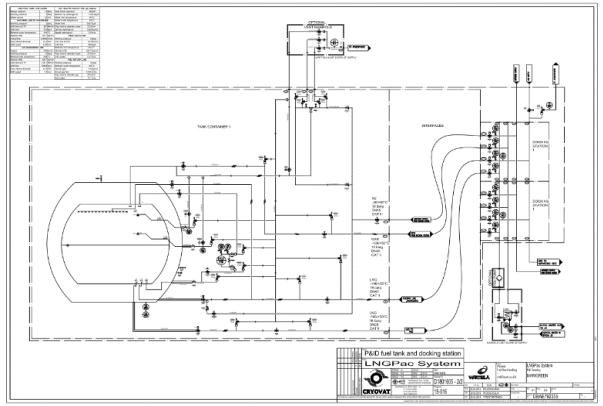
## Docking station

Docking skid with flexible hoses and cables

## Automation

Complete automation and safety system for the gas supply system

Gas to GVU(s) / engines




## Glycol-water skid

Supplies glycol-water to the evaporator skid for evaporation and heating of the LNG/gas. Uses LT-water as heating media

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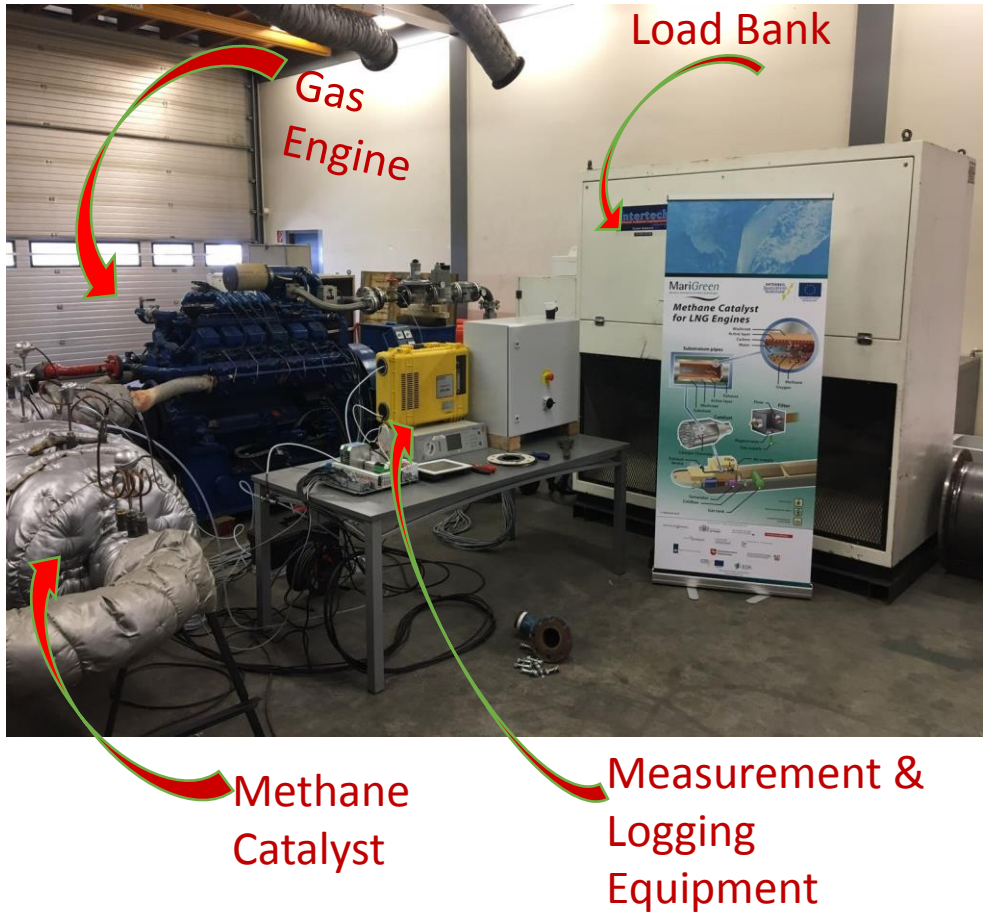
# MariGreen: Methane Catalyst

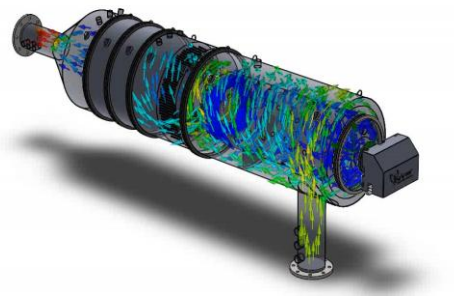
Tests of developed catalyst are performed to determine:

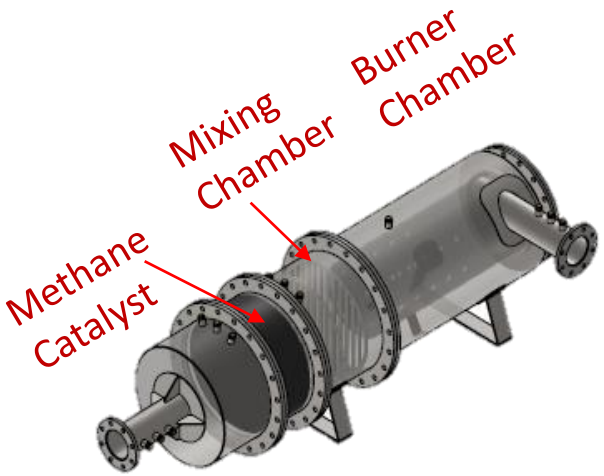
1. Performance
   Conversion of methane

2. Deterioration Factor
   Catalyst deactivation time while on stream under steady-state flow conditions (i.e. engine load factor)

3. Regeneration Method
   Regain original conversion ratios.



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# Feasibility Study: Hydrogen as Fuel in Inland Shipping

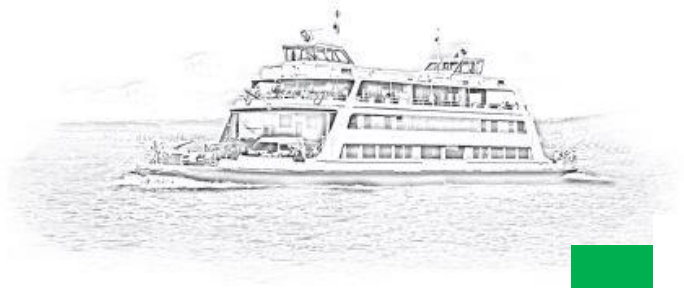
INTERREG Deutschland Nederland
Europäische Union Europese Unie
www.deutschland-nederland.eu

**Elements of the feasibility study:**

1. Status quo for hydrogen application as fuel in IWT
2. Technological feasibility
3. Cost expenditure
4. Regulatory framework for European IWT
5. Infrastructural frame conditions and perspectives
6. Education and training requirements
7. Action approaches for implementation of hydrogen as fuel in IWT

Perspectives for the

Use of Hydrogen as Fuel in Inland Shipping



→ **Hydrogen in vessels is neither ecologically nor economically beneficial nowadays**

→ **A significant increase in green hydrogen production and decreasing costs are necessary but also foreseeable**

→ **In many fields of inland navigation hydrogen can be applied from a technical point of view**

**Study is available for download at www.marigreen.eu**

$H_2$

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# EcoFlettner: Preliminary trial results

- Installation and test of ‚EcoFlettner‘ within the project MariGreen
  - Successful installation onboard ‚Fehn Pollux‘ in May 2018 in Leer
  - Trial phase is ongoing, preliminary results are available

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# EcoFlettner: Preliminary trial results

- Preliminary results of the trial phase:
  - Rotor has slightly higher performance than calculated
  - Largest thrust measured on board up to now:
    **abt. 70 kN** @ BFT 7 in beam winds
  - Largest performance measured on board up to now:
    **abt. 700 kW** (ME Equivalent) @ BFT 7 in beam winds

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# EcoFlettner: Preliminary trial results

- Average Rotor Performance (Rough Estimate)
  - For Fehn Pollux Concept (Eco-Flettner) only!
  - Based on first Trial Phase (Trend)
  - Depending on Wind Conditions (Wind + Ship's Course/Speed)
  - Rotor in Automatic Mode (Optimum)

| Medium Wind | Good Wind | Very Good Wind |
|---|---|---|
| 2 kW ME-Equivalent Power per 1 m² of projected Rotor Area (H x D)<br><br>e.g. Fehn Pollux<br>108 kW<br>About 16.6 % @ 650 kW MCR | 2.5 kW ME-Equivalent Power per 1 m² of projected Rotor Area (H x D)<br><br>e.g. Fehn Pollux<br>135 kW<br>About 20.8 % @ 650 kW MCR | >3 kW ME-Equivalent Power per 1 m² of projected Rotor Area (H x D)<br><br>e.g. Fehn Pollux<br>>162 kW<br>About >24.9 % @ 650 kW MCR |

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# Windship Modelling and Voyage Optimization
# Routenoptimierungs-Software

- Route optimizing software developed in MariGreen was installed onboard ‚Fehn Pollux‘
- Optimising algorithm is based on energy model of the ship and the Eco Flettner rotor
- Integrated route network makes handling for the crew more easy

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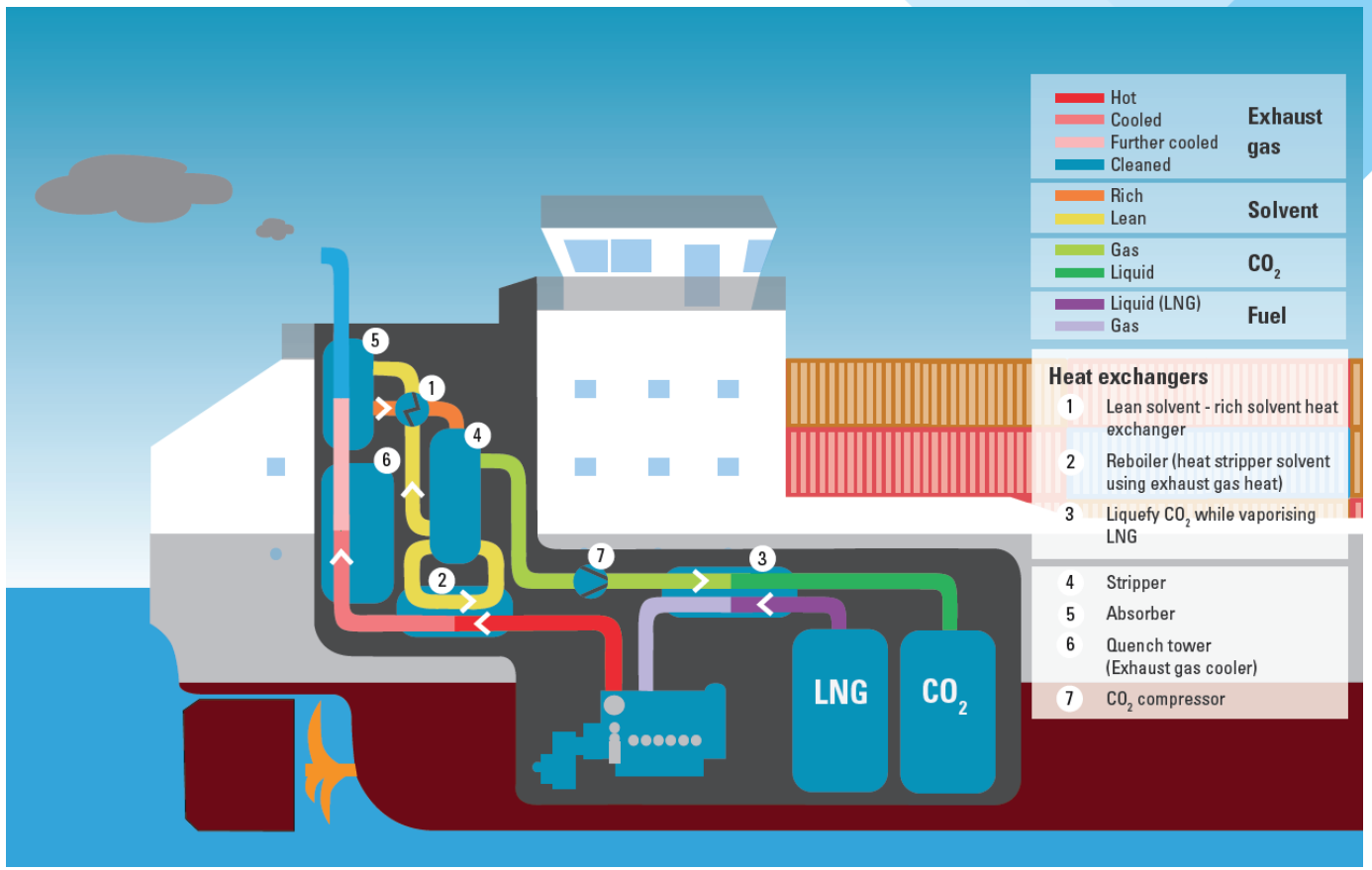
# CO2ASTS

## $CO_2$-Abfang, -Speicherung und Transfer in der Schifffahrt

- Reduktion der CO2-Emissionen durch Carbon Capture and Storage an Bord
- Machbarkeitsstudie:
  - Recherche existierender Technologien
  - Business case
  - Technologische Machbarkeit
  - Simulationen und Tests zur Darstellung der Technologie
  - Marktanalyse zum Thema Endnutzung des CO2
  - Hafen und Transportlogistik

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# Vielen Dank für Ihre Aufmerksamkeit

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