



LCO2 SHORE TO INJECTION TANKER

WITH DP2 OPERATION AND LCO2 CONDITIONING & INJECTION CAPABILITY

Concept development of liquified CO2 tanker

KNUD E. HANSEN holds a strong position in concept development of liquified CO2 tankers and has completed this design on behalf of our client INEOS Energy as part of Project Greensand where CO2 captured from CO2 emitters at shore is stored under the North Sea. The technology is referred to as Carbon Capture and Storage, CCS.

Liquified CO2 tankers of this scale are a newly specialized type of ship designed for carrying the heavy liquified CO2. The CO2 captured from emitters at shore is liquified, cooled and transported as medium or low pressure liquified CO2, depending on the selected state. The emerging of the liquified CO2 tankers is motivated by the need to satisfy the Paris Agreement. By 2050 the Paris Agreement aims to reduce global warming to 1.5°C resulting in a net-zero carbon

emission civilization. To attain the 2050 goals, a medium-term political target of considerable CO2 reductions by 2030 is essential. Carbon storage and capture play a crucial role in this path, as does the construction of efficient liquified CO2 carriers to assist the process.

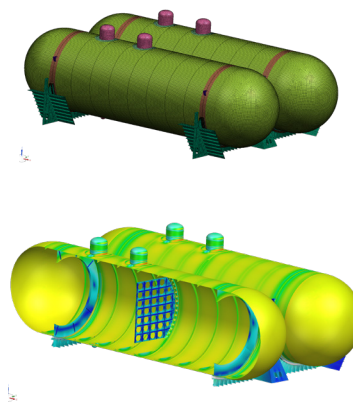
The ship has a number of liquified CO2 storage tanks that hold liquified and cooled CO2. The liquid CO2 cargo type-C tank was designed in-house at KNUD E. HANSEN to DNV - Maritime Approved in Principle (AiP) standards. DNV - Maritime was satisfied with the intensive use of sophisticated FEM models for analyzing all aspects of the tank and its integration with the ship.



The ship is equipped with bow mooring and cargo discharge capability, optionally turret type, which allows for the injection of liquified CO₂ into the offshore platform's system, which leads to reservoirs in the seabed. Liquified CO₂ is injected using specialized pumps located on the cargo deck.

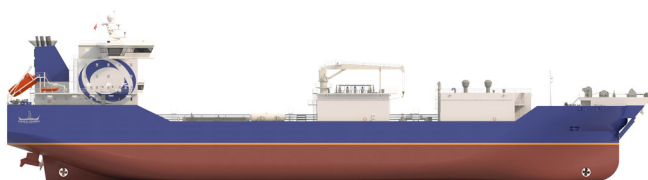
To ensure high uptime for injection all year, the ship is outfitted with DP2 capabilities, allowing for the injection of liquified CO₂ to a very high sea state in one of the roughest sea environments.

The high-powered power plant, designed for simultaneous liquified CO₂ conditioning and injection as well as ship position keeping, incorporates a sophisticated waste heat system that significantly increases the overall efficiency of the power plant, resulting in the lowest OPEX for the operator in light of future fuel prices. The power plant is designed to use non-polluting fossil-free fuels with the highest efficiency possible, in accordance with the goals of the Paris Agreement.



KNUD E. HANSEN has been responsible for the following key elements of the liquified CO₂ carrier:

- Ship design
- DP2 design and analysis.
- Integration of bow and turret unloading systems.
- RAO calculation.
- Waste heat management for improved OPEX during CO₂ conditioning.
- Design of type-C tanks to the approved in principle (AiP) stage.
- Tank pressure evaluation (medium pressure vs low pressure).
- Process system design to transfer, condition the CO₂ and injection it with high pressure into the reservoir.
- 3D model for coordination of cargo deck layout.



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