Economic Commission for Europe

ADN Administrative Committee

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Geneva, 30 August 2024
Item 3 (b) of the provisional agenda
Matters relating to the implementation of ADN: special authorizations, derogations and equivalents

26 July 2024

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Request for a recommendation on the use of methanol as fuel for the propulsion of the tank vessel “Chicago”

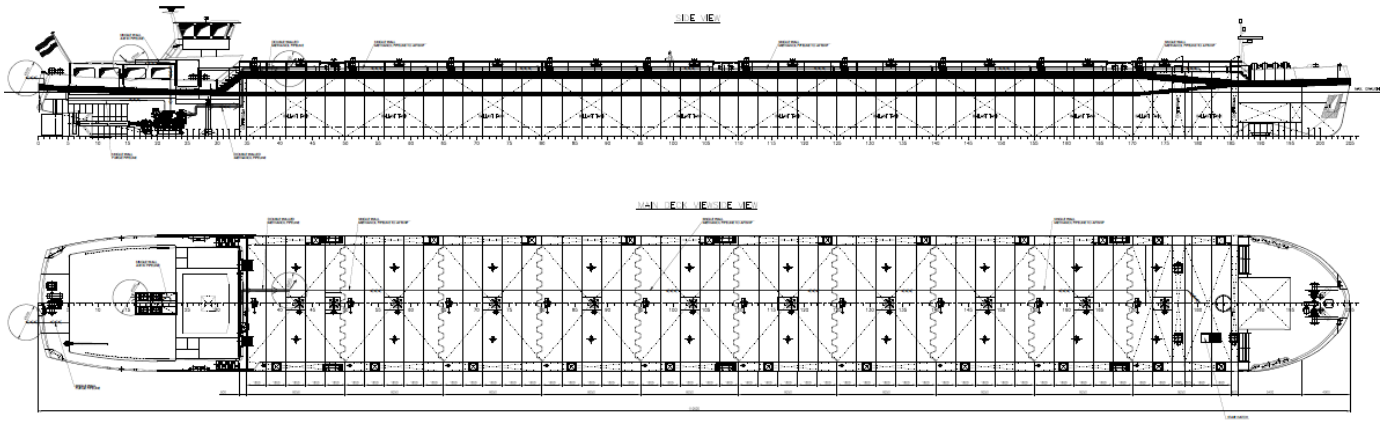
Transmitted by the Government of the Netherlands

Annex to document ECE/ADN/2024/4

Annex

ADN — Concept of operation (CONOPS)

MTS Chicago



Date: 14 May 2024

Revision: 4

Shipname: MTS CHICAGO

Subject: Methanol propulsion retrofit

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Introduction

1. This Concept of Operations (CONOPS) describes how Unibarge will convert and operate an Inland waterway (IWW) tanker into a Methanol fuelled inland waterway (IWW) tanker, which uses Methanol as a primary fuel, with diesel fuel as backup and ignition fuel.

2. In consultation with Class Society Lloyd's Register a risk-based procedure has been followed in order to comply with ADN 7.2.3.31:

> "7.2.3.31.1 The use of engines running on fuels having a flashpoint equal to or lower than 55 ºC (e.g. petrol engines) is prohibited. This provision does not apply to: – the propulsion and auxiliary systems which meet the requirements of Chapter 30 and Annex 8, Section 1 of the European Standard laying down Technical Requirements for Inland Navigation vessels (ES-TRIN) as amended.[1]"

I. Vessels characteristics

3. MTS Chicago is a IWW C2.2. classed tanker.

Length O.A.	110,00 m
Length MLD	109,95
Breadth O.A.	11,40 m
Breadt MLD	11,40 m
Depth MLD.	5,40 m
Max. Draft-scantling (ab)	3,85 m

Number of cargo tanks	10
Current Capacity of cargo tanks	approx. 3200 m^3
Number of slobtanks	1
Capacity of slobtanks	±7,5 m^3

4. Powered by 1 dual fuel propulsion systems consisting of:

Main engine

Engine type	1 x Catterpillar 3512 © DI-TA
Max cont. rating (MCR)	1775hp
Engine speed	1600 rpm

5. In order to retrofit the barge to Methanol propulsion the existing cargo tank 9 will be divided in two where one part (~142 m3) will be used to carry Methanol as fuel for the propulsion system, the remaining part (~238 m3) will remain operational as cargo tank.

6. A fully segregated Methanol bunker manifold will be installed on the main deck at fr.61 at port- and starboard side (on top of the Methanol fuel tank). The bunker system will be fully segregated from the cargo system.

II. Vessels main systems

7. This chapter describes the functioning of several main systems that are required for the safe usage of Methanol as fuel. This chapter summarize the safe handling of the fuel system, to avoid contact with liquid or vapours.

8. Following main elements are described:

- Methanol storage tank located in the cargo area
- Methanol bunker system
- Fuel supply system
- Main engine / engine room
- Purge & drain systems

A. Methanol Fuel system

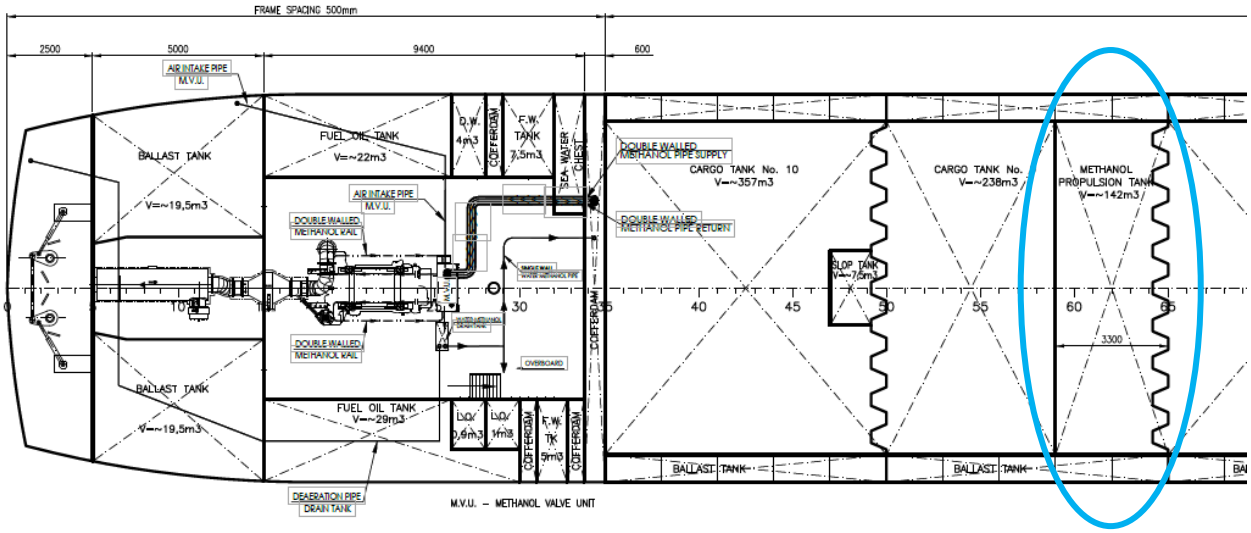
1. Methanol Fuel Tank

9. A single Methanol fuel tank, of approx. 144 m^3, which will be installed in the cargo area between fr. 59 and fr. 65.

10. The Methanol fuel tank is a single walled tank.

11. The tank will be equipped with:

- Filling pipe to the bottom of the tank, with 90° bend
- Vapor return pipe
- 2 x Pressure and Vacuum relief valve
- Nitrogen, to keep the tank pressurised at 10 kPA
- Fuel supply line
- Fuel return line from engine
- Fuel return line from pump



12. The tank will be equipped with the following control/alarm/safety functions:

- High/low level alarms
- Overfill protection
- Temperature sensor
- Pressure sensor, with high pressure alarm

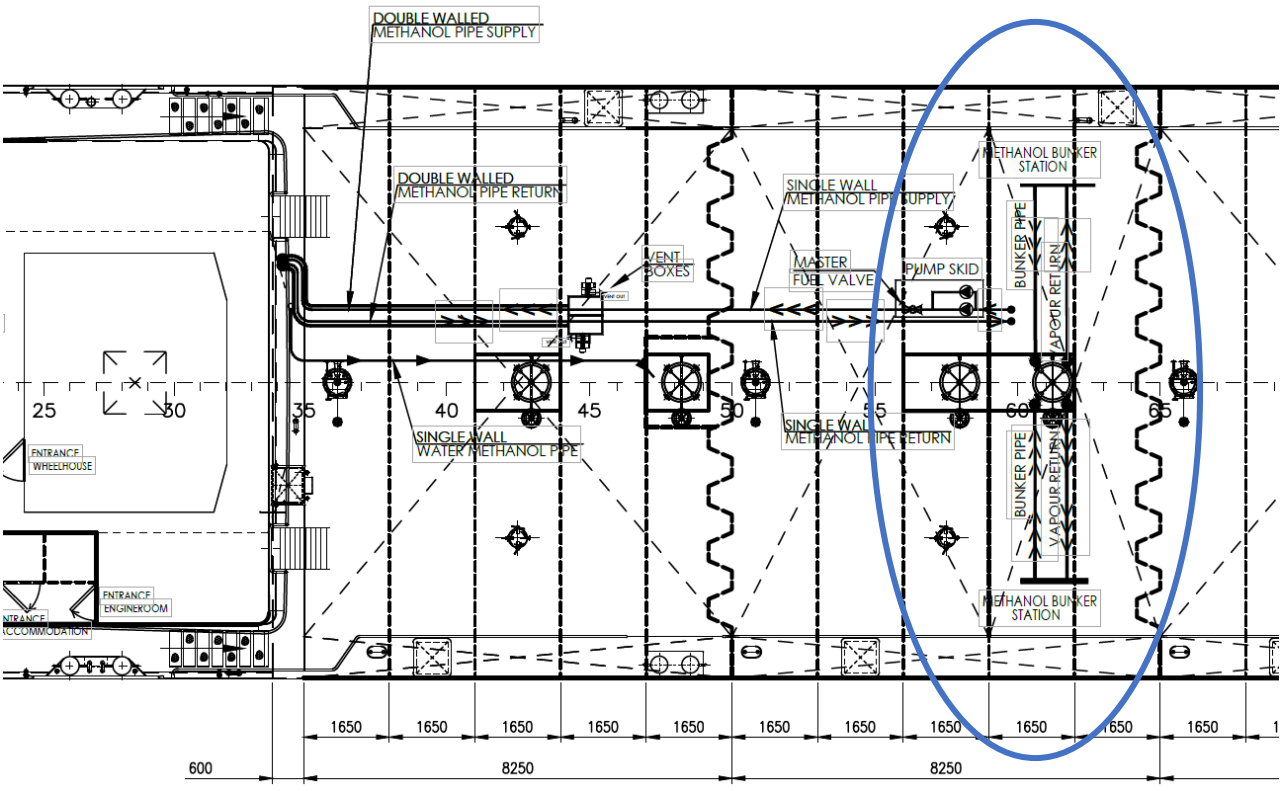
2. Methanol Bunker System

13. The bunkering manifold is designed to receive Methanol from ashore. The Methanol will be transferred by a hose, which is connected between a shore connection and the bunker manifold. The connection will be made with a breakaway coupling.

14. The Methanol bunker manifold is located on the main deck at fr.61 at port- and starboard side.

15. The bunkering manifold will be equipped with a stainless steel drip tray on port- and starboard side.

16. The drip trays of the bunker stations can be drained by the existing slob pump into the slob tank.



17. The bunkering manifold consist of:

- 1x Bunker connection on port- and starboard side
- 1x Vapor return connection on port- and starboard side
- 1x Pressure transmitter and indicator
- 1x Overfill protection connection
- 1x N2 purge connection on the bunker lines
- 1 x Ship to shore connection

3. Fuel Supply

18. The methanol is transferred to the engine in the aft ship through a stainless steel pipe, which runs over the deck, from the methanol storage tank to the deck, where the pump skid will be installed and from the deck through a Master Fuel Valve (MFV) on deck to the MVU and to the main engine. The stainless steel pipe is single walled from the Methanol storage tank to the deck up to fr. 44. From fr. 44 into the engine room to the MVU and to the engine the stainless steel pipe will be double walled.

19. A return line from the engine to the deck up to fr. 44 will be double walled stainless steel pipe. From fr. 44 to the methanol supply line will be single walled and to the methanol storage tank.

20. The space between the double walls from MVU to the engine and from the engine to the MVU will be filled with pressurised nitrogen at 10kPA. A pressure sensor will be installed in this double walled pipe to detect leaks of the inner pipe (pressure will rise) and the outer pipe (pressure will drop). In case of leaks the fuel pumps will stop and the master fuel valve will close, stopping the fuel supply to the engine.

21. The MVU and the double walled pipes from MVU to the deck will be ventilated by means of a double ventilator, each capable of exchanging the air in the double walled pipes 30 times per hour. A flowmeter, liquid detector and a gasdetector will be installed on this double walled pipe to detect leaks.

22. In case of leaks the fuel pumps will stop and the master fuel valve will close, stopping the fuel supply to the engine.

23. All single walled fuel lines on deck will be equipped with pressure gauges.

B. Main engine / engine room

24. The existing Caterpillar 3512b CCR2 main engine will be converted to a methanol dual fuel system by ArenaRED. The methanol will be pumped from methanol storage tank to the engine by a methanol supply system. Within the fuel line there are several shutoff valves that control the methanol flow, a purge system and leak detection system.

25. The ECU is the Electronic Controller Unit that controls and monitors the engine, including its methanol fuel injectors. The “PLC” controls and monitors the methanol tank, purge system, methanol pump, methanol fuel valves and checks for leaks.

26. The ArenaRED system is monitoring the combustion parameters in addition to the original Caterpillar sensors. Also, the ECU decides if dual fuel operation is allowed. This will be communicated with the fuel supply PLC. The ArenaRED system is continuously monitoring fuel supply parameters, any deviation in signal or lack of signal the fuel supply PLC must cut the fuel supply immediately and he ArenaRED ECU will switch to diesel fuel.

27. The alarm, monitoring & control system will be installed in the engine room, with three control stations. The control stations will be installed on the bridge, in the engine room and on deck. The system integrates the following systems:

- Fire detection
- Gas detection
- Fuel supply (pumps and master fuel valve)
- ArenaRed ECU (common alarm and running contact)
- Methanol storage tank alarms and monitoring
- Bunkering
- Purging
- Draining

C. Purge/drain systems

28. The fuel supply system, will have the following possibilities to purge:

Purge of bunkering line:

- After bunkering the bunkering line will be purged by an inert gas, purging remaining methanol in the bunkering line into the methanol storage tank (hose connection).

Purge of fuel supply line:

- In case of service or emergency the fuel line will be purged with inert gas:
    - purging the remaining methanol in the fuel line from pump to engine and from engine into return line back into the methanol storage tank through the fuel return line (fixed connection).
    - purging the remaining methanol in the fuel line in suction line of the pump back into the methanol storage tank (hose connection).

Draining of outer wall of double walled pipe:

- In case of leakage of the inner pipe into the outer wall the gas detection or leak detection will be activated fuel supply will be stopped by closing the master fuel valve. The methanol in the outer wall will be drained into a dedicated methanol drain tank. A dedicated pump will pump outboard water in the drain tank, to dilute the methanol to maximum of 30per cent. The diluted methanol can be pumped into the slob tank.
- The barge will be equipped with a nitrogen system that is used to purge systems as described in 3.3 an to keep the tank pressurized at 5 kPA at all time. A Nitrogen generator will be installed in the fore ship engine room, including a nitrogen storage vessel, to assure sufficient nitrogen at all times.

D. Firefighting systems

29. The engine rooms will be equipped with a fixed fire extinguishing system, with a fire extinguishing gas.

30. The deck is equipped with a water sprinkler system and firefighting connections for fire hoses.

E. Gas detection system

31. A gas detection system will be installed on the vessel. This system detects gasses in the accommodation, the engine room, the double walled pipe between MVU and deck, void 9 and protected pump space.

F. Leak detection system

32. The double walled fuel pipe, the MVU, Void 9 and the protected pumpspace will be equipped with leak detection sensors at the lowest point to detect methanol leakage.

33. The double walled fuel pipes between engine and MVU will be equipped with pressure sensors, to detect pressure increase and pressure drop.

34. The double walled fuel pipes from deck to the MVU will be equipped with a flow meter and a gas detection sensor to detect a leakage.

G. Drain/Bilge system

35. The Void 9, the drip trays of the bunker stations and the drip tray of the protected pump space can be drained by the existing slob pump into the slob tank.

36. In the engine room a dedicated drain tank is installed to drain the methanol fuel system consisting of the double walled methanol fuel pipes and the MVU. The methanol fuel tank is filled with 50 per cent water, in case of leakage the methanol will be drain into the drain tank, where it dilutes into the water. A dedicated pump can pump the diluted water/methanol into the slobtank.

III. Vessels operational risks

A. Hazardous Area Plan

37. To determine the hazardous areas on the vessel the following Hazardous Area Plan and detailed aft ship plans are made by Rommerts Ship Design:

- Chicago Methanol - 11 sh 01 Hazardeous Area Plan 2023-10-24 (Annex 8)
- Chicago Methanol - 12 sh 01 Aftship 2024-01-08 (Annex 13)
- Chicago Methanol - 12 sh 02 Aftship 2024-01-08 (Annex 14)

B. Hazop

38. To help manage safety risks, a HAZOP study has been performed, under supervision of Class. The principal objective is to increase confidence that safety related aspects of the ship are adequately discussed and prepared for.

C. Fuel/cargo interaction

39. Currently Chicago is classed as C.2.2 IWW tanker with an extensive Cargo List. Methanol is allowed to be transported on board. The crew on board of MTS CHICAGO has extensive knowledge as the barge has been deployed in dedicated transport for Methanol as the customer is a Methanol producer.

40. As stipulated in 3.1.1. the existing cargo tank 9 will be divided in 2 where one part (~142 m3) will be used to carry Methanol as fuel for the propulsion system, the remaining part (~238m3) will remain operational as cargo tank. The Methanol fuel tank will be single walled.

41. The risk of damage to the propulsion system of the barge is mitigated by the ArenaRED safety system as stipulated in 3.2. The system is continuously monitoring fuel parameters of the fuel supply. Any deviation to set parameters or lack of signal will result in switch over to gasoil propulsion.

42. The set-up of the barge allows for different goods to be transported in adjacent cargo tanks. In order to further mitigate exposure to risks of contamination and/or interaction of the Methanol stored in the bunker fuel storage and cargo in the adjacent cargo tanks, a limitation to the existing Goods List will be applied as per Cargo Compatibility Chart as per US Coast Guard (USCG_46-CF)

D. Training

43. Crew training is an integral part of the Unibarge Quality System. Mandatory training on quarterly basis is performed on board and supervised by shore staff. Quarterly training focusses on operational aspects of handling goods, firefighting and emergency preparedness (eg spills, allission).

44. MTS Chicago is a barge dedicated to Methanol transport and the crew has extensive knowledge on Methanol.

45. The crew has been involved in the development of the detailed bunker procedures for Methanol (H0.6.1). Apart from developing the bunker procedures the crew has also been

involved in the design of the bunker system. The lay-out of the bunker system is such that the set-up is identical to the set-up of the loading operations. Bunkering will take place on customer site, where.

46. All crewmembers will be well trained for their duties on board of the vessel, before the vessel will be put in operation. The regular training program ensures that the crewmembers are well informed and capable to perform their duties.