LNG Low Pressure Tank

abh INGENIEUR-TECHNIK GmbH

Marine Service GmbH

THE ROOTSELAARGROUP pressure vessels, cryogenics and gas systems

Ahlers & Vogel

DORHOUT ADVOCATEN

FRISIA Aktiengesellschaft Reederei Norden-Frisia

Lloyd's Register

INTERREG Deutschland Nederland

Europäische Union Europese Unie

MariGreen Maritime Innovations in Green Technologies

The Novel Design

European Patent Application

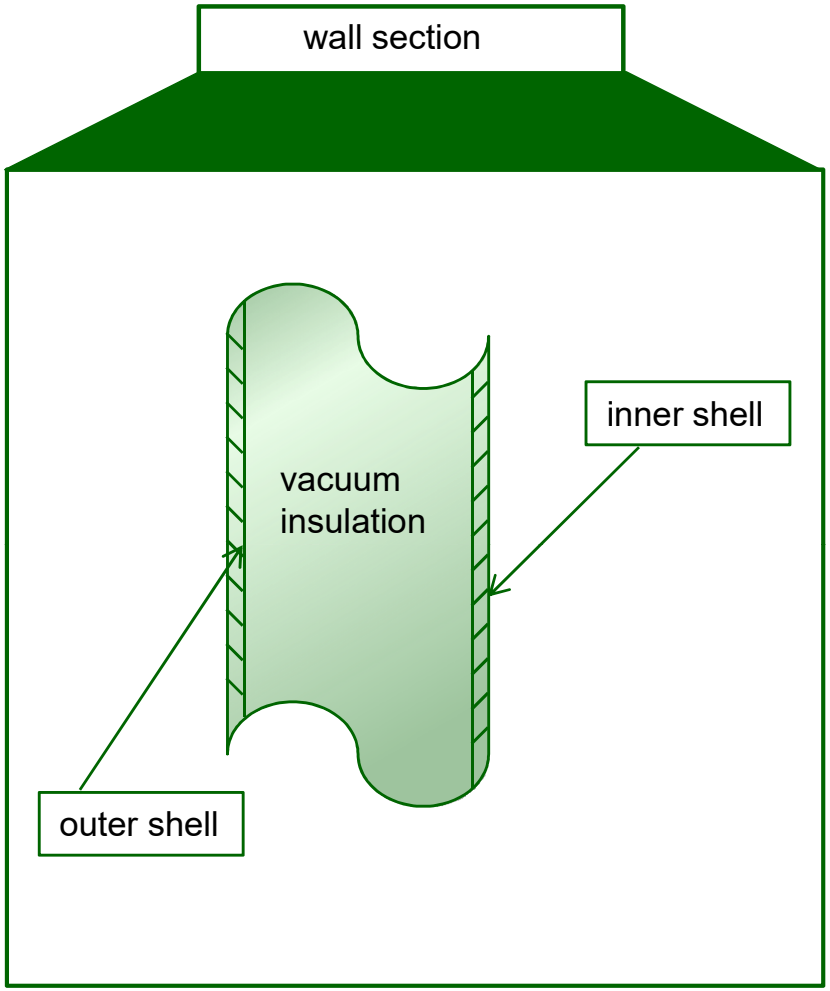
The Principle

- prismatic Low Pressure Tank
- vacuum insulated
- box-in-box principle
- high variance in tank shape
- max. utilisation of given space for LNG-storage

The Vacuum Insulation

- evacuated, rigid nanoporoes insulation boards
- insulation boards maintain the distance between outer and inner shell
- structural strength induced by the vacuum level

Insulation Principle



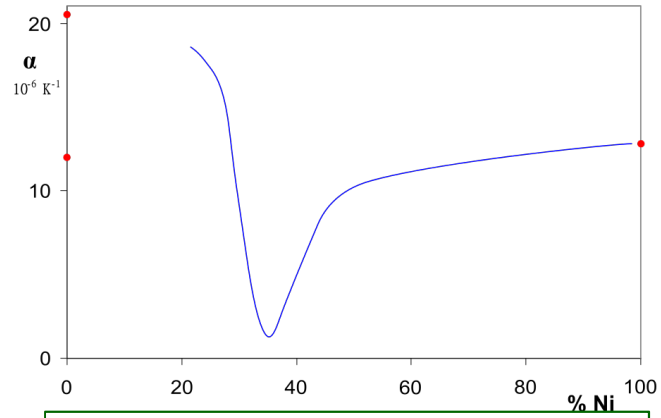
- required vacuum level 1 mbar
- heat conductivity of evacuated insulation 0.0037 $^{w}/_{mK}$
- inner and outer shell of stainless steel
  - inner shell: 1.3912
  - outer shell: 1.4301
- wall thickness of outer and inner shell abt. 1 mm
- insulation boards to withstand the external pressure of abt. 10 $^{t}/m^{2}$, caused by the evacuation
- inner and outer box are to be welded heliumtight
- material outer and inner shell are to be suitable for low temperatures

Coefficient of Linear Expansion

1.4301

20°C – 200°C: 16,5 [10^{-6} K^{-1}]

1.3912

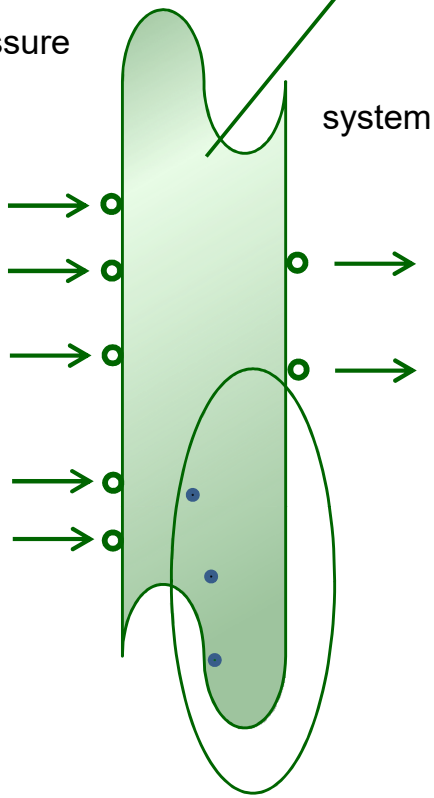


$\alpha \approx 1{,}2 * 10^{-6} K^{-1}$ @ 36% Ni

example: thermal shrinkage of inner tank wall, companison of 1.4301 and 1.3912

1.4301	**1.3912**
L_o = 3030 mm, T = -162°C $\longrightarrow \Delta T$ = 182 K	
$\Delta l = l_o * \Delta T * \alpha$ = 8,82 mm	$\Delta l = l_o * \Delta T * \alpha$ = 0,66 mm

Permeation



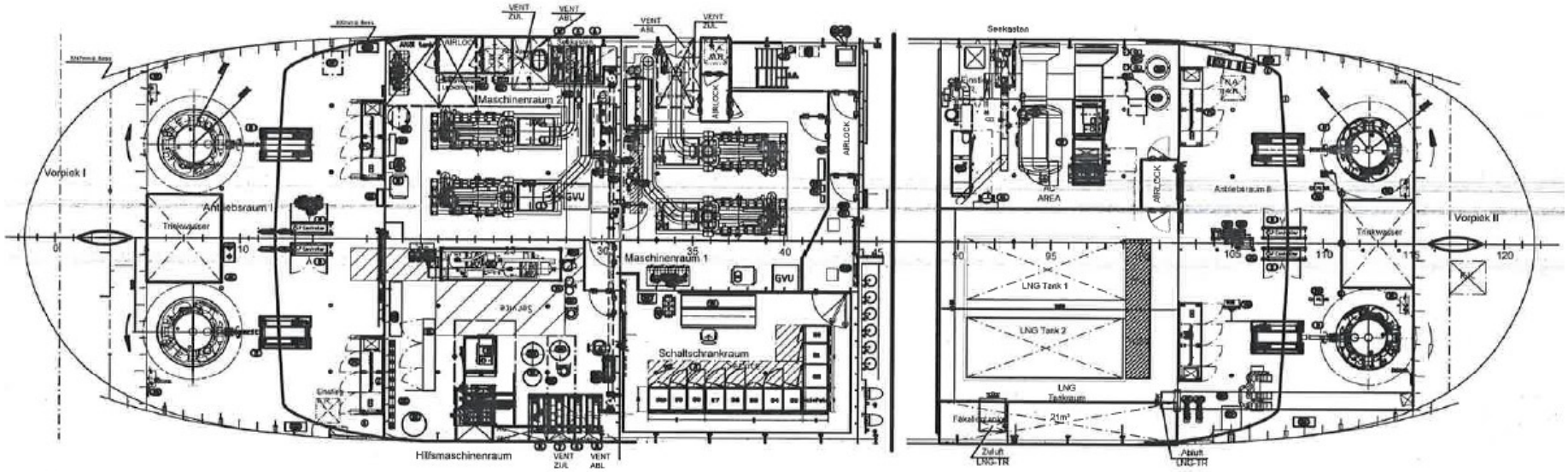
SORPTION
substances are absorbed on the surface of the solid

DESORPTION
the adsorbate escapes as a gas on the low pressure side of the solid (increase of pressure within the vacuum space)

DIFFUSION
the permeat penetrates the solid material through pores or molecular interstices

austenic steel has a nearly negligible leak rate at 1 mm wall Zhickners and at 1013 m bar pressure difference

Technical Concept for LPT- Intepation on a wadden sea ferry

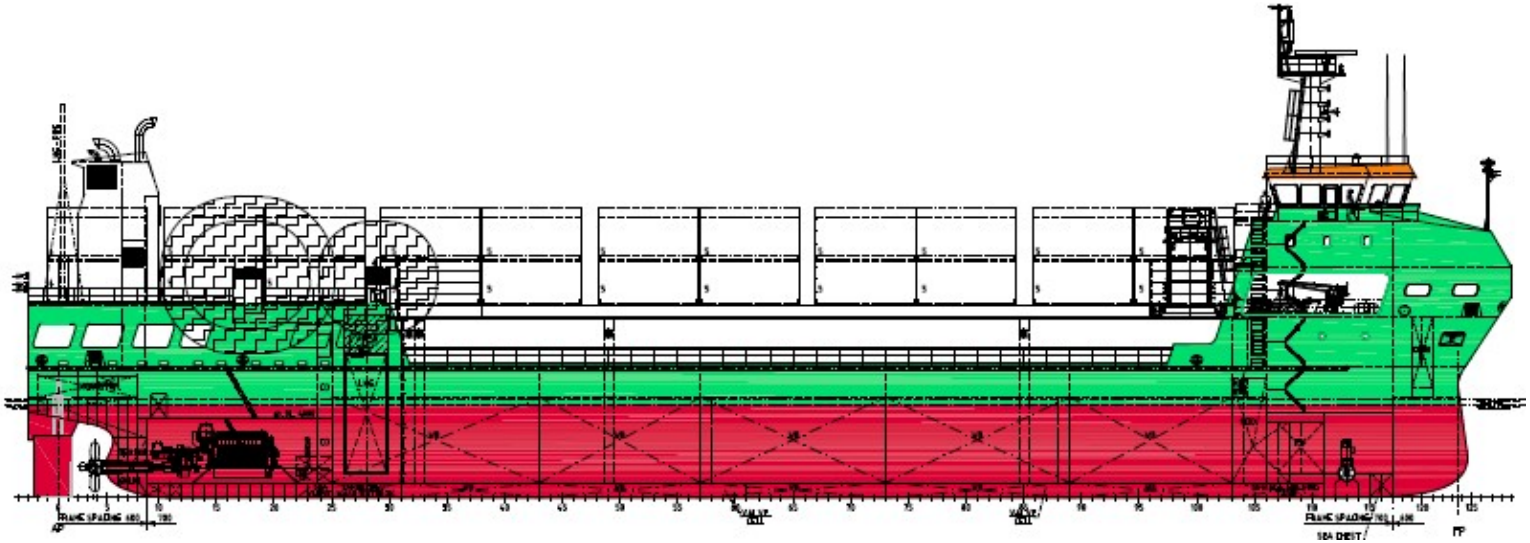


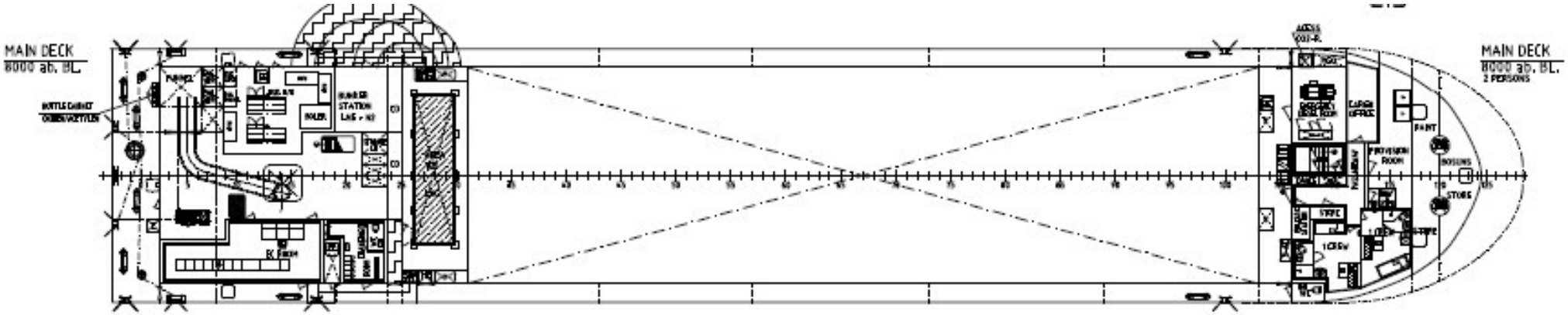
- arrangement of tanks and process technology
- operational aspects
  - required bunker capacity
  - layout bunker station
  - stand alone time
  - use of boil off

Testing the Protopye

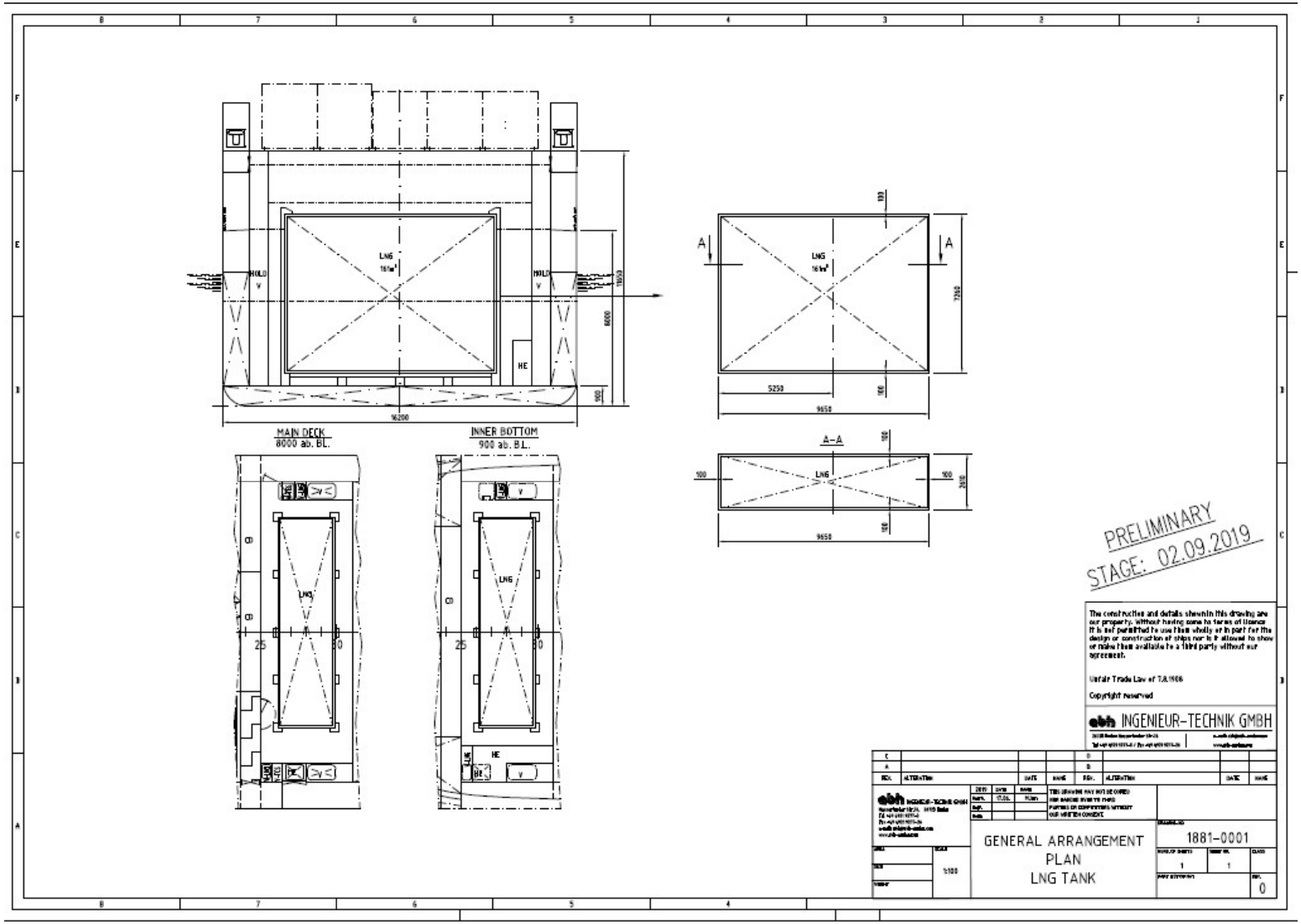
- Testing with LN_2
- Test procedure not finalined

4750 TDW MPC- Base





160 m³ rectangular LNG- Tank



Thank you very much for your kind attention.

MariGreen
Maritime Innovationen in Green Technologies

abh INGENIEUR-TECHNIK GmbH
Nesserlander Str. 76
26723 Emden / GERMANY

abh@abh-emden.com

www.abh-emden.com