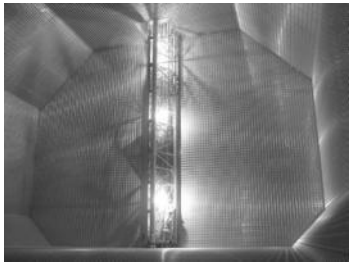
Expert in LNG

# REACH$_4$ - LNG Bunker Mast

## 2016







**LNG as Fuel Division**

Safety | Excellence | Innovation | Teamwork | Transparency

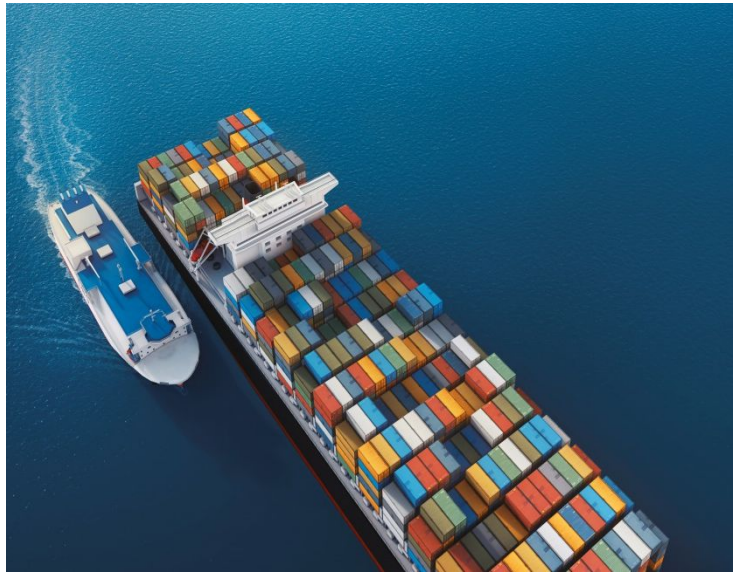
# Content

- **System introduction**
  - Purpose
  - System overview
  - Main assets
- **Technical description**
  - Operational capabilities
  - Normal Connection/Disconnection
  - Emergency disconnection
- **Proofs & Synthesis**

# LNG Bunker mast by GTT

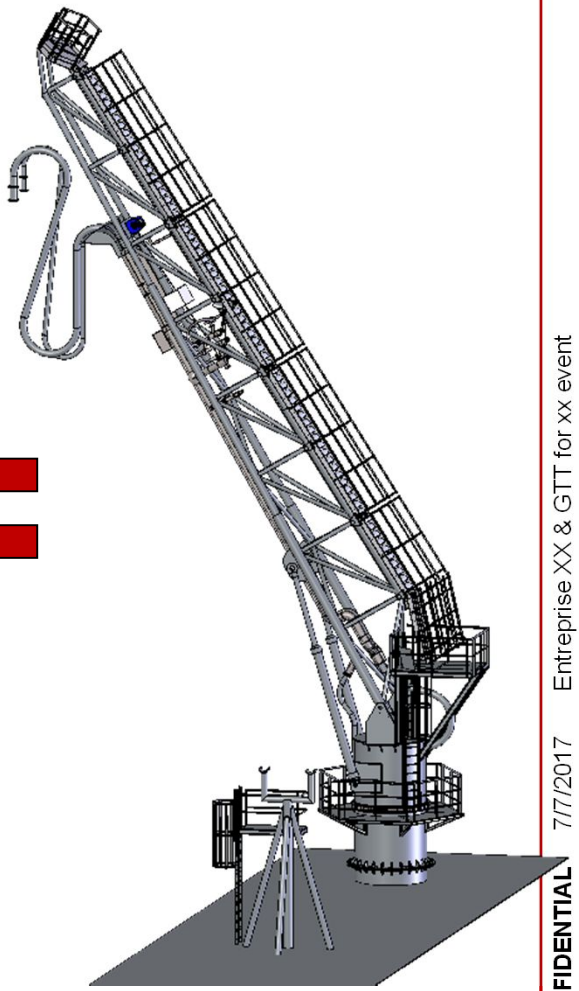
## Purpose

- Provide a LNG transfer system for Ship to Ship bunkering applications
- No compromise on safety

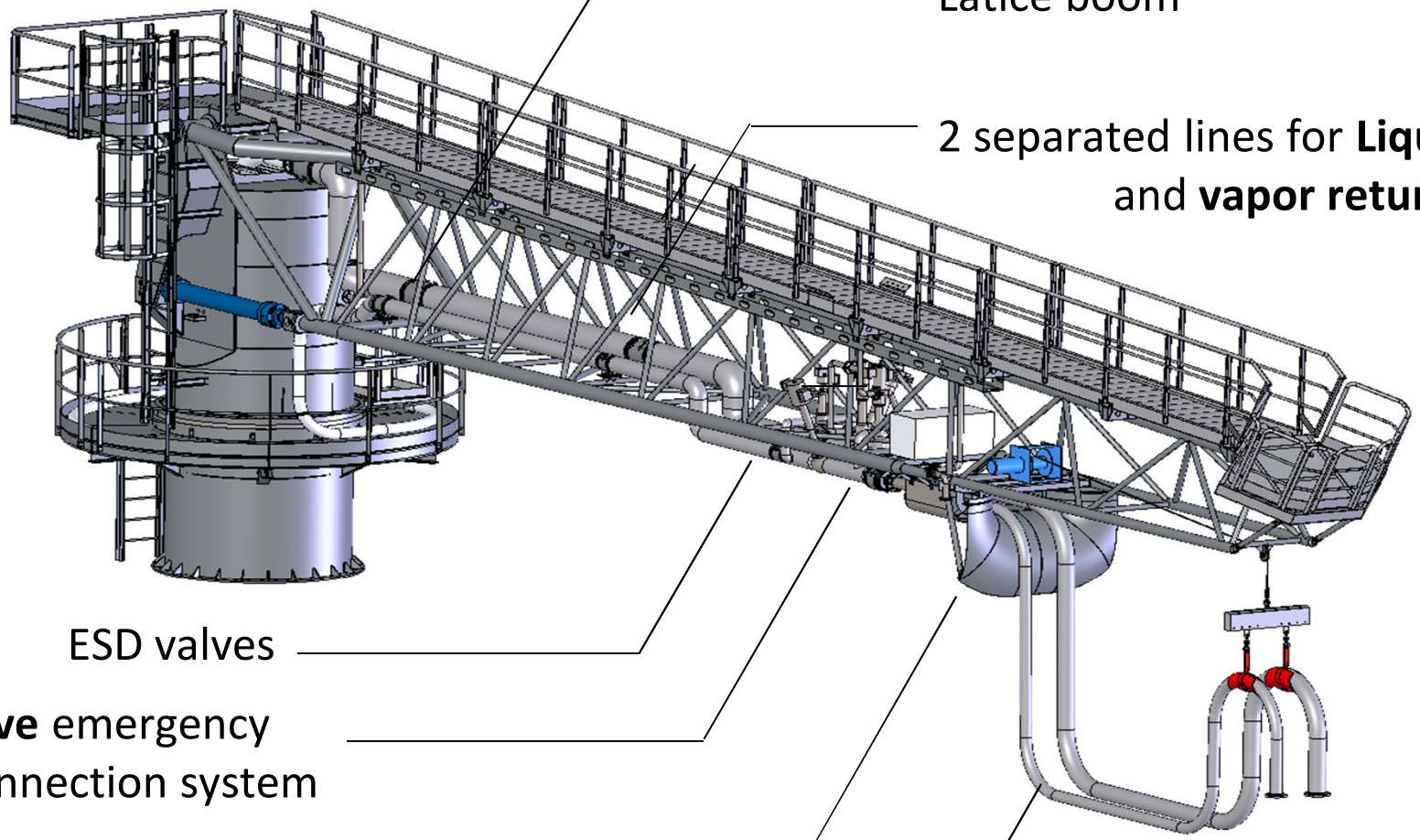


# Innovative adaptation of existing system for conventional fuel

Cryogenic protection
+
Emergency disconnection system
+
Structure reinforcement

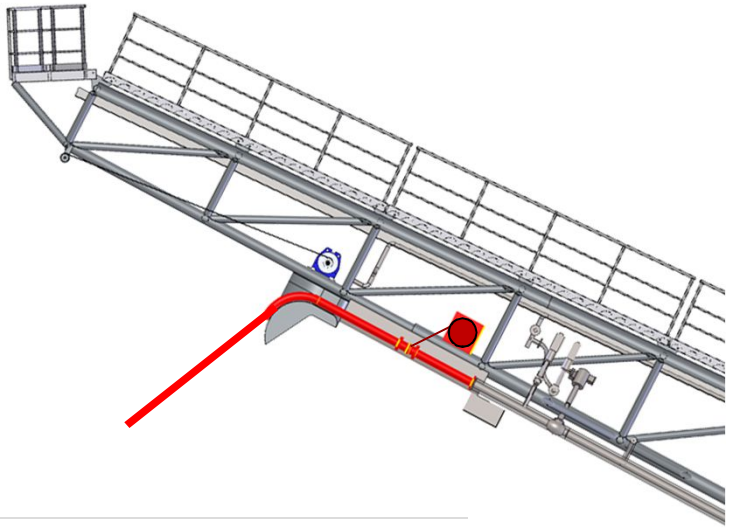


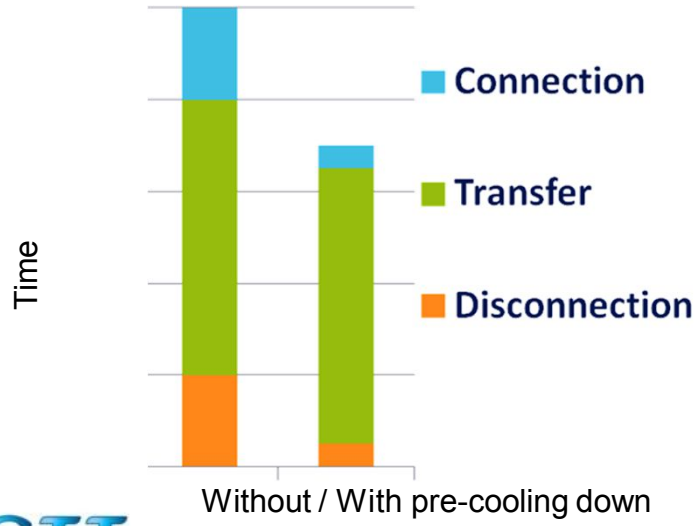
# A simple way to safety



# Main Assets

- **Safe**
  - In line with ISO/DTS 18683
  - **Passive** and **fixed** emergency disconnection system
  - Compliant with **ATEX** regulation



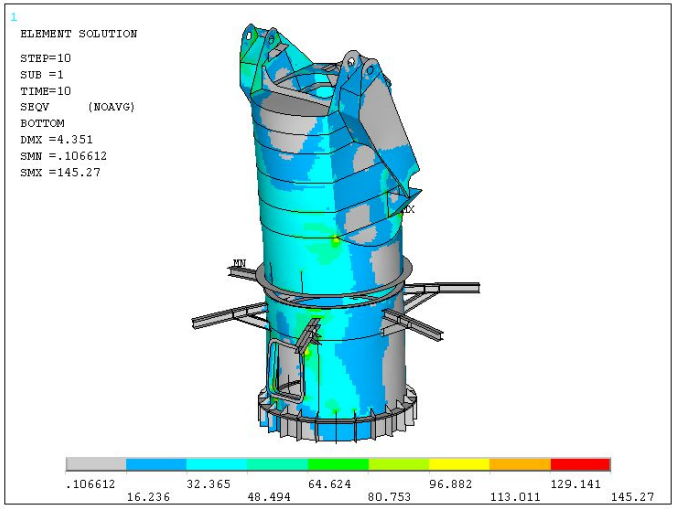



- **Fast**
  - Closed loop for pre-coolingdown
  - Dry couplings for quick connection/disconnection

# Main Assets

## Robust

- **Conservative** value of dynamic amplification factor
- Designed according to **offshore standard** EN 1474 & API RP2A



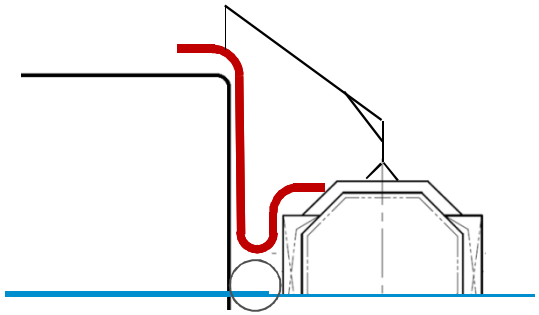

Code check of the pedestal using FEM

## Reliable

- Only 1 swivel joint inside the pedestal
- Reduced maintenance
- Break-away coupling :
  Easy replacement of the breakstuds for maintenance or after emergency disconnection

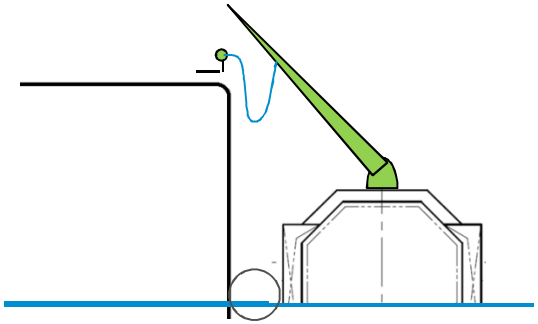
# Compared to existing offering

## Simple flexible hose



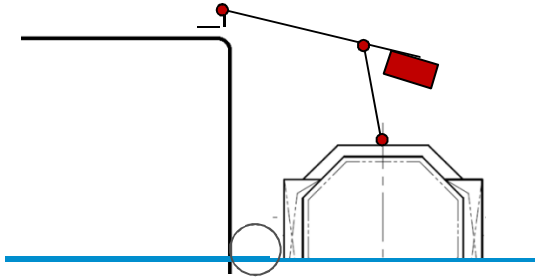
- Low point, difficult to drain
- Time for connection/disconnection
- Difficult integration of disconnection devices

## Bunker mast



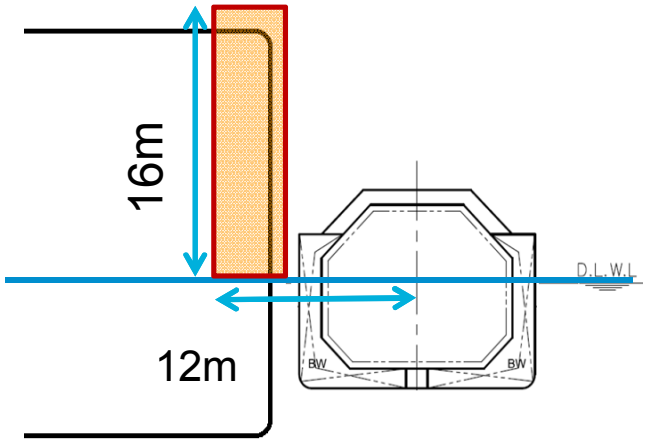
- Well proven system for conventional fuel
- Draining by gravity
- Passive emergency disconnection
- Simple system
- Easy to operate

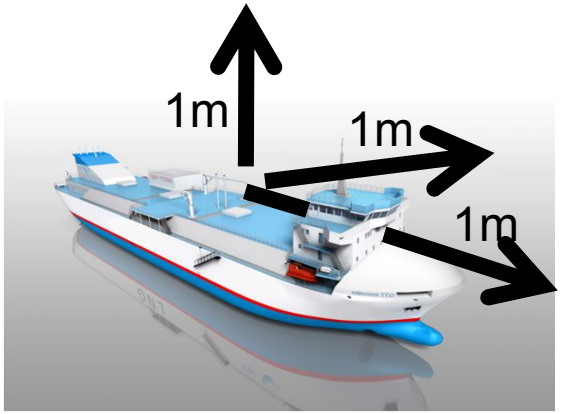
## Articulated rigid arm

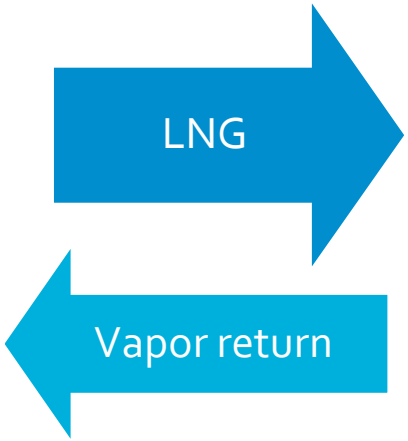


- Multiple swivel joints
- Powered emergency disconnection
- Ship motion and counterbalance
- Complex and expensive systems

# LNG Bunker mast by GTT




## Operating range

- Able to bunker most of ships
- Independent from a specific bunker station arrangement

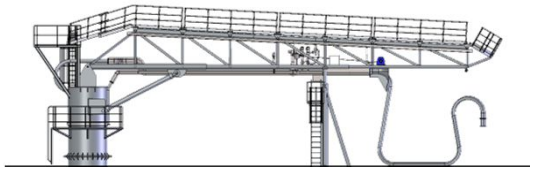
## Relative motion

- Designed for bunker operation in sheltered area (harbour, shipping roads)

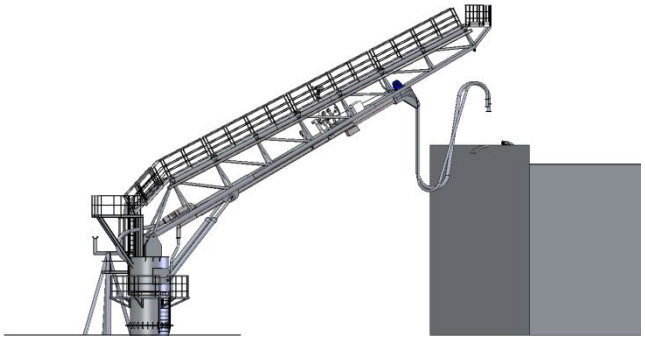
## LNG flow rate

- Designed for LNG flow rate of 600 $m^3/h$
- Easily upgradable for a more important flowrate

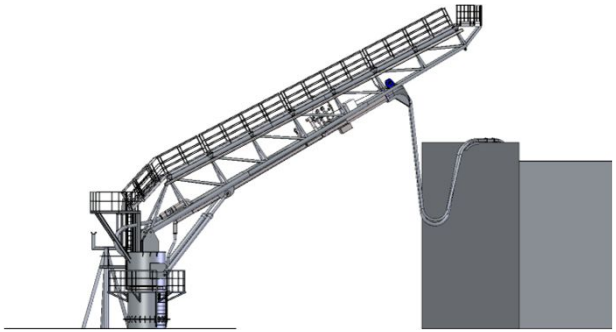
# Normal connection/disconnection in 5 key steps



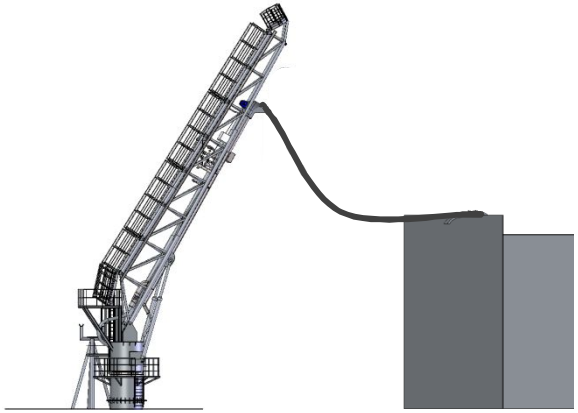
1 - Stowed position



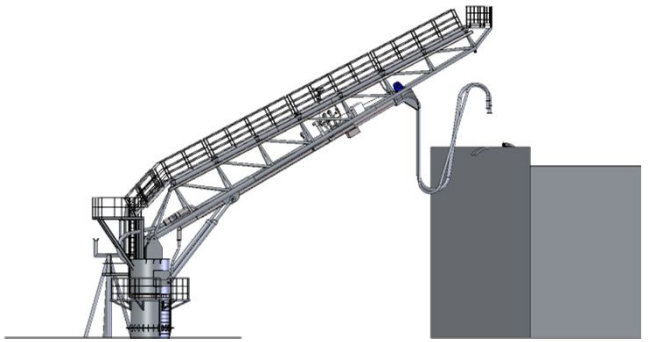
2 – Connection



3 – Transfer



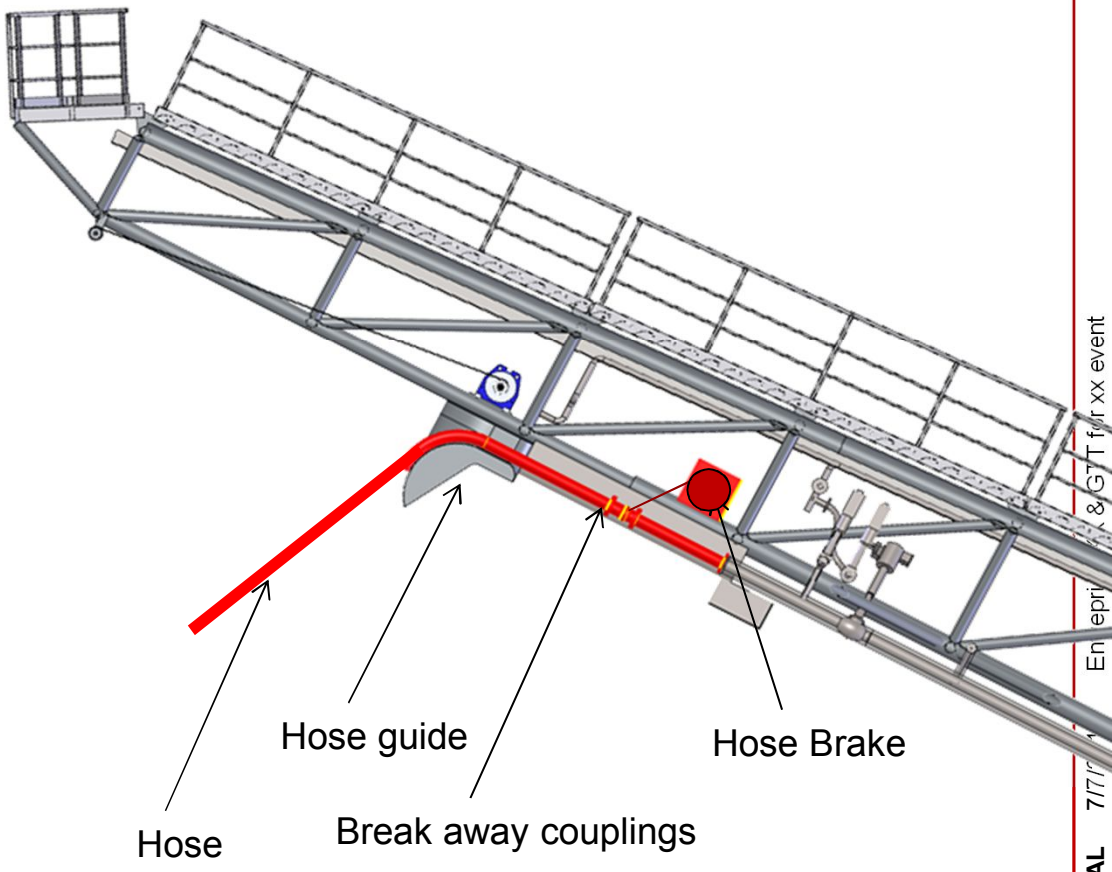
4 – Draining



5 - Disconnection

# Passive emergency disconnection

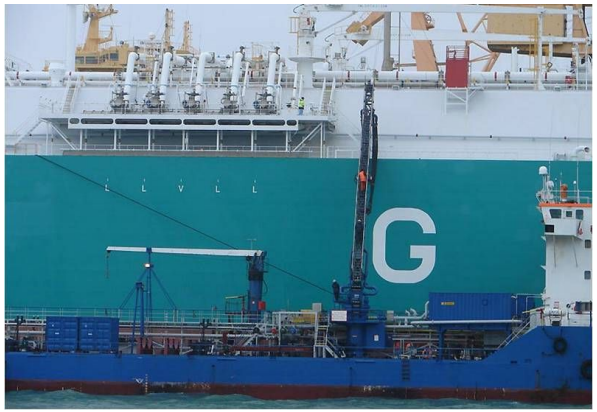
- Triggered in case of excessive stress on flexible hose
- **Inherently safe**
- No need of monitoring/activation devices
- **No spurious disconnection**
- Hose brake to control the fall
- **Patent pending**



# A robust design based on proven technologies

Based on sea-proven components

HAZID Workshop
&
Approval in principle



Regulation & Safety philosophy from offshore application (EN 1474 & API RP 2A)

Bunker masts are standard practice for conventional fuels

# Synthesis

## Characteristics:

•Innovative adaptation of **existing system** for conventional fuel

• Able to bunker **most of** the ships

• Operation in sheltered area

• Up to 600 $m^3/h$

## Advantages:

• **Simple** and **economic** solution

•Safe

• Quick

• Simple & Easy to use

• Robust & Reliable

## Proofs:

• Bunker masts **prove** themselves for conventional fuel

• Based on **sea-proven** equipments

• **AIP** from BV

• Hazid workshop

# Thank you for your attention

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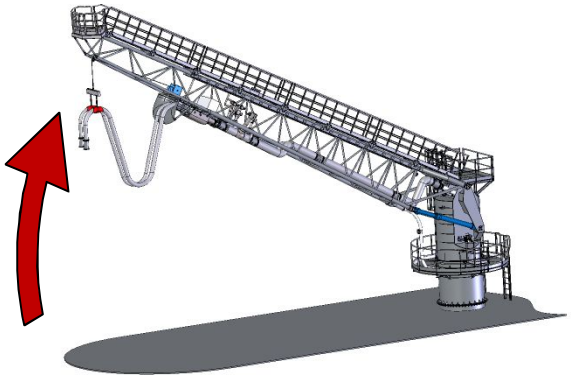
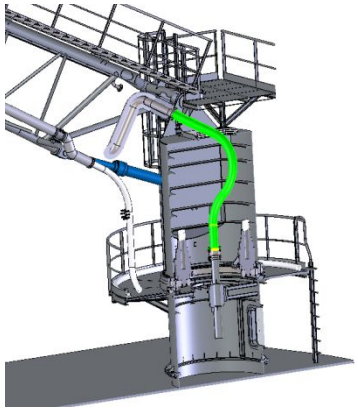
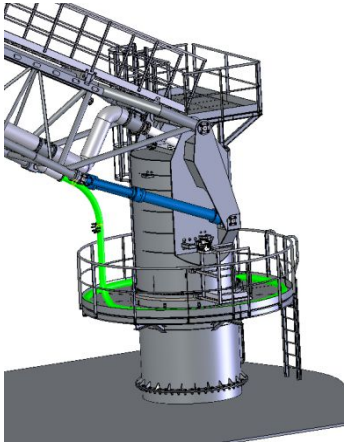
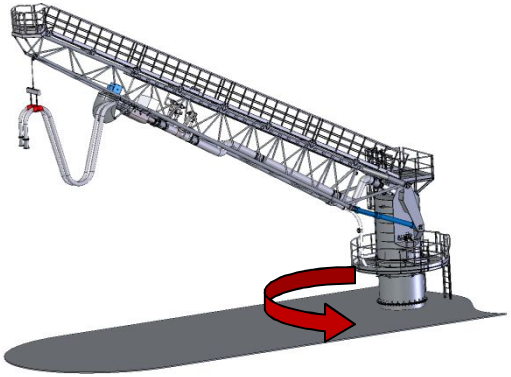
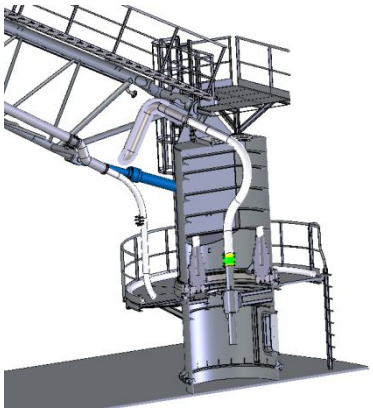
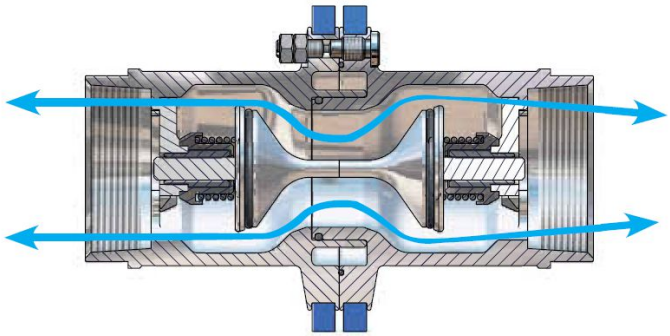
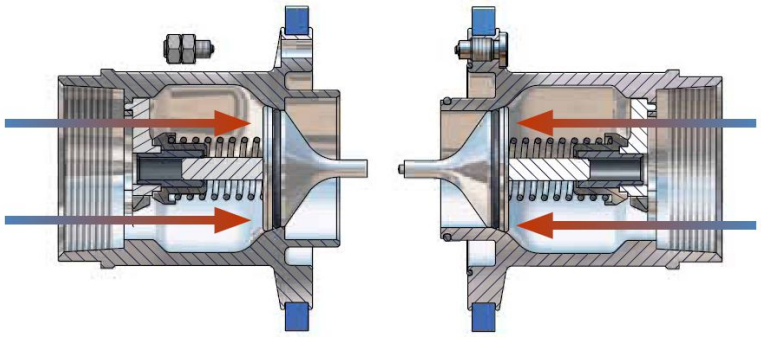
# Articulations of transfer lines

| | Liquid Line | Vapour line |
|---|---|---|
|  Luffing range: 0° - 60° |  1 flexible hose (3,7 m) |  1 flexible hose (15 m) |
|  Slewing range: -170° - +170° |  1 swivel joint | |

# Break away coupling

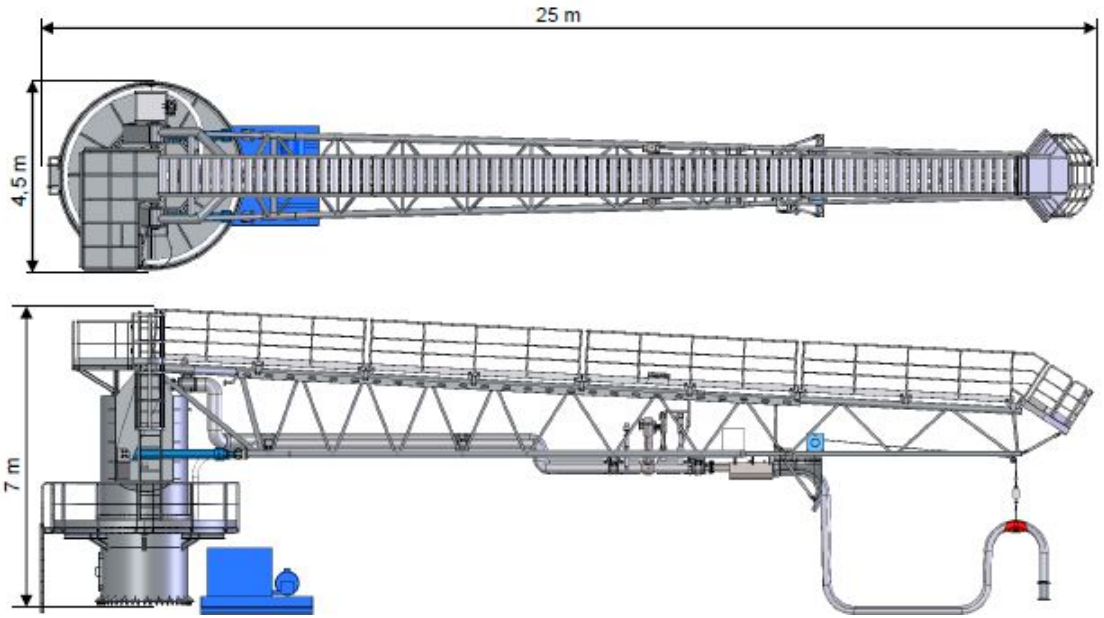


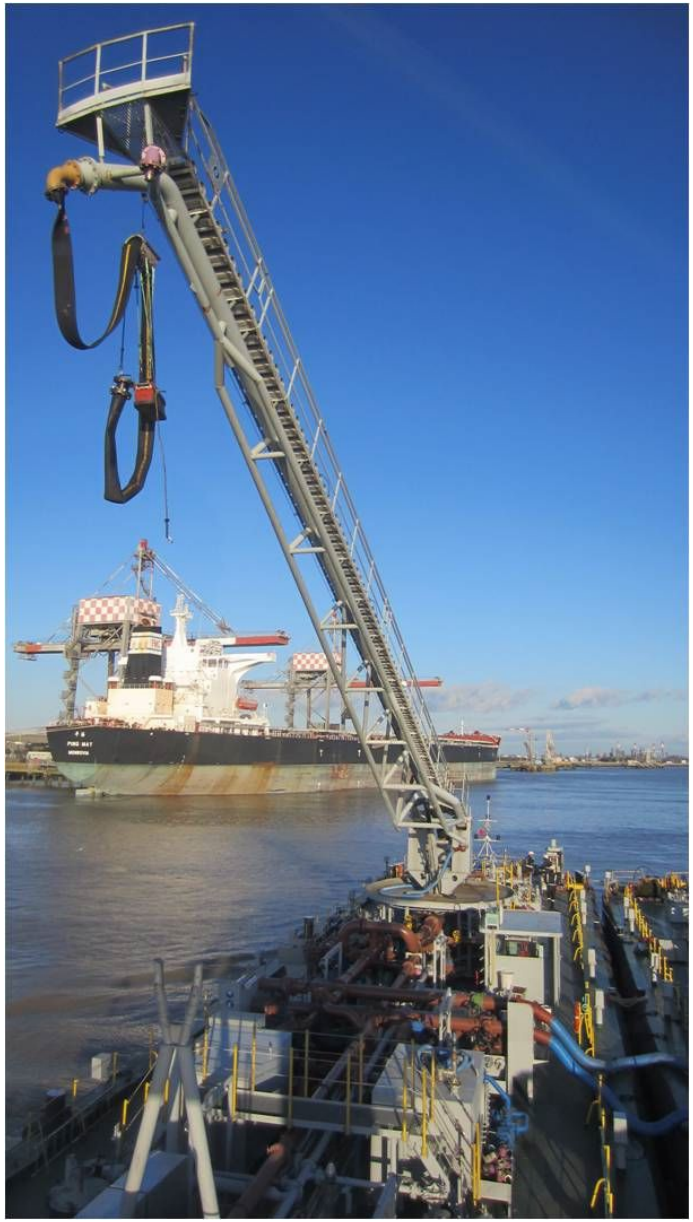


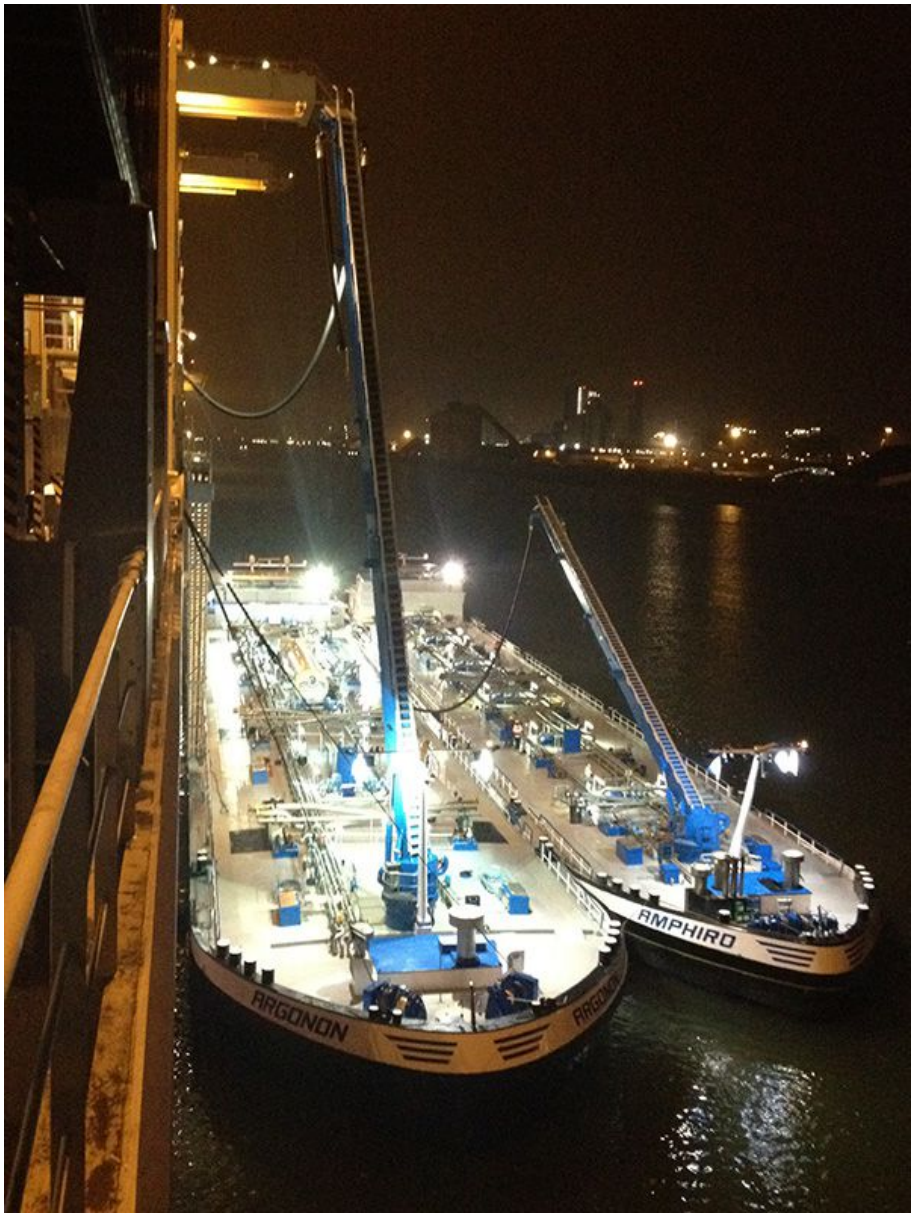
Breaking bolts

# Weight and occupied volume

| | | |
|---|---|---|
| Latice structure | 3 178 | kg |
| Upper pedestal | 5 842 | kg |
| Lower pedestal | 1 829 | kg |
| Ganway | 1 018 | kg |
| Platform | 1 548 | kg |
| Line and process equipement | 1 872 | kg |
| Cylinders | 1 404 | kg |
| Hydraulic Power Unit | 1 800 | kg |
| Other hydraulic equipments | 1 190 | kg |
| Emergency release system | 314 | kg |
| **Total** | **19 996** | **kg** |








# Bunkering operations for fioul

# Bunkering operation between Seagas and Viking Grace