
BOLUDA
TOWAGE
READY FOR
THE FUTURE
GREEN DEVELOPMENTS HYBRID & TIER III

Changing the game

Operational experience hybrid tugs & lessons learned

Pioneering Retrofit TIER III

Way forward

HYBRID

- **Operational experience**
- **Lessons learned**

BOLUDA TOWAGE

Generations hybrid tugs

2012

1st Generation hybrid

1st Hybrid Rotortug in Europe:

RT Adriaan

Nowadays: **VB Kracht**, Rotterdam

2015

2nd Generation hybrid:

Series Advanced

Rotortugs ART80-32

RT Evolution

London

RT Emotion

Bremerhaven

BOLUDA TOWAGE

Benefits Hybrid Clean & Simple

REDUCED EMISSIONS OF CO^2, NO_X AND PM

Lower fuel usage
Cleaner combustion

Emission element	% reduction (overall)	Reduction per year (kg)
PM (particulate matter)	~ 35%	532
HC (unburned hydrocarbons)	~ 36%	198
NO_X (nitrogen oxide**)	~ 32%	21.600
CO^2	~ 35%	443.000

(Emissions per tug: 2nd generation Rotortug ART80-32)

IMPROVED FUEL ECONOMY

No unnecessary idling of diesel engines.

MAINTENANCE SAVINGS

Minimized engine use
Less engine overhauls, oil and filter changes.

NOISE REDUCTION

Noiseless zero emissions mode
No diesel engines running

SAFE & HEALTHY WORKPLACE

Fast switch from hybrid mode with electrical motors to conventional modus with diesel engines.
Battery power during sailing mode

Lessons learned hybrid system

In-depth knowledge of the port environment and the tug's sailing profile

- Seeking the best match between port environment and tug capacity & hybrid system
- Optimal performance hybrid tug in port environment with locks

Sailing profile
Port of Bremerhaven
Nordschleuse &
Kaiserschleuse

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Lessons learned hybrid system

- Training program and skills crew (Master and Engineer)
- Clear instruction for Dispatch (planning & mobilization hybrid tugs)

- Battery's location & safety precautions batteries

- Maintenance cost of the hybrid system & battery life cycle

- Possible black-out issue hybrid modus 1st generation. Improvements / update software (achieved)

IMO TIER III

- Pioneering 1st and 2nd retrofit
- Lessons learned
- 4 newbuild tugs TIER III

The ‘why’….?

SUSTAINABLE LOGISTIC CHANNEL

Call from Port Authorities
Most recently: Port of Zeebrugge - conditions for the extended award for concession

2019: EU GREEN DEAL

Inclusion of the shipping industry (by 2050)

EUROPEAN SHIPPING WEEK

Sense of urgency for our towage industry!

BOLUDA TOWAGE

IMO TIER III – retrofit

Union Koala & Union Panda

2020

1st retrofit conventional tug in Europe

Union Koala
Zeebrugge

2021

2nd retrofit conventional tug

Union Panda
Zeebrugge

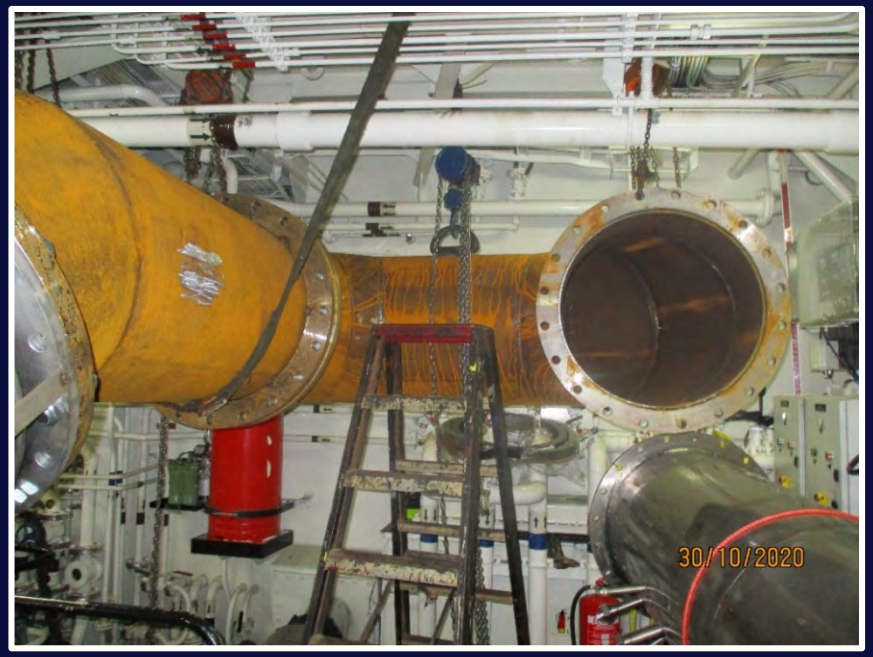
"Putting an elephant in a shoe box"

- Engineering of the routing in engine room for the new exhaust system (to avoid clashes with the existing equipment and piping)
- Installation SCR (Selective Catalytic Reduction) system
  - ABC engine's exhaust gasses are subjected to a special after-treatment known as Selective Catalytic Reduction (SCR).
  - Per engine one after-treatment unit: a 4m length and 1 m width, and a weight per unit of approx. 2 tonnes

IMO TIER III – retrofit

Union Koala & Union Panda

ABC engines connected with Selective Catalytic Reduction units



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IMO TIER III newbuild tugs

2021: 4 newbuild tugs TIER III in Zeebrugge

VB Bolero and VB Rumba
ASD 2813

VB Samba and VB Flandes
ART 80-32 (Rotortugs)

Will other ports follow?

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BENEFITS IMO TIER III

NO_x

REDUCED EMISSIONS OF NO_x

Cleaner combustion contributes to reducing exhaust emissions thanks to TIER III and the use of sulphur free fuel oil - type EN590

Emissions reduction of NO_x per tug:	**80%**
Emissions reduction of NO_x **on a yearly basis**, for the entire fleet of **6 tugs** operating in Zeebrugge, all complying to TIER III:	**353 tonnes**

12 x

IMO INTERNATIONAL MARITIME ORGANIZATION

IMO TIER III CERTIFICATION

BOLUDA TOWAGE

LESSONS LEARNED IMO TIER III

- Retrofitting a tug to reduce NO_x emissions is possible with minimum operational impact
- Retrofit 2nd tug ‘Union Panda’ ready within 3 weeks
- Significant additional value TIER III-tugs
- Retrofitting a tug to reduce the CO^2 emissions is impossible without major changes
- Investment is for the ship owner:
  No climate contribution paid by the customer or (port) authority for the use of these tugs and ecological footprint

Research other ‘green’ solutions

Most appropriate tug could be

<u>a combination of TIER III and:</u>

- **Electric, or**
- **Hydrogen, or**
- **Gas/LNG**

Any questions?


ARE YOU READY
FOR THE FUTURE ?
#joined responsibility
for #sustainable shipping

THANKS FOR
YOUR ATTENTION

EUROPEAN
TUGOWNERS
ASSOCIATION