



**ANGLO BELGIAN  
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**Jornada Técnica:  
Motores Dual-Fuel Marinos  
Combustibles Renovables  
6/3/2023**





Ogepar Group



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**engine developer and  
manufacturer since  
1912**

**medium-speed  
1MW-10MW**

**reliability  
emission compliance  
multifuel solutions**

**EU made  
family  
vertical integration**



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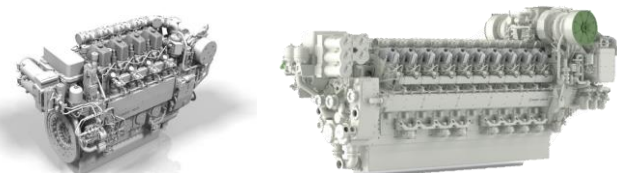
DL/DV36



DZC/VDZC



Evolve E23 series



POWER [kW]

10000

8000

6000

4000

2000

0

16DV36

12DV36

8DL36

6DL36

16(V)DZC

12(V)DZC

8DZC

6DZC

20EV

16EV

12EV

8EL

6EL

4EL

rpm

450

550

650

750

850

950

1050

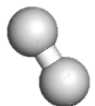
1200



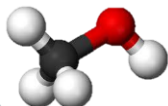


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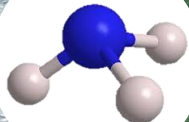
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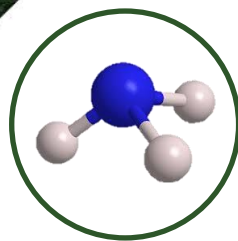
hydrogen  $\text{H}_2$



methanol  $\text{CH}_3\text{OH}$



ammonia  $\text{NH}_3$



Ammonia  $\text{NH}_3$

**Not** in ABC medium/long term development plans

**Peak laminar burning velocity:** 7 cm/s

VS  $\text{H}_2$ : 285 cm/s – Diesel 87 cm/s - MeOH 55 cm/s

In the practice:

- Low speeds work better (ideal for 2 stroke engines)
- High diesel ratios in DF engines
- High risk of unburned  $\text{NH}_3$  in the exhaust

## Advantages

No carbon  
Nitrogen widely available

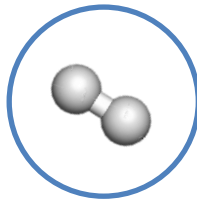
## Disadvantages

Extremely toxic  
Gaseous at ambient conditions  
Regulation (use, bunkering, local authorities)  
 $\text{NO}_x$ ,  $\text{N}_2\text{O}$  (GWP – 300!)  
Low emission temperatures – difficult aftertreatment

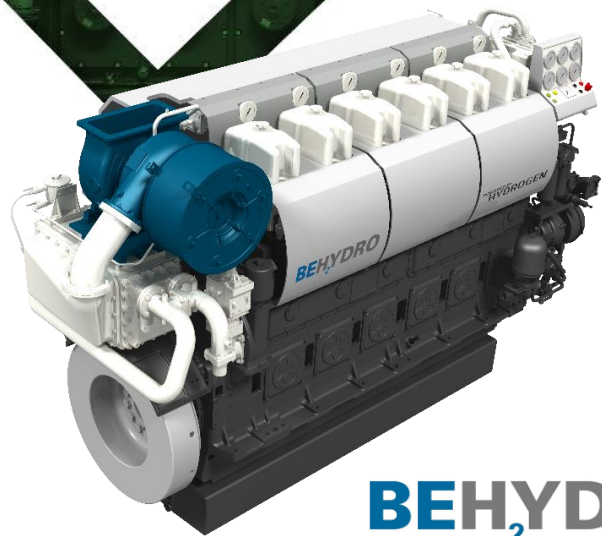


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## H<sub>2</sub> Hydrogen



**BEHYDRO**

- DZ series – Port Injection (Otto Cycle)
- 1000 – 2700 kW at 1000 rpm
- up to 85% substitution DF engine (2020)
- 100% H<sub>2</sub> Spark ignited (2022)
- Pre-ignition free + H<sub>2</sub> embrittlement resistant
- Suitable for Gas Safe Machinery Spaces

### Advantages

No carbon  
Simplest e-fuel

### Disadvantages

Storage  
Permeability  
Pre-ignition  
Material embrittlement  
Gaseous fuel at ambient conditions  
Regulation and infrastructure





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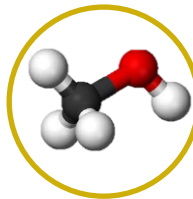
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methanol  $\text{CH}_3\text{OH}$



- DZ series – DF Port Injection (otto cycle)
- 1000 – 3570 kW at 1000 rpm
- 70% substitution DF engine
- Suitable for Gas Safe Machinery Spaces
- Available since 2022
- Low pressure  $\text{CH}_3\text{OH}$  - 8 bar

## Advantages

Liquid at ambient conditions  
Good energy density  
100% power output – ideal for retrofit  
Regulated

## Disadvantages

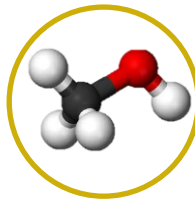
Carbon  
Low flashpoint – Gas Safe Machinery spaces  
Toxicity  
Corrosivity





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methanol  $\text{CH}_3\text{OH}$

Machine room

Fuel Preparation Space  
(can be outfitted in a  
cofferdam)



Low pressure MeOH injection pump  
( $< 10\text{bar}$ ) + filters

Flow meter

Double wall piping in machine room



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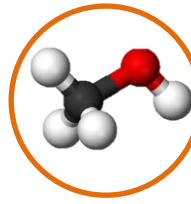
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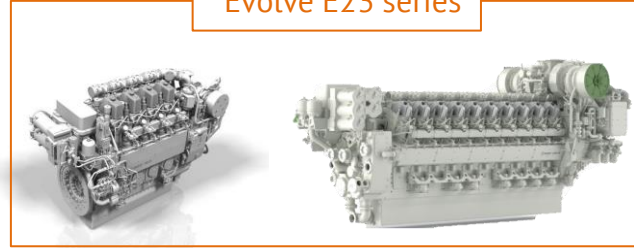


methanol  $\text{CH}_3\text{OH}$

DL/DV36



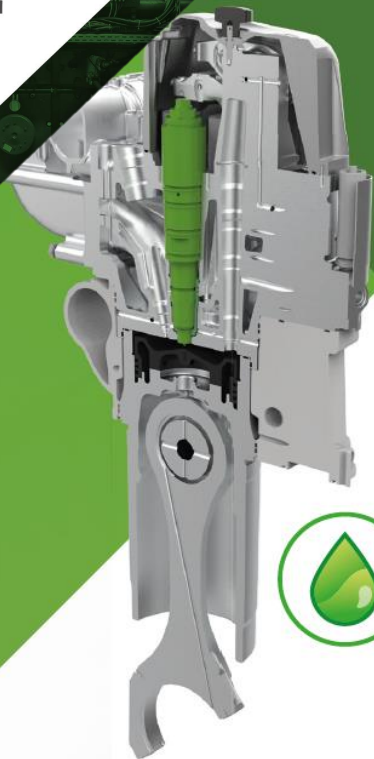
Evolve E23 series



## DEVELOPMENT PROGRAM 2025:

- Methanol Direct Injection DL/DV36 - Evolve
- Higher substitution ratios
- Better technology for higher compression ratio engines



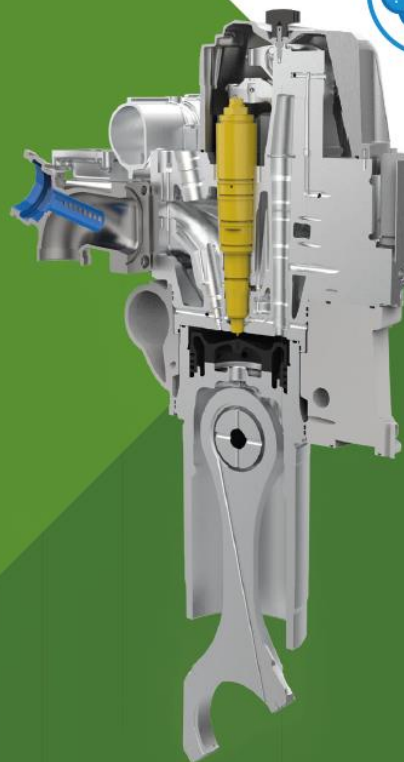


## Liquid fuel

Highly efficient Common Rail or PLN  
fuel injection system for liquid fuels.

## Dual fuel

Micro pilot liquid fuel injection  
combined with gas injection system.



## Spark ignited

100 % gas using a spark plug.





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