Pollution of sea water by garbage.

Pollution of sea water by sewage.

Pollution of sea water by oil.

Pollution of sea water by ballast water.

Pollution of air by exhaust gases.

Pollution of air by CFK’s.

Pollution of sea water by garbage.
OPERATING PROFILE HARBOUR TUG

Engine power operating time

Operating time [%]

Engine power [kW]

- PS main engine
- SB main engine
SLOW SAILING

- Engines at idle speed
- Clutches engaged
- Rudder propellers to the side
- Loss of energy
PROPULSION SYSTEM

**MTU 16V4000**
- 16 cylinder V-type engine
- Common rail fuel system
- Emissions compliant with IMO Tier 2
- Maximum power 1840 bkW at 1600 rpm

**ROLLS ROYCE US 205 FP**
- Straight shaft line with bow teeth coupling
- Built-in on/off clutch
- CuNiAl five bladed fixed pitch 2400 mm propeller
- TK nozzle with stainless steel inner plate
DIESEL ELECTRIC PROPULSION SYSTEM

MTU 12V2000 GENERATOR/FIFI SET ENGINE

- 12 cylinder V-type engine
- Common rail fuel system
- Emissions compliant with IMO Tier 3
- Exhaust gas after treatment system
- Maximum power 695 kW at 1800 rpm

ABB ELECTRIC PROPULSION ENGINES

- Jacket water cooled 440 V – 60 Hz AC
- Rotor shaft and bearings designed to transfer the maximum torque diesel propulsion engine
- Maximum power 230 kW at 900 rpm
Selective Catalytic Redaction system (SCR)
- Diesel Oxidation Catalyst (DOC)
- Diesel Particulate Filter (DPF)
- Fuel according to EN590 required
TUGS  ➤  ASD TUG 2810 HYBRID

HYBRID PROPULSION SYSTEM

- Main Engine (IMO Tier 2 compliant)
- Generator set (IMO Tier 3 compliant)
- Main Engine (IMO Tier 2 compliant)
- Electric motor / generator propulsion
- Propulsion switchboard
- Electric motor / generator propulsion
- Rudder propeller
- Battery set (100 kW) (120 kWh)
- Battery set (100 kW) (120 kWh)
- Rudder propeller
- Propeller
- Hotel switchboard
- Propeller
OPTIMIZING IN EFFICIENCY IN ALL OPERATIONAL CONDITIONS
STANDBY MODE

HARBOUR MODE | STANDBY MODE | FREE SAILING MODE | TOWING MODE | FIFI MODE | HYBRID OVER RIDE

Rudder Propeller | Electric Machine | Switchboard

FUEL REDUCTION

32%
75%

5% 5% 15%

Standby mode is part of the Free Sailing mode when the RPM is lower than 500 RPM
FREE SAILING MODE

- HARBOUR MODE
- STANDBY MODE
- FREE SAILING MODE
- TOWING MODE
- FIFI MODE
- HYBRID OVER RIDE

DIESEL ENGINE
GENERATOR
ELECTRIC MACHINE
RUDDER PROPELLER

FUEL REDUCTION
32%
75%

0-8 KTS SPEED
0-900 RPM RPM RANGE
0 T BOLLARD PULL

Diesel electric propulsion up to 8 knots and only the IMO Tier 3 compliant generator/fifi set engine running. (One battery pack is loaded by the propulsion switchboard.)
Diesel direct propulsion up to 13 knots or 60 tons bollard pull, only two main engines running.
(One battery pack is loaded by the propulsion switchboard, one battery pack feeds the hotel switchboard.)
Diesel direct propulsion up to 13 knots or 60 tons bollard pull and 1200 m³/hr fire fighting capacity. Two main engines and one generator/fifi set engine running.
REDUCTION EMISSIONS AND FUEL CONSUMPTION

Fuel and emissions compared to benchmark

- Nox
- PM
- HC
- CO
- Fuel
- CO2
- SOx

- ASD Tug 2810 Standard
- ASD Tug 2810 Hybrid + Batteries