



Innovative Power Transmission



MARHY® – Maritime Hybrid Drive
An efficient Propulsion System for Ships



Existing solutions and new trends for safer maritime transport

To meet safety requirements and more and more stringent environmental regulations – required for ships carrying hazardous cargo – innovative propulsion concepts are necessary.

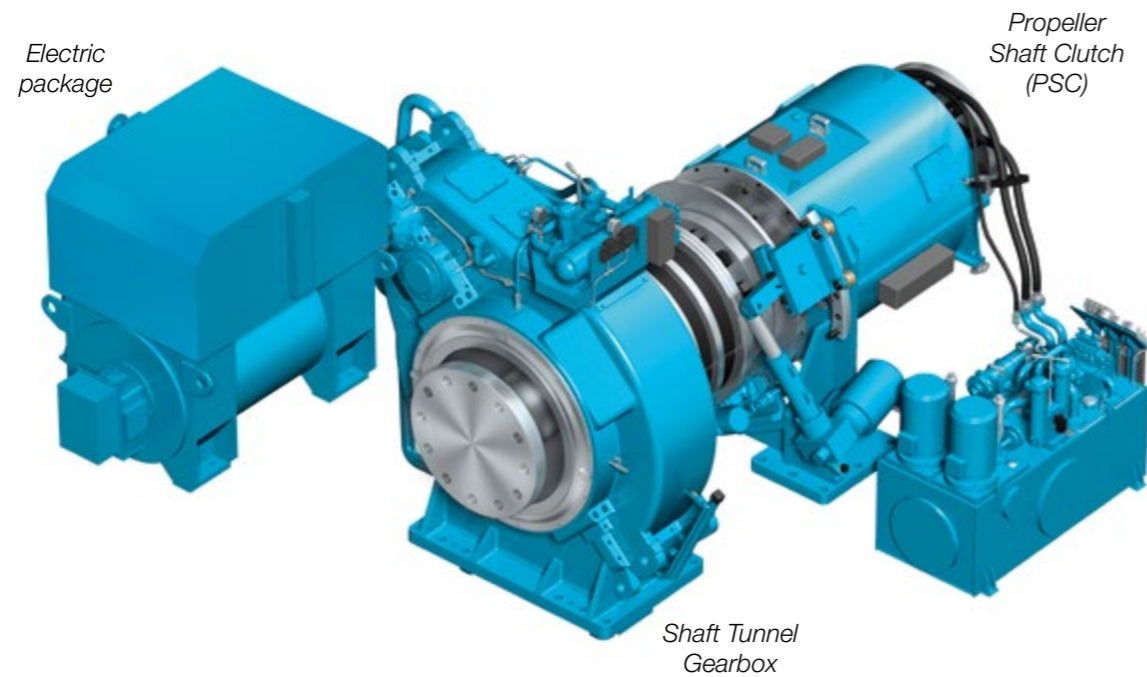
On technically advanced new ships, the single shaft line propulsion train is supplemented by a second propulsion system, independent of the main engine. The Power-Take-Home system (PTH) ensures maneuverability in case of main engine failure.

The growing number of installed PTH systems, mainly on product/chemical tankers, is revealing a trend towards increased safety and environmental awareness.

MARHY® can be used on any type of vessel with Fixed Pitch or Controllable Pitch Propeller (FPP or CPP), with a propulsion power of up to 60 MW. PTO/PTH/PTI power will be adapted in accordance to each specific project requirement.

MARHY® – The package of RENK’s proven drive components

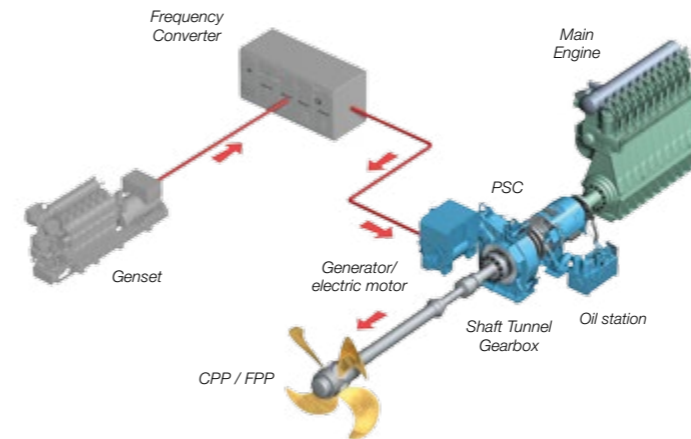
MARHY® system: the new concept



MARHY® is a redundant propulsion system for ships, driven by a slow speed diesel engine.

MARHY® is used for economical and environmentally friendly propulsion for slow steaming and maneuvering, Power-Take-Home (PTH), additionally covering the Power-Take-Off (PTO) and Power-Take-In (PTI/Booster) features.

Electric Propulsion Mode (PTH, PTI, PTO)

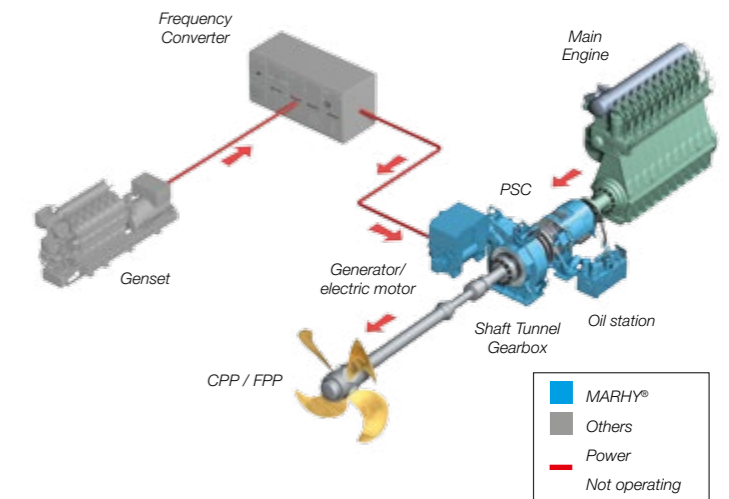


PTH mode

- Main engine at standstill
- Propeller Shaft Clutch (PSC) remotely disengaged
- Gensets supplying the booster power
- Frequency Converter feeding the „electric motor/PTO generator“, operating as electric motor

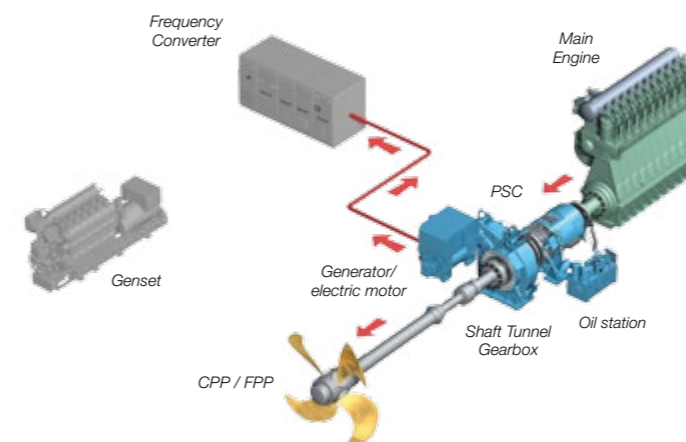
PTI mode

- Main engine is running
- Propeller Shaft Clutch (PSC) remotely engaged
- Gensets supplying the booster power
- Frequency Converter feeding the „electric motor/PTO generator“, operating as electric motor



PTO mode

- Main engine operating range 70 – 100% (FPP)
- Propeller Shaft Clutch (PSC) remotely engaged
- „Electric motor/PTO generator“ operating as generator
- Frequency Converter ensuring required power at constant voltage and frequency within 70 – 100% (FPP) main engine speed range



MARHY® – Package components

RENK tunnel gearboxes

One essential mechanical component of the MARHY® system is the RENK tunnel gearbox. RENK tunnel gearboxes – free-standing independent units – are located in the propeller shaftline, reduce the electric motor speed to propeller speed in electric propulsion mode and raise the main engine speed to PTO generator speed in PTO mode.

RENK tunnel gearboxes, supplemented by a highly flexible coupling, have proven their longevity and reliability in more than hundred installations.

Main advantages of the RENK tunnel gearbox:

- The tunnel gearbox allows increased efficiency during PTH mode with low propeller speed (at approx. 60% of nominal speed)
- During maintenance, the system can be easily disconnected via an elastic coupling to freely run the propeller by the main engine
- Compact and efficient design



RENK tunnel gearbox

RENK Propeller Shaft Clutches

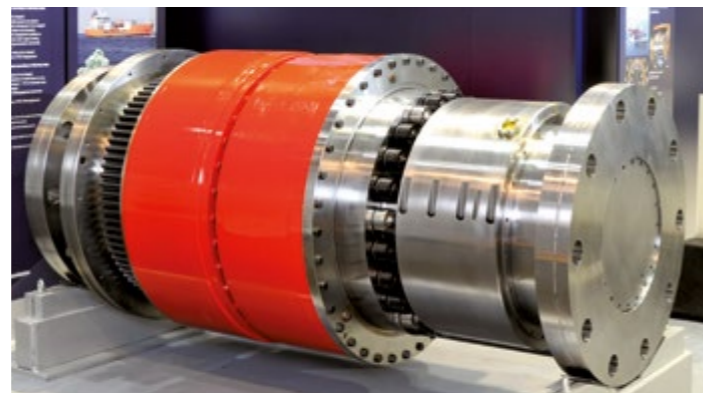
To activate the redundant and main engine independent MARHY® system, the main engine has to be disconnected from the shaftline. The patented RENK Propeller Shaft Clutch (PSC) is located between the main engine and the RENK Tunnel gearbox.

To start the MARHY® system, the PSC has to be opened via a fully automatic system from the ECR (Engine Control Room) at standstill. The reduced propeller thrust at slow steaming will be transmitted by the thrust bearing, fully integrated into the clutch.

To switch back to main propulsion, the PSC will be engaged during standstill. The slightly conical gearing is hydraulically moved into position and closes the clutch free of clearance.

Main innovations & advantages of the RENK Propeller Shaft Clutch (PSC):

- Fully automatic controlled operation for clutch dis-/engaging
- Designed for frequent use
- Clearance free gearing
- Compact and low weight design



Propeller Shaft Clutch (PSC)

Electric package

Main advantages of the electric package:

- Electric package is covering electric propulsion mode as well as PTO mode
- Easy integration of digital control & monitoring system in vessel power management system
- Compact and integrated design

Why choose MARHY®

An ecological system

- Redundant propulsion as specified by Classification Societies, for the minimization of the risk of ecological disasters
- Reduction of gas emissions in electrical propulsion mode
- Immediate availability of the propulsion system and improved maneuverability allow the ship to depart a very short notice in case of emergency, e.g. during loading and unloading of hazardous cargo
- Reduction of noise and vibration levels in electric propulsion mode

An economical system

- Reduction in off-hire since maintenance is possible during operation
- Main engine operation only during sea voyages at optimum load conditions, thus avoiding wear and fouling, and hence resulting in reduced maintenance
- Fuel savings
- Lower insurance premiums, less tug assistance and harbour fees
- Better resale value and easier chartering due to improved safety and operational capabilities
- Fast return of investment

A turnkey package

From design to supply, on to commissioning, training and through-life support, RENK works in close partnership with ship owners and shipbuilders to make their ships as economical and reliable as possible.

Main components of the MARHY® package:

- RENK Propeller Shaft Clutch (PSC)
- RENK tunnel gearbox
- Highly flexible couplings
- Electric package including:
 - Electrical motor/generator
 - Frequency converter with harmonic filters and digital control & monitoring system





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