



WE BRING THE NEXT LEVEL IN ENERGY EFFICIENT SHIPPING

WE Tech

CREATING SAVINGS



SOLUTIONS OVERVIEW



THE NEXT LEVEL OF ENERGY EFFICIENT SHIPPING

By utilising variable frequency drive (VFD) technology the WE Tech variable speed shaft generator solution presents unmatched efficiency in ships electrical power generation. Our solutions allow fully optimised propulsion machineries that also generate electrical power on board – thus Auxiliary Generators can be stopped when sailing.

By further utilising permanent magnet technology in the rotating machines WE Tech offers superior energy efficiency, power density, design flexibility and operational reliability in our solutions.

ABOUT WE TECH SOLUTIONS

WE Tech Solutions specialises in variable frequency drives and permanent magnet generator technologies. The company has developed a portfolio of new solutions providing many benefits to the shipping industry worldwide such as increasing energy efficiency, reducing fuel consumption and cutting environmentally harmful emissions.

The energy efficient solutions are suitable for new buildings and for upgrading of existing ships. WE Tech is a leading energy efficiency solutions provider, headquartered in Vaasa, Finland.

We are a strong player with global presence.

CREATING SAVINGS

BENEFITS

LOWER CAPITAL EXPENDITURE

- Less installed power thanks to increased efficiency and flexibility of the electrical system
- Smaller footprint of Main Switch Board and less copper in cabling and bus-bars thanks to limited fault currents with DC-link power distribution. Less copper also means reduced weight of the electrical system
- Lower THD (Total Harmonic Distortion) in the electrical system thanks to Low Harmonic AFE (Active Front End) frequency drive technology

LOWER OPERATIONAL EXPENDITURE

- Savings in electric power generation with shaft generator driven by the Main Engine in variable (optimal) speed
- Savings from reduced fuel and maintenance costs with stopped Auxiliary Generators
- Savings from reduced losses in electrical power distribution
- Savings from propulsion machinery and/or electrical power generating machinery always operating at optimal point

IMPROVED RELIABILITY

- Take Me Home/Take Me Away operating modes
- Safe return to port with Auxiliary Propulsion Drive
- Boost modes: Low-load optimisation/Ice-boost mode
- Black-out prevention with battery packages connected to DC-link power distribution
- Possibility for dual or quad split of electrical power distribution

REDUCED ENVIRONMENTAL FOOTPRINT

- Thanks to improved efficiency of propulsion machinery as well as electrical power generation and distribution, the environmental footprint will be reduced with lowered fuel consumption and thus lowered emissions

BETTER DESIGN FLEXIBILITY

- Variable speed Shaft Generators, variable speed Auxiliary Generators and DC-link power distribution solutions remove traditional design limitations
- Propulsion machinery, cargo handling and electrical power distribution is always operating with high efficiency
- The utilisation of permanent magnet technology is further reducing size and weight of the machinery thanks to unmatched power density

SHORE CONNECTIVITY

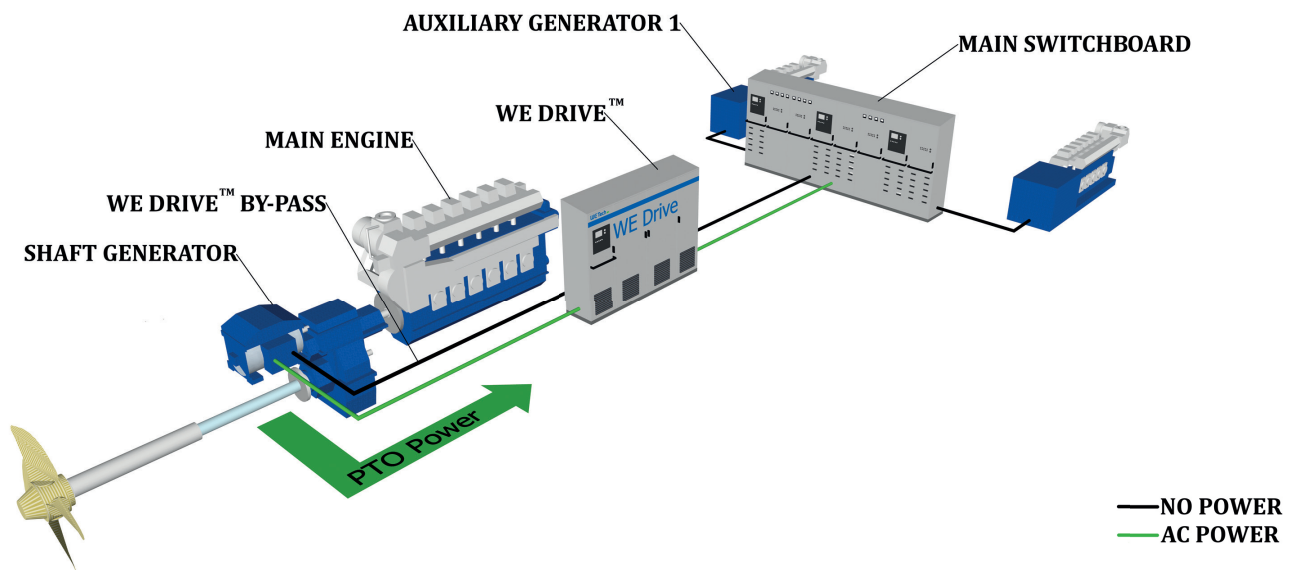
- Shore power is conditioned for the vessels electrical system via the WE Drive™
- Vessels becomes unaffected by the variations in voltages and frequencies of the national power grids worldwide – shore power is always matching
- Shore power is generated with at least 50 % lower cost than electricity generated on-board the vessel
- Auxiliary Generators stopped at port reduce costs and environmental footprint

ENERGY STORAGE SOLUTIONS

- Battery packages connected to DC-link power distribution systems provide an energy reserve that can be used for electrical load peak shaving and black-out prevention
- In connection with variable speed Auxiliary Generators the battery pack helps keeping generator load from surging during electrical load steps. Stable electrical load allow generating sets to stay within optimal operation window
- Battery packs provide substantial fuel savings in DP (Dynamic Positioning) operations



SOLUTION ONE // ECONOMICAL OPERATIONS

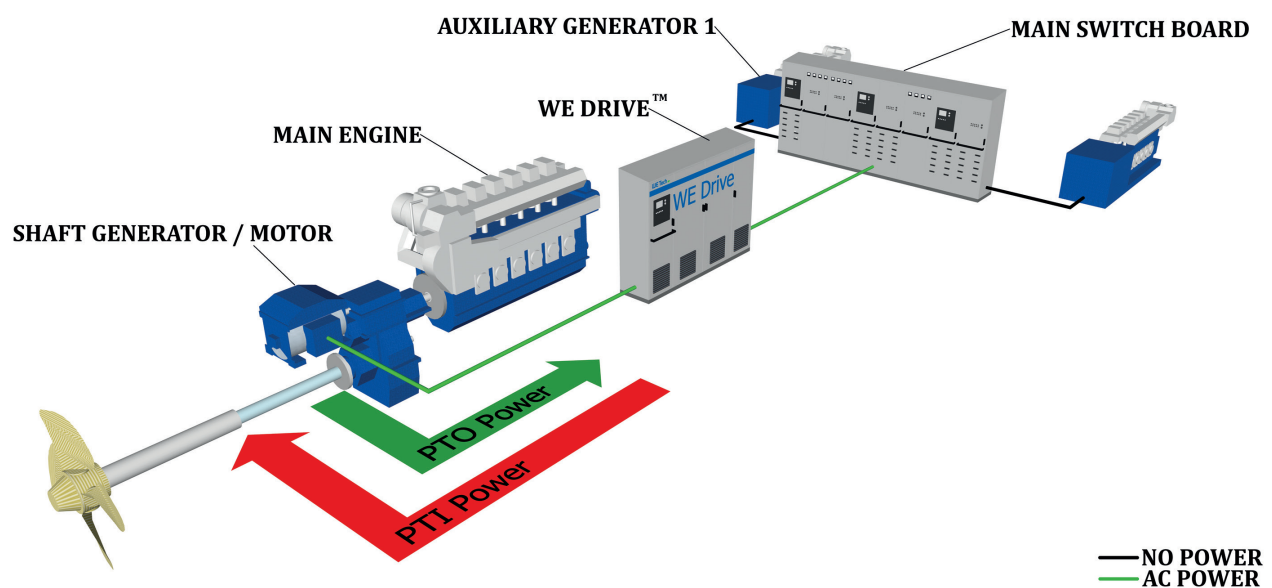


Solution One is a PTO (Power Take Out system) that enables propulsion machinery to operate in combinator/variable speed mode while the shaft

generator produces ships electrical power. The variable speed shaft generator solution operates alone or in continuous parallel with

Auxiliary Generators. The Solution One can also be used for upgrading of existing vessels.

SOLUTION TWO // TAKE ME HOME

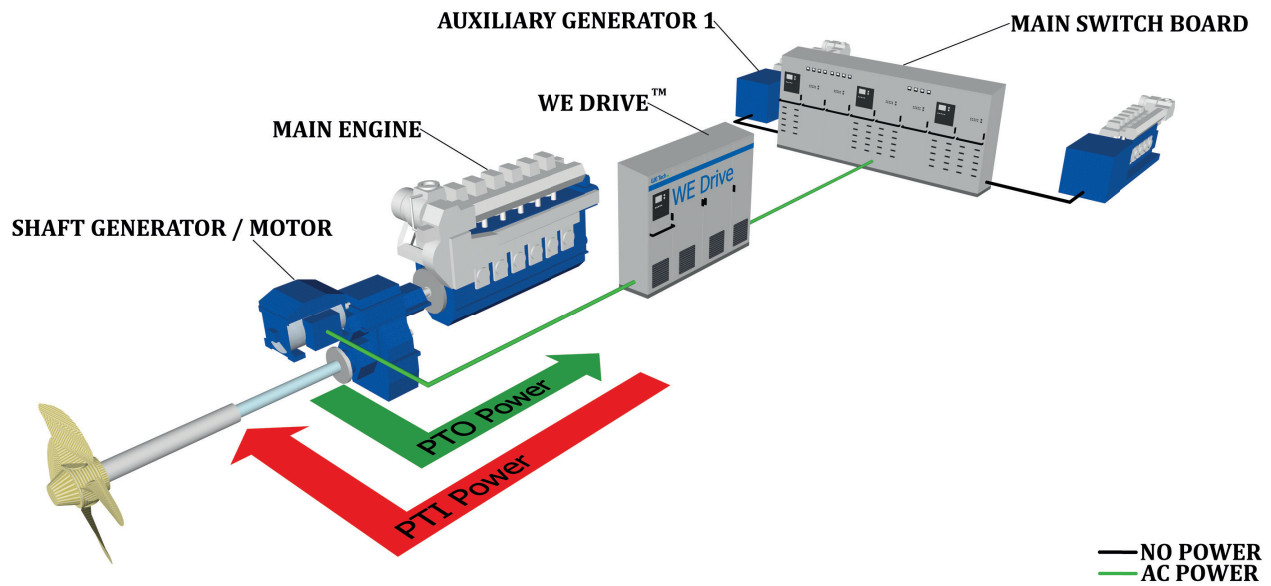


Solution Two is a PTI (Power Take In system) used for Take Me Home/Take Me Away operations. In PTI mode the

Shaft Generator is operated as an electric motor which is controlled by the WE Drive™. The Main Engine is

disconnected from the propeller shaft when in Take Me Home mode.

SOLUTION THREE // BOOST MODE

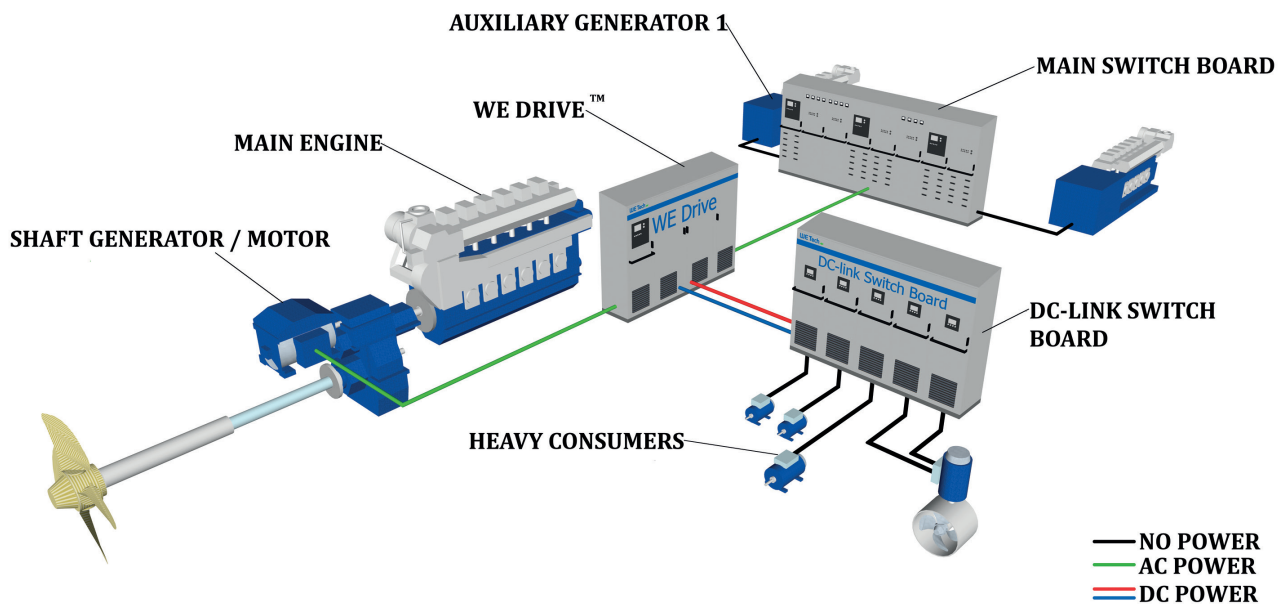


Solution Three is a PTI Boost system. The Shaft Generator is utilised as an electrical motor, driven by the WE Drive™ and provides additional

torque to the propeller alongside with the Main Engine. Solution Three is utilised as Ice-Boost mode for ice-classed vessels when sailing in ice and

for boosting the Main Engine when otherwise required. Boost mode allows for low-load optimisation of the Main Engine in normal conditions.

SOLUTION FOUR // EFFICIENT POWER DISTRIBUTION

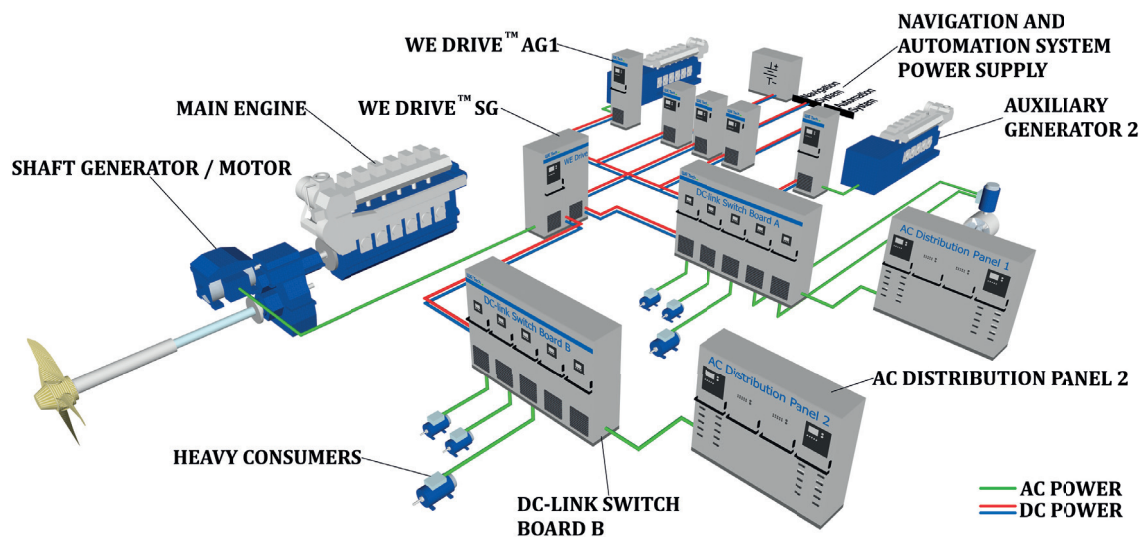


Solution Four utilises the DC-link of the WE Drive™ thus enabling energy efficient and economical methods to distribute power. Large consumers such

as bow thruster and cargo pumps have their dedicated INU (Inverter Unit) connected directly to the DC-link of the WE Drive™. This way harmonic

distortion (THD) remains low in all operation conditions and fault currents in the Main Switch Board are limited.

SOLUTION FIVE // HYBRID DC MACHINERY

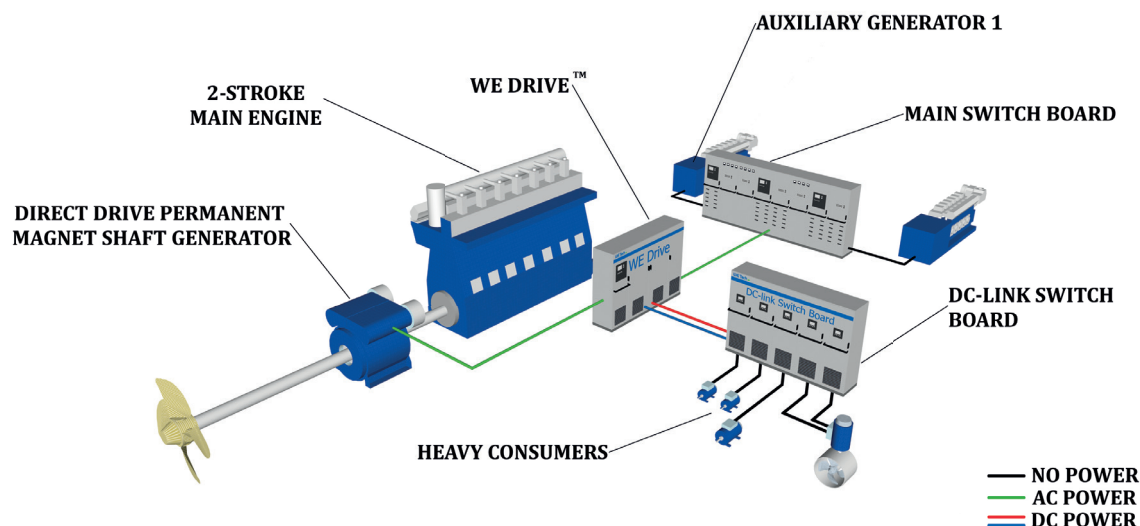


Solution Five uses all the energy efficient features of hybrid propulsion machineries plus a ship-wide DC-link power distribution system. DC-link distribution of electrical power to all consumers substantially increases the energy efficiency of the vessel.

The Hybrid DC machinery concept includes variable speed Auxiliary Generators and Permanent Magnet technologies for the rotating machines. With the ship-wide DC-link power distribution fault currents are kept to a minimum thanks to the precise controls

by dedicated INUs (Inverter Units) in the distribution system. The need for large switchboards and bulky transformers are therefore eliminated, which means greater savings in space and weight as well as far better total efficiency.

DIRECT-DRIVE PERMANENT MAGNET SHAFT GENERATOR SOLUTIONS FOR TWO-STROKE INSTALLATIONS



The shaft generator permanent magnet rotor is mounted directly on the intermediate shaft of the propulsion system. Mass and inertia are very low and thus the impact on propulsion system torsional vibration calculations (TVC) remains minimal. No additional bearings are required, thus the propeller shaft

system design remains uncompromised. During installation the shaft generator including rotor and intermediate shaft is lifted as a package into the vessel and positioned on the generator bed in the propeller shaft line.

With the WE Drive™ and direct-drive permanent magnet shaft generator in

PTO mode, ships electrical power is generated by the fuel efficient 2-stroke Main Engine operating in variable speed.

Solution One to Five is available for vessels with 2-stroke Main Engine via the Direct-Drive Permanent Magnet Shaft Generator Solution.

WE TECH SOLUTIONS

The solutions are applicable for most ship types and propulsion machineries e.g. slow speed (2-stroke Main Engine) direct driven propeller or medium speed (4-stroke Main Engine) via reduction gear driven propeller.

SOLUTION FIVE	WE Drive™	Shaft Generator Motor	Hybrid Machinery	Ship wide DC Bus Power Distribution
SOLUTION FOUR	WE Drive™	Shaft Generator Motor	Hybrid Machinery	DC-link Power Distribution
SOLUTION THREE	WE Drive™	Shaft Generator Motor	Boost Mode	
SOLUTION TWO	WE Drive™	Shaft Generator Motor	Take Me Home	
SOLUTION ONE	WE Drive™	Shaft Generator	ENERGY EFFICIENCY	
		Economical Operations	Hybrid Machinery	Efficient Power Distribution
				Hybrid DC Machinery

SELECTED NEW-BUILDING PROJECTS

See a complete reference list via <http://www.wetech.fi/en/references.html>



Zelenodolsk NB 111

Type: Coastguard Vessel
Owner: Russian Coastguard
Shipyard: PHC «Zelenodolsk Plant», Russia
Scope: Solution Three (Hybrid Machinery)



A series of 4 new building vessels

Type: Post-Panamax sized Pure-Car-Truck-Carrier vessels
Owner: Wallenius Shipping, Sweden
Shipyard: Tianjin Xingang Shipbuilding Heavy Industry, Co., Ltd., China
Scope: Solution Three



A series of 4 new building vessels

Type: 15000 dwt Product Tankers
Owner: Terntank Rederi A/S, Denmark
Shipyard: AVIC Dingheng Shipbuilding, Co., Ltd., China
Scope: Solution Two



A series of 2 new building vessels

Type: 15100 dwt Asphalt Carrier/Product Tankers
Owner: Transport Desgagnés Inc., Canada
Shipyard: Besiktas Gemi Insa A.S.Turkey
Scope: Solution Two



A series of 2 new building vessels

Type: 68000 dwt SUL Bulk Carriers
Owner: Vulica Shipping, USA
Shipyard: Jiangsu Hantong Ship Heavy Industry, Co., Ltd., China
Scope: Solution One



A series of 2 new building vessels

Type: 9400 dwt Asphalt/Bitumen Tankers
Owner: Tarbit Shipping AB, Sweden
Shipyard: RMK Marine, Turkey
Scope: Solution Four



A series of 2+2 new building vessels

Type: 17500 dwt Chemical Tanker
Owner: Rederiet Stenersen AS
Shipyard: Taizhou Kouan Shipbuilding Co., Ltd., China
Scope: Solution Four



A series of 2 new building vessels

Type: 12000 dwt RORO Vessels
Owner: Toll Shipping
Shipyard: Jinling Shipyard of Sinotrans & CSC SBICO, China
Scope: Solution Four



A series of 4+4 new building vessels

Type: ROPAX Vessels
Owner: Stena RoRo
Shipyard: AVIC Weihai Shipyard Co., Ltd., China
Scope: Solution Four



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