EPROX-DC

MAN Energy Solutions
Future in the making

Energy-saving electric propulsion system

Future in the making

Highly efficient diesel-electric propulsion

In today's world, fuel-saving propulsion systems are a must, and that requires new and innovative solutions. But is it possible to design a highly efficient diesel-electric propulsion plant without sacrificing performance?

DC grids: lower fuel oil consumption, better performance

For many years, electric propulsion plants employed alternating current (AC) distribution systems. AC systems were long regarded as the best solution, and a large number of diesel-electric vessels with AC systems and variable speed drives were built for diverse purposes. But times are changing: thanks to new direct current (DC) components in combination with gensets operated at variable speeds, an innovative propulsion system has evolved, creating a much more flexible and compact solution with a range of potential applications.

EPROX-DC: fuel-efficient propulsion

Developed in partnership with leading e-suppliers, EPROX-DC is a fuel-efficient diesel-electric propulsion system. DC grids with integrated energy storage sources are now a reality. This decouples the load application on the propeller from the diesel engine, reducing peak loads, and making the entire propulsion plant more responsive and dynamic. Furthermore, the loading of the engines can be kept constant and high. When powered solely by electricity from storage sources, the system produces zero emissions.

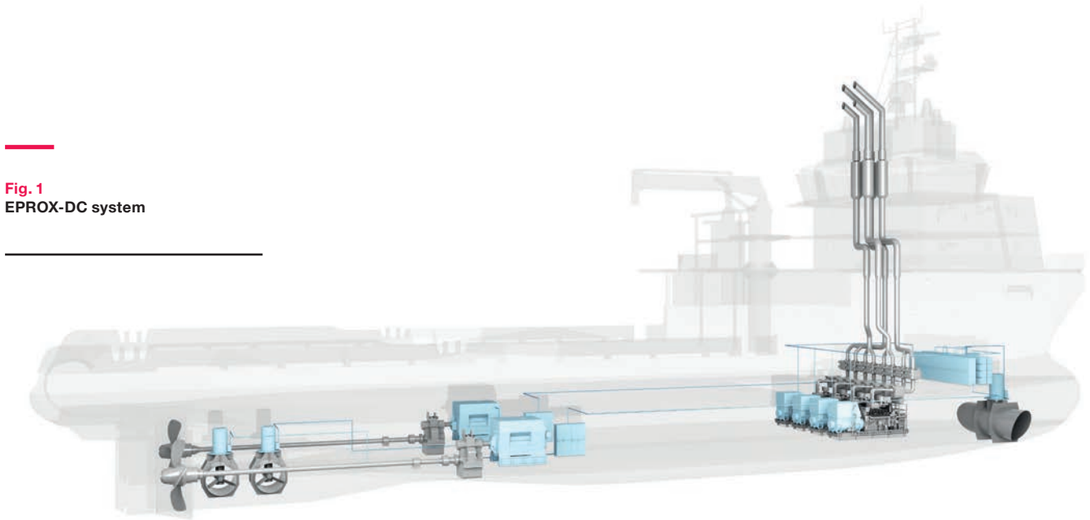


Fig. 1
EPROX-DC system

Benefits of EPROX-DC

Variable speed gensets for extra efficiency

- Very low fuel oil consumption. Diesel engines run at a set speed defined by the control system according to the current system load – maximizing efficiency and minimizing fuel oil consumption.
- Engines can operate at variable speeds: gensets run independently without needing to be synchronized.
- Energy storage sources, such as batteries or capacitors, can be used to reduce transient loads on diesel and dual fuel engines. In DP operation, this improves the propulsion system's dynamic response, generating significant benefits.
- Load peaks are shaved as power can be sourced from energy storage devices. Load acceptance is diverted away from the engines.
- The number of online engines is reduced by the electrical spinning reserve. Peak loads can be managed without starting a standby genset.
- EPROX-DC plants comprise fewer components and require less space. The total footprint of a system of this type is smaller in comparison to classical diesel-electric systems. This reduces installation costs.
- In addition to buffering against load peaks, batteries can act as the sole power source if they have sufficient capacity. During periods of low load, full electric propulsion is possible, with zero emissions.
- Energy storage sources contribute to a reduction in diesel engine maintenance.

Variable speed diesel engines combined with DC technology

The EPROX-DC energy-efficient diesel-electric propulsion system includes the latest DC equipment and an intelligent arrangement of rectifiers and inverters. What's more, heavy components such as supply transformers have been removed. This innovative system was developed by leading e-suppliers such as AKA, ABB and Siemens. MAN Energy Solutions is cooperating with these key players to provide a fully optimized system. The result is a best-in-class propulsion system that combines innovative electrical technology with industry-leading diesel and dual fuel engines.

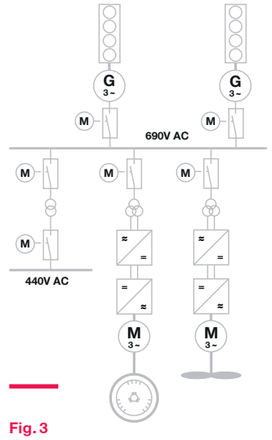


Fig. 3
Classical

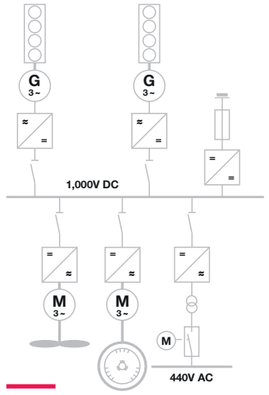


Fig. 4
EPROX-DC

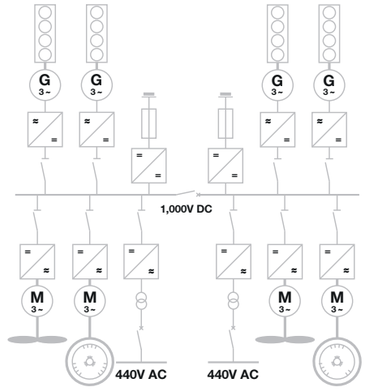


Fig. 5
Single line diagram of an EPROX-DC system for a PSV. The system is available up to a total installed power of 15 MW.

Energy storage devices – offering flexibility and performance

It is beneficial in terms of fuel oil consumption to run gensets at high loads, using surplus power to charge batteries. If less energy is required, one genset can be shut down, with the remaining gensets still running at high load, supported by the batteries.

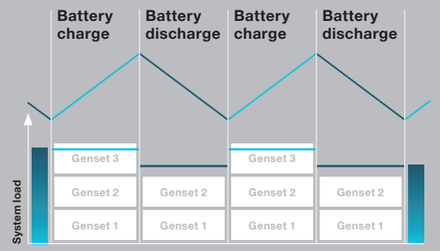


Fig. 2
Strategic loading of the gensets

Variable speed gensets cut fuel oil consumption

Variable speed diesel engines minimize fuel oil consumption. Depending on the current load, the control system can set the speed for optimum SFOC.

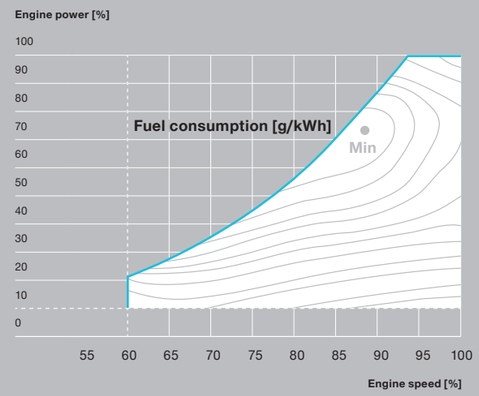


Fig. 6
Typical SFOC map: four-stroke diesel engine
(diagram is for illustration purposes only)

Example: EPROX-DC for a windfarm service vessel

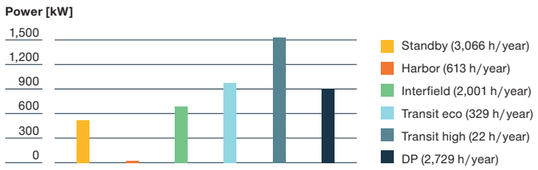
Potential fuel savings

Windfarm service vessel, DP 2

Vessel details

Length, overall	84 m
Dead weight	5,000 t
Max. speed	14 kts
Eco speed	10 kts
Azimuth thrusters	2 x 1,600 kW
Bow thrusters	2 x 1,400 kW
Retractable thrusters	1 x 800 kW

Operational profile



Classical diesel-electric propulsion plant

Main generator engines: 4 x 12V175D MEM, 4 x 1,743 kWe, 1,800 rpm

Operational profile	h/year	Power [kW]	Engines running	SFOC* – MEM [g/kWh]
Standby	3,066	523	1	228
Harbor	613	1	0	0
Interfield	2,001	689	1	213
Transit eco	329	979	2	208
Transit high	22	1,530	3	196
DP	2,729	900	2	238

MAN 175D GenSet

EPROX-DC plant

Main generator engines: 4 x 12V175D MEV, 4 x 1,785 kWe, 1,080-1,800 rpm

Operational profile	h/year	Power [kW]	Engines running	SFOC* – MEV [g/kWh]	Saving
Standby	3,066	523	1	202	26
Harbor	613	1	0	0	0
Interfield	2,001	689	1	197	16
Transit eco	329	979	2	190	18
Transit high	22	1,530	3	192	4
DP	2,729	900	2	190	48

*All SFOC figures are calculated and for information purposes only; incl. attached pumps

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