



Alfa Laval E-PowerPack

Efficient power production from waste heat energy on board

The Alfa Laval E-PowerPack is a compact, easily installed module for converting waste heat energy into free electrical power. Based on Organic Rankine Cycle (ORC) technology, it gives marine vessels a convenient efficiency upgrade that reduces fuel costs, shrinks carbon footprint and supports compliance with sustainability requirements.

Application

The E-PowerPack can generate electrical power from a wide variety of heat sources. These range from jacket water (supplied at 85°C or more) to high-temperature heat sources like steam. The E-PowerPack can deliver a net electrical output of 200 kW per module, producing maximum results by adapting to the heat source with excellent partial load capacity.

By taking advantage of otherwise wasted thermal energy, the E-PowerPack significantly lowers fuel consumption and reduces the load on the auxiliary engines. As a result, it simplifies compliance with sustainability requirements, allowing a vessel to improve its Energy Efficiency Index (EEDI/EEXI) and Carbon Intensity Indicator (CII). Combined with lower emissions, this can provide a competitive advantage, for example by making it possible to maintain higher speeds.

Moving forward, the E-PowerPack can help offset the cost of switching to new fuels like methanol, which are both more expensive and less energy-rich than traditional marine fuels.

Benefits

- Significant savings through maximum use of fuel energy
- Improved Energy Efficiency Index (EEDI/EEXI)
- Improved Carbon Intensity Indicator (CII) and vessel rating
- Reduced emissions and carbon footprint
- Easy installation and little maintenance
- Reliable, automatic operation in all marine conditions

Marine approvals

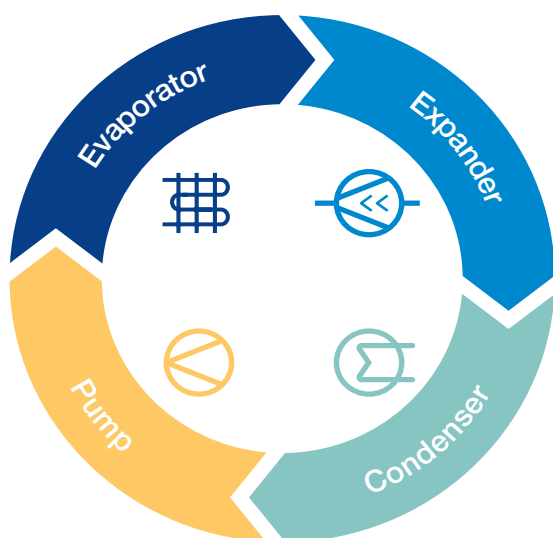
The E-PowerPack is marine-certified by leading classification societies.



Working principle

The E-PowerPack generates electricity by means of an Organic Rankine Cycle (ORC), a closed thermodynamic system where the liquid-vapour phase change of an organic refrigerant is used to drive a generator. Compared to water, which is used in a standard Rankine Cycle, the organic fluid has a lower boiling point that allows low-temperature heat sources to be utilized.

In the evaporator stage of the E-PowerPack, the supply of heat causes the liquid refrigerant to become superheated vapor. The vapour moves into an expander, where the expansion of the gaseous refrigerant turns rotary screws. This drives the unit's generator, which produces electrical power. The refrigerant is then reliquefied in a condenser and repressurized by a feed pump, so that it is ready to enter the evaporator and begin the cycle again.



Design

The E-PowerPack comprises standardized components in marine-grade materials. The module itself houses the closed ORC circuit, which utilizes a standard organic refrigerant that is non-toxic, non-flammable and non-ozone-depleting. It also contains the generator, which can be connected to the vessel's grid directly (most common) or via power electronics. The module is controlled from a separate control cabinet.

Business case

E-PowerPack, 200 kW

Conditions*

- Vessel operating area EU
- Steam surplus 0–1700 kg/h
- Avg. net power output 105 kW
- Operating time per year 6500 h
- Annual power output 683 MWh

Annual fuel savings

- MGO 171 t
- LNG 107 t
- Methanol 284 t

Annual CO₂ savings**

- MGO 3.88 CO₂e (WTW)
- LNG 3.69 CO₂e (WTW)
- Methanol 2.05 CO₂e (WTW)

Payback period

- MGO 2.3 yrs
- LNG 3.9 yrs
- Methanol 2.4 yrs



* Additional factors may impact payback time

**Expressed on a well-to-wake basis (gCO₂e/gFuel) according to figures from EU Fuel Maritime

Technical data

Max. rated electrical output	200 kW net (240 kW gross)
Heat sources	<ul style="list-style-type: none"> • Jacket cooling water • Hot water • Thermal oil • Saturated steam
Electrical data (auxiliaries supply and default grid connection)	380–415 V (3~ + PE), 50 Hz / 440–480 V (3~ + PE), 60 Hz
Module dimensions (L x W x H)	2200 mm x 1650 mm x 2060 mm
Weight (filled with refrigerant)	4600 kg plus electrical cabinets (300 kg)

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