

RENK



HYBRID PROPULSION

Integrated Front-end Power System (IFPS)

IFPS® – the smarter shaft generator

/ Resources

Save CO₂ and exceed
IMO standards

/ Efficiency

Maximum efficiency,
minimum space required

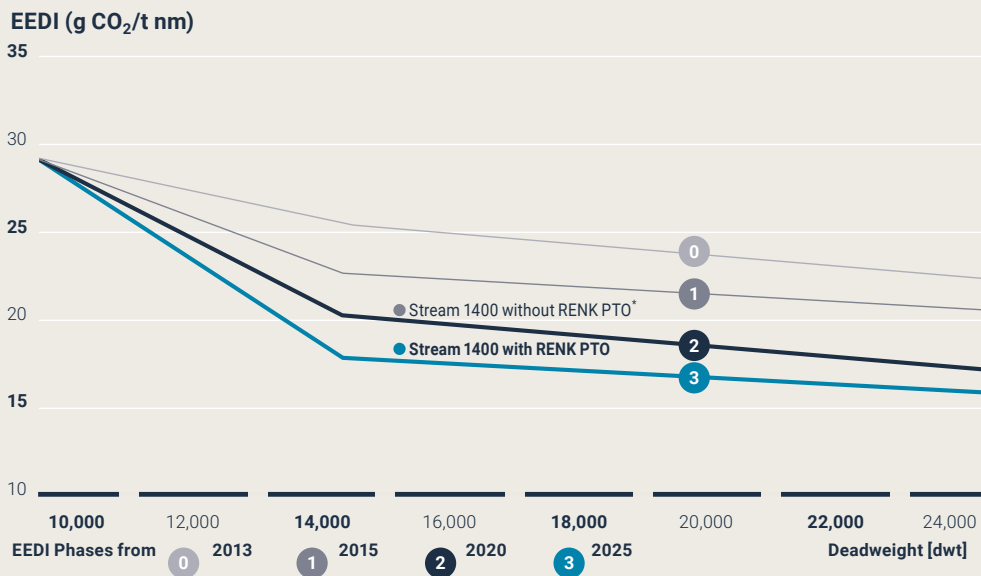
/ Performance

Direct transmission with the IFPS®
solution from RENK



For over 140 years, RENK has proven its unique expertise for managing extreme forces in the entire drive train. As one of the world's leading manufacturers of single and double-motor gear units for marine and stationary applications, auxiliary marine drive systems, tunnel gearboxes, shaft generator gear units, and propeller shaft couplings, RENK offers key added value when it comes down to absolute reliability at sea.

Stay the course to achieve EEDI goals. With smart marine solutions.



In comparison to emissions from ships currently in operation, emissions of nitrogen oxides, particulate matter, and CO₂ must decrease significantly by 2020. And environmental regulations for emissions produced by ships are set to become even stricter.

* Source: TECHNOLOG Services

Relentless pursuit of perfection. To maximize sustainability and success.

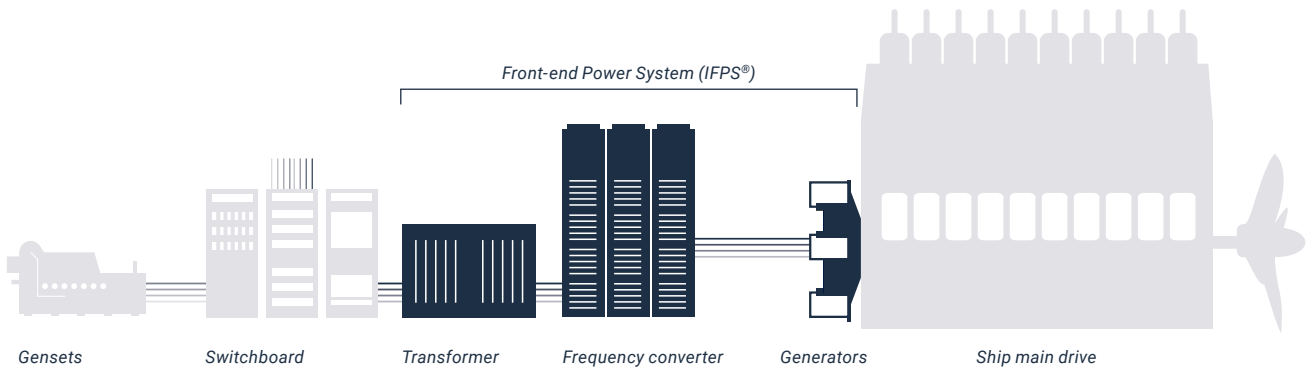
Together with our partners, we are committed to minimizing fuel consumption while keeping exhaust emissions as low as possible. We do this by taking responsibility for our customers' efficiency and success as well as protecting the environment for future generations.

Shipping is already the most efficient way of transporting bulk goods today. But this growth market is under extreme pressure.

Strict IMO standards in the Energy Efficiency Design Index (EEDI) clearly regulate the significant extent to which ships will have to boost their efficiency in every stage of their lifecycle.

In other words, successful vessel owners and shipping companies should invest in their fleet's performance now. Products and solutions from RENK help put you on the path to a successful and profitable future.

RENK Integrated Front-end Power System.



Features

- Modular concept
- Easy installation
- No base required
- Flat gearbox
- Short generators
- Constant mains frequency
- Parallel operation possible

The compact power pack by RENK to boost your competitiveness.

The Integrated Front-end Power System is a power take-off (PTO) solution for marine applications. It comprises a single-stage gear, up to four generators and the corresponding frequency inverters, as well as the transformers for connecting to the electrical system. Our specialists have designed every aspect of the system for front-end installation – because in many cases, there is no space for other PTO solutions between the main machine and the ship’s propeller.

However space is usually limited in the bow as well. For this reason, the system features a flat gearbox and special short generators. The gearbox is connected to the crankshaft by a central intermediate shaft and a flexible coupling. An angle encoder can be mounted on the cover of the coupling.

Precise measures. Big effects. Low costs.

The installation of the front-end solution requires only a few simple modifications to the main drive housing and the crankshaft. The system is mounted directly on the front side of the motor and does not require an additional base. Thanks to the modular concept, it can be adapted with several generators of the same size.

A regenerative frequency inverter with active input enables a constant mains frequency at a variable motor speed. The electrical assembly allows both parallel operation with other units as well as island operation if the front-end solution is the single source for electrical energy.

**Universal, Scalable,
Modular.**

Includes space for up to four generators with an output of up to 2,500 kW – in new installations as well as systems already in operation.

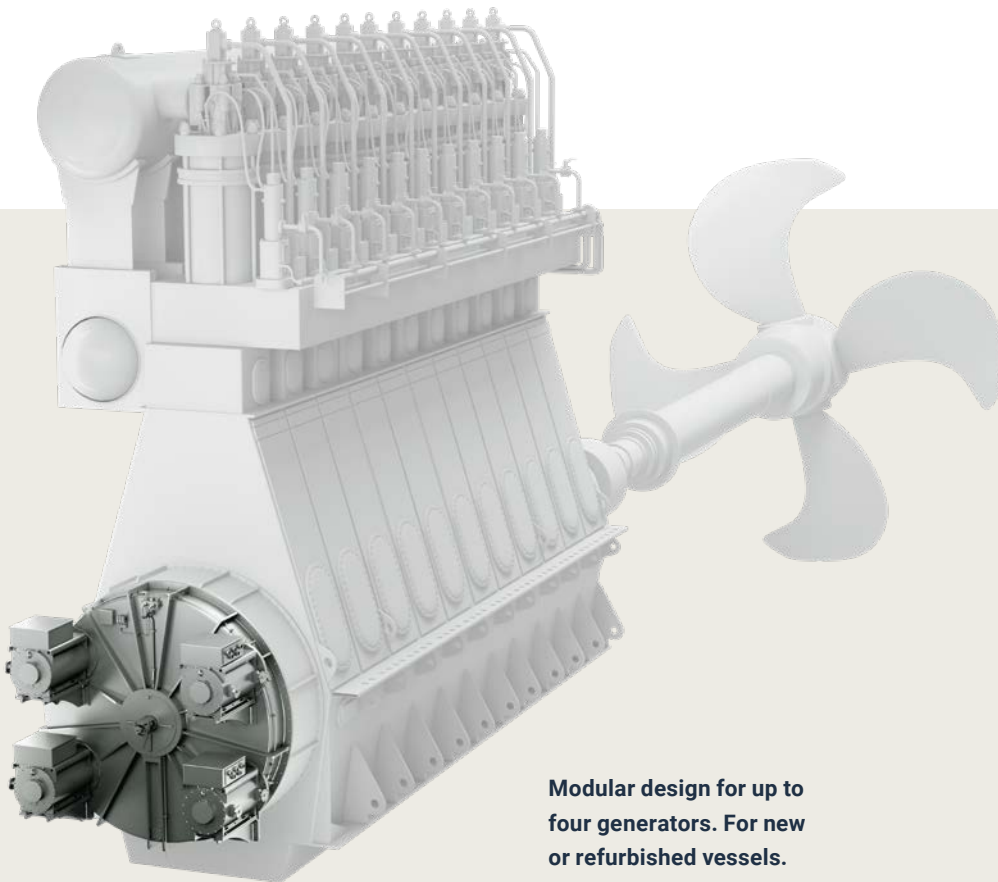
**91.0% efficiency including
transformer.**

The PTO solution from RENK that is mounted at the front end: Installed at the bow and featuring multiple drives, the reliable and compact system significantly reduces emissions – ensuring strict EEDI goals can be successfully achieved in the future as well.

One of four
generators

Flexible coupling
(covered)

Gearbox
housing



/ 1,600 mm

Footprint – no further space
required for generators and
gearbox

/ 2,500 kW

Nominal capacity of
the system with four
generators

**Modular design for up to
four generators. For new
or refurbished vessels.**

Scalable. Space saving. Simple. Experience benefits you can count on.

Advantages at a glance

- Scalable design
- PTO output up to 2,500 kW
- Extremely compact design
- Reduced maintenance costs
- Simple and reliable
- Flexible operation
- Measurable fuel savings and CO₂ reduction
- Meets EEDI targets for 2020

Integrated PTO Solutions by RENK. Improve your sustainability now.

Marine PTO solutions for 2-stroke diesel motors like the Integrated Front-end Power System (IFPS®) are a must for efficient shipping that's ready for the future. RENK front-end solutions reduce exhaust emissions and fuel consumption. They can be retrofitted and require minimal space.

Ongoing operation is also more efficient because the operating hours of the auxiliary generators are decreased, which also reduces maintenance costs. The front-end mounted PTO solution for 2-stroke motors is based on the tried-and-tested design of the RENK tunnel gearbox and features the reliable operating characteristics you've come to expect.

And it is still flexible – because the modular system works on both FPP (fixed pitch propeller) and CPP (controllable pitch propeller) installations.

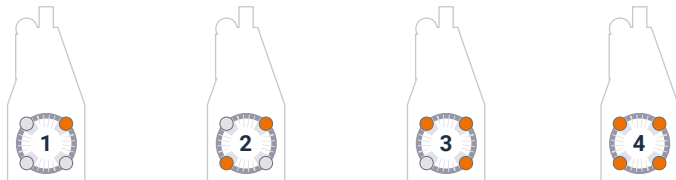
Tight construction and excellent effectiveness. Where it matters.

Extremely efficient power generation (in contrast to auxiliary generators) thanks to the main machine results in an outstanding overall efficiency of 91.0 percent with only low harmonic distortion and a constant mains frequency at a variable main motor speed.

The system generates a scalable PTO output of 500 to 2,500 kW – without additional axial space, because the flat design of the gearbox and short generators with a length of less than 1,600 mm are extremely compact. This offers plenty of scope for future ship designs that save even more space.

The system is highly flexible during ongoing operation

So it has a wide range of application areas and performance ranges. Plus, it adapts perfectly to changing electrical load conditions and can be expanded on a modular basis.



Scalable up to four generators

Electrical power to vessel's main switchboard [kW]	500/625	1,000/1,250	1,500/1,875	2,000/2,500
System Length [mm]	1,500	1,500	1,600	1,600
IFPS Efficiency from crankshaft to VFD* [%]	95.6/96.2	95.6/96.2	95.6/96.2	95.6/96.2
Generator Type	PM Generator(s) with Water Jacket Cooling			
VFD Type	Active Front-End (AFE) VFDdrive with Insulated Gate Bipolar Transistors (IGBT)			
Total System Efficiency** [%]	> 91			

* incl. gearstep, coupling and generator ** incl. gearstep, coupling, generator, transformer and frequency converter

Significant savings throughout the lifecycle. Here's the proof.

RENK PTO solutions deliver unprecedented cost savings! This was the outcome of a study on efficiency, OPEX, EEDI, and fuel savings conducted by Technolog Services. The analysis was based on a freight ship for transporting containers and cars that completed a typical round-trip voyage in northern Europe of 14 days, stopping at 13 ports and covering 3,000 nautical miles. The savings in maintenance costs alone during the entire period amounted to an incomparable 3,255 dollars.

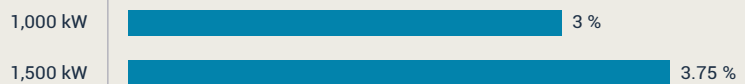
<3.8 %
Fuel cost savings*
on a typical northern Europe
round trip of 3,000 NM

<3,255 \$
Maintenance
cost savings*
on a STREAM 1400 feeder vessel
on a 14-day voyage

<6 M \$
20-year lifecycle cash
flow OPEX saving potential

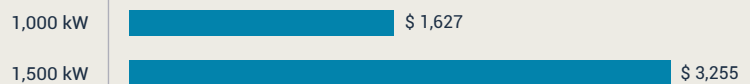


Savings Fuel with Front-end Power System by RENK*



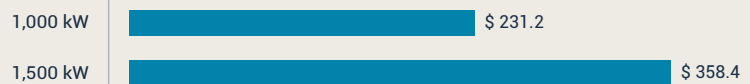
Fuel consumption on a standard vessel with 100 reefer (1,000 kW PTO) and 190 reefer (1,500 kW PTO) per round voyage.

Savings maintenance per round voyage with Front-end Power System by RENK*



Absolute maintenance cost savings for auxiliary gensets (A / E) based on USD 10 per operating hour on round voyage.

Annual Cash Flow saving with Front-end Power System by RENK* in k



20 years Lifecycle Cash Flow saving with Front-end Power System by RENK* in k \$



Total annual and lifecycle OPEX saving potential with RENK PTO solutions compared to auxiliary gensets.

Vessel data:

- Overall length: 149.90 m
- Deadweight: 13,900 dwt
- De-rated maximum continuous rating: 9,250 kW x 88.0 rpm
- Power generation sets: 3 x 1,050 kW
- Container capacity: 1,400 TEU

* Quelle: TECHNOLOG Services



Trusted Partner.

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