Fuel Cell Systems

Extending zero-emission operations

Vessels that can charge often or have enough energy storage capacity can operate zero-emission on batteries alone. For other vessels, we can extend the range and operational flexibility by adding green fuels and a fuel cell system.

Corvus Energy drives innovation for zero-emission transport one step further with the development of the Inherently Gas Safe Fuel Cell System to compliment its well-established marine battery portfolio. The Corvus system uses well-proven hydrogen fuel cell technology from Toyota, already used around the world in the industrial, trucking and car industries. This technology, combined with built-for-marine adaptations, makes this an advanced marine fuel cell system with high levels of safety and integrity.

Batteries and fuel cells are partners in power

Battery energy storage systems handle load variations perfectly and enable fuel cell systems to operate at the most efficient load levels at all times. Together, they are ideal partners.

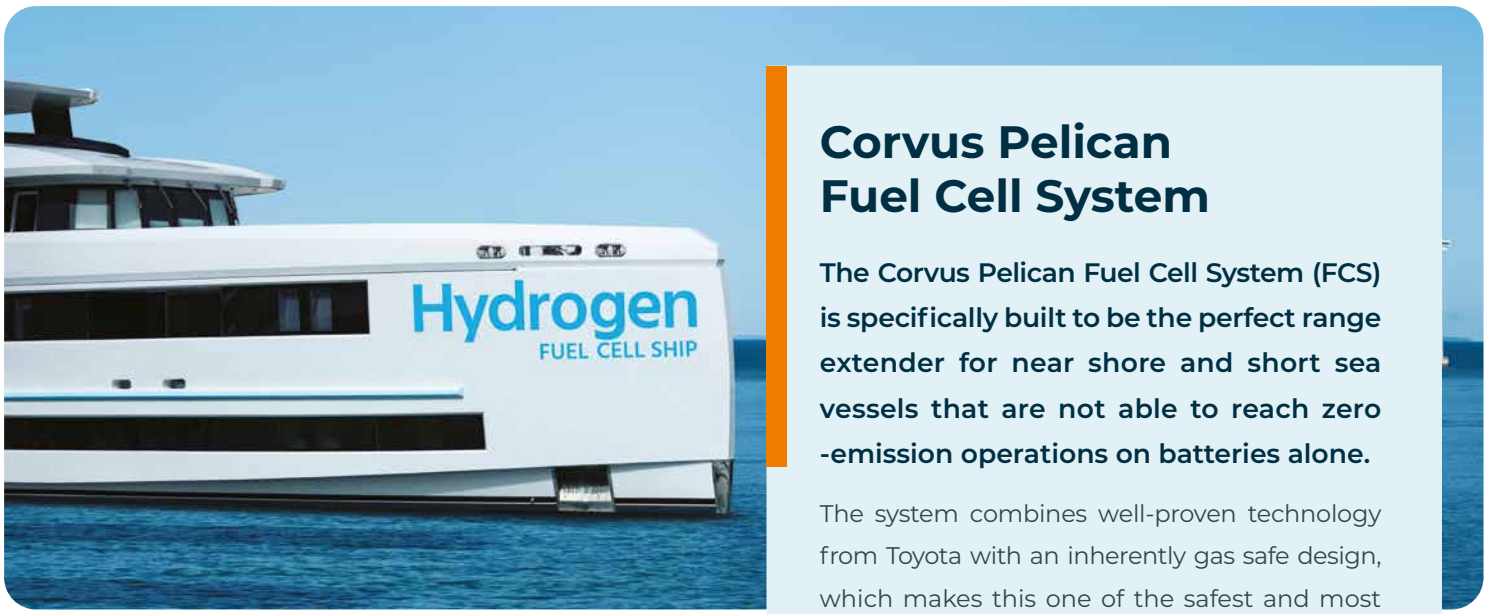
Corvus Energy is developing *CoPilot*, a real-time advice system designed to optimize power distribution between the battery energy storage and fuel cell systems.

What is a marine fuel cell system

A marine fuel cell system can be used as a range extender for various types of vessels, providing an efficient and environmentally friendly power source.

Fuel cells are electrochemical devices that convert the chemical energy from a fuel into electricity through a chemical process.

In the context of range extension, Corvus Energy marine fuel cell systems, used in combination with battery energy storage systems, provide additional power when needed. This allows the vessels to extend zero-emission operations for longer periods of time without refuelling or recharging.



Corvus Pelican Fuel Cell System

The Corvus Pelican Fuel Cell System (FCS) is specifically built to be the perfect range extender for near shore and short sea vessels that are not able to reach zero -emission operations on batteries alone.

The system combines well-proven technology from Toyota with an inherently gas safe design, which makes this one of the safest and most advanced marine fuel cell systems available.

Applications

The Corvus Pelican FCS is ideal for zero-emission operation onboard ships that go on routes where hydrogen supply is available. The system can serve as a main power source or an additional power source.

Typical Vessel Types:

- Container feeder vessels
- Service operation vessels
- Platform supply vessels
- Ferries
- Ro/Ro-Ro/Pax
- Tugboats
- Smaller cruise vessels
- Coastal/ regional transport

Features

- Built specifically for marine applications
- Inherently gas safe
- Flexible and modular design
- Scalable to meet any power demand
- Compatible with next generation fuel cell modules
- CoPilot system for optimization of power distribution between the FCS and ESS
- Remote performance monitoring capabilities
- Designed for cost-efficient maintenance

Corvus Energy Safety Innovations

Inherently gas safe with type approval

- Surrounding machinery space can be considered gas safe under all conditions
- Significantly reduces the requirements of support systems for safety and ventilation

Technical Specifications

Corvus Pelican Fuel Cell System

Fuel Cell System Specifications	
Pack Power Size	340 kW (4 x 85 kW FC module)
System Power Range	340 kW - 10 MW
Output Voltage	400-750 VDC[1]
Pack Weight (dry)	3750 kg
Pack Dimensions, incl. Base and Connections (±10 mm)	Height: 2320 mm | Width: 1427 mm | Length: 2160 mm
Electrical Connection	Parallel connection 4 FC modules in FC pack
Specific H2 Consumption	Available upon request
Operational Specifications	
Fuel	Hydrogen gas and air
Fuel Quality	ISO 14687:2019 Type I Grade D | SAE J2719:2020
Cooling Water Temperature	Inlet: 5-37°C | Outlet: Typical 55°C
Ambient Temperature	5°C - 45°C
Process Air Temperature	-30°C – 45°C
Ducted Process Air Inlet	Available
Hydrogen Inlet Temperature	-30°C – 50°C
Hydrogen Inlet Pressure	5.4 bar.g – 14 bar.g[2]
FC Enclosure Inert Gas	Nitrogen generator included in FC pack
Exhaust	Pure water + air
Safety Specifications	
Safety Design	Designed to ensure gas safe machinery space(s)
Class Compliance	All major class societies (Pending)
Type Approval	DNV
Safety Signal Interface	Hardwired
General Specifications	
Control and Monitoring Interface	MODBUS TCP
Service Interval	Optimized according to operational profile
Ingress Protection	IP44
CoPilot	Optional
Auxiliary power supply	230 (VAC 50/60 Hz)
Pack Interfaces against Ship Side	Hydrogen supply, process air supply, compressed air, cooling water, exhaust, process water, inert gas vent

[1] Recommended operational voltage: 550 - 725 VDC. Must be maintained from external source.
[2] Minimum pressure is dependent on pack power.