

E-MARINE SOLUTIONS

Autonomous Container Feeder Vessel

YARA Birkeland





Powering the world's first fully electric and autonomous container vessel with a Leclanché 6.7MWh Marine Battery System

The Challenges



The **Solution**





Yara International ASA is a global firm specialising in agricultural products and is one of the world's largest producers of mineral fertiliser.

Currently, Yara uses trucks to transport large quantities of fertiliser from its plant in Porsgrunn to Brevik – a round trip of 24km. With over 100 journeys per day, these heavy-duty vehicles significantly contribute to CO_2 emissions, noise pollution and traffic congestion.



For Yara, environmental leadership is a crucial element of its success, and the company was motivated to find a more sustainable solution for the transport of their products.

The 80 m long, 120 TEU fully electric container feeder ship, Yara Birkeland, commissioned by Yara, will replace 40,000 truck journeys per year and be powered by Leclanché's Marine Battery System with a total capacity of 6.7 MWh. This change will reduce annual emissions of CO₂ by 700 tonnes as well as help reduce noise, dust and support improved road safety.

The Yara Birkeland will use electricity generated by Norway's hydropower to charge the ship while moored. Norway is the sixth biggest producer of hydropower globally.

"As a leading global fertilizer company with a mission to feed the world and protect the planet, investing in this zero-emission vessel to transport our crop nutrition solutions fits our strategy well."

> Svein Tore Holsether president & CEO, Yara

96% of electricity produced in mainland Norway is generated by its 1690 hydropower plants

Vessel

The container ship will be a first of its kind, starting off manned before transferring to fully autonomous operations over a test period of two years. It will offer an eco-friendly alternative mode of transportation along this route, slashing NOx, SOx and particulate matter emissions to zero.

The Yara Birkeland will travel silently, at eco-speeds of six to seven knots and a top speed of 13 knots, contributing to a significant reduction in noise pollution along the coastal environment.

Loading and discharging will be done automatically using electric cranes and equipment. The ship will not have ballast tanks, instead, it will use the battery packs as permanent ballasts. It will be equipped with an automatic mooring system, ensuring that both berthing and unberthing can be completed without human intervention.

Leclanché worked in partnership with Kongsberg Maritime, who were selected as the integrators for this project.



An example of one of the Marine Rack Systems (MRS) as fitted on the Yara Birkeland

The Technology

With over 200 patents in lithium-ion (Li-ion) battery cell technology and production, Leclanché batteries deliver exceptional safety, longevity and cycle life. Leclanché battery systems and cells are manufactured in automated facilities in Germany and Switzerland and in compliance with the highest environmental standards.

The Marine Rack System (MRS) provided by Leclanché for the Yara Birkeland is a modular and scalable Li-ion battery system for marine applications. It uses high energy Li-ion G/NMC cells with unique features, including bi-cell laminate design and ceramic separators, to ensure optimal performance.

The cells are fitted into robust modules packaged into IP65rated enclosures designed for harsh maritime environments. The enclosures are assembled into the MRS with a dedicated, in-house designed battery management system.



IP65 enclosure with battery module and integrated cooling plate

Safety is a Priority

The Leclanché MRS was developed in conjunction with DNV-GL and certified by all other major certification authorities (RINA, Bureau Veritas and Lloyd's Register).

- The MRS features a fully certified active fire extinguishing system.
- Multi-layer safety measures on a cell, module and system level, tested and certified against mechanical, thermal and electrical abuse.
- Our MRS fire suppression system offers protection against all unexpected external hazards (electrical, mechanical and thermal).
- Automatic extinguishing system uses independent heat- and smoke/ gas-triggering sensors to prevent false alarms and improve reactivity
- The battery system is redundant, with four separate battery rooms: if one or more of the strings are emptied or stop working, the vessel can continue its operations.

Vessel Details

Vessel Details	Yara Birkeland
Vessel Type	Open Hatch Container Feeder
Battery System	MRS (55Ah G/NMC)
Battery Energy (MWh)	6.7
Dimensions (L x W, m)	80 x 15
Cargo Capacity	120 TEU
Operation date	2021
CO ₂ emissions during operation	Zero

The Vessel Diagram





"We are very proud to be able to contribute to the success of this unique project with our technology and our experience from the e-marine sector. With our battery system for the Yara Birkeland, we are once again enabling an important step towards more emission reduction and climate neutrality in the field of maritime shipping".

> Anil Srivastava Chief Executive Officer (CEO) of Leclanché

The Certificates

THE ENERGY TRANSITION

The Leclanche Marine Rack System was first certified in 2017 by DNV and was the first marine battery system to obtain this approval. Since then, it has received numerous additional class approvals from major certification authorities.



SOLUTIONS

SYSTEMS