

CONNECTIVITY

Plugging ships and ports into a cleaner future



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Ports have a crucial role to play in facilitating the reduction of shipping emissions. ABB offers scalable and flexible frequency conversion technology that guarantees seamless, automated power transfer of a ship's load from its onboard power plant to an onshore source and back, thus meeting the needs of ship owners and ports. The result is a significant reduction in fuel use, pollution, vibrations, and noise.



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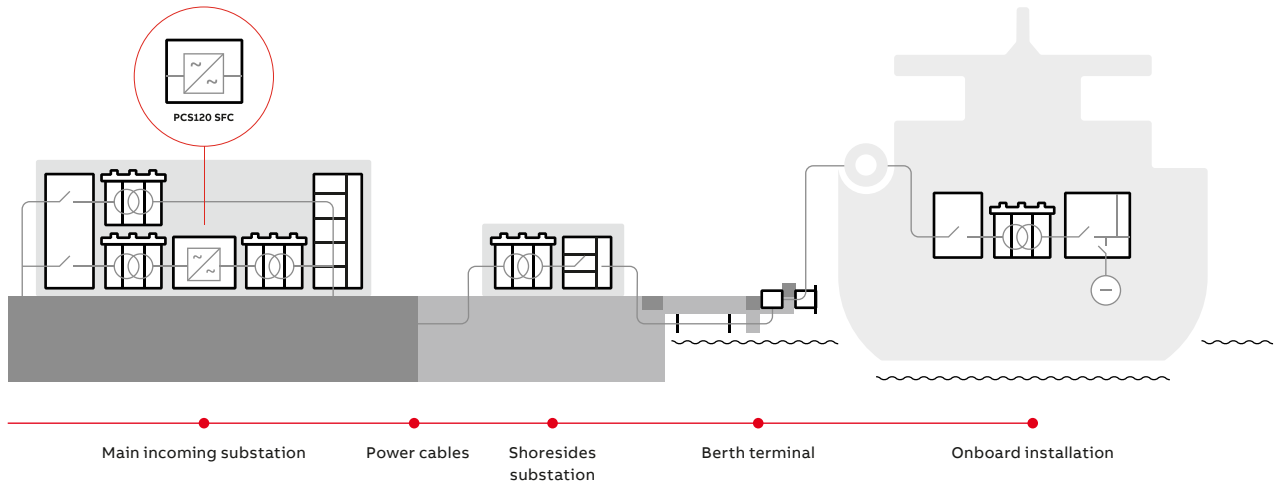
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According to the Organization for Economic Co-operation and Development (OECD), 90 percent of traded goods are transported by sea [1]. Furthermore, as demand for global freight increases, maritime trade volumes are expected to triple by 2050. But while maritime shipping provides a cost-effective mode of moving goods over long distances, and is thus a source of prosperity, it is also a major source of pollution, accounting for approximately 30 percent of total

global NO_x emissions and around 2.6 percent of total global greenhouse gas emissions.

According to a 2018 report by the International Transport Forum [2], an organization that is administratively integrated with the OECD, ports have a crucial role to play in facilitating the reduction of shipping emissions →01. The reason for this is that in the majority of ports, ships at berth use their diesel generators to run amenities, such





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— 01 Ports have a crucial role to play in facilitating the reduction of shipping emissions.

— 02 Overview of a shore-to-ship power connection.

— 03 Overview of an onshore power configuration.

as heating, ventilation, and cooling, as well as galley equipment. All of this not only has a negative impact on the environment, but also reduces the quality of life of local communities as a result of the noise and vibrations produced by ships.

Mounting pressures to reduce the pollution generated by the world’s fleet have forced ship owners to adopt a proactive approach to measuring and monitoring combustion, which is reflected in such programs as marine fuel management (MFM). However, going green and becoming compliant with the demanding requirements of regulatory authorities, such as IMO/MARPOL and the EU, call for decisive steps. This is where advanced technology steps in.

Shore-to-ship power

ABB’s new Static Frequency Converter (SFC) technology is the most reasonable and cost-effective choice for greener ports and fleets. The solution enables ships to shut down their diesel generators and plug into an onshore power source while berthed. However, most ships’ power generation units operate at a frequency of 60 Hz, whereas the local grid in most parts of the world is 50 Hz. This means that providing ships with electricity requires a shore-side electricity supply arrangement →02–03. [3].

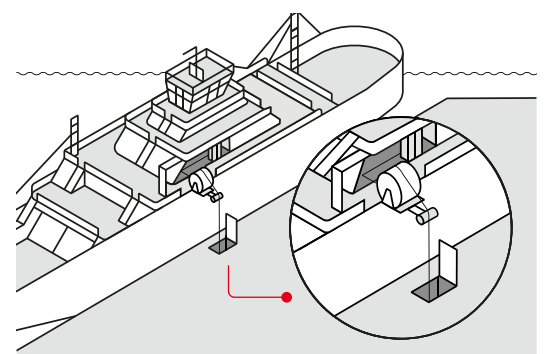
With this in mind, ABB offers static frequency converters that reliably and efficiently convert grid electricity to the appropriate load frequency. The company’s leading-edge frequency conversion technology guarantees a seamless automated power transfer of the ship load from the onboard power plant to the onshore source and back. The result is a significant reduction in terms of fuel and lubrication oil consumption, which means less pollution and improved financial benefits. Shore-to-ship power is especially applicable to ships operating on dedicated routes, and vessels that consume large amounts

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of power while in port. This can offer concrete benefits for, eg, terminal operators whose ferries berth each day for a fixed number of hours.

Modular and scalable

ABB’s SFC is a scalable, modular power converter system. It is comprised of multiple pairs of independent rectifiers and inverters managed by a system controller to provide a stable and reliable voltage and frequency source that can synchronize and regulate power when operating in parallel with other energy sources such as an onboard generation system. These features permit maximum flexibility in adjusting the system to suit the customer’s needs. ABB’s SFC portfolio includes the PCS100 (Power Converter System) and upcoming PCS120 →04, which is suited for low-power applications.



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04 ABB's PCS120 SFC.

05 More and more ports are reducing their environmental impact by allowing ships to tap into grid power.

05a Pipavav Shipyard Limited is the largest shipyard in India.

05b Killybegs Fishery Harbour Centre in Donegal, on Ireland's northwest coast.

05c The Bahrain port.

The modularity and scalability of these systems enable multiple units to operate in parallel, which makes the solution adaptable to the power requirements of different ships and to a variety of port infrastructures →05. If a unit is to be placed outdoors, a suitable enclosure can be delivered as part of the package if required. This gives the customer flexibility when planning and implementing the physical and spatial layout of power converter systems so that they harmoniously fit in with the surrounding environment.

Low operational impact

Another advantage of these systems is their superior availability, which results from their high reliability, robustness, and low maintenance (PCS100 MTTR < 30 min / PCS120 SFC < 10 min) – factors that lead to reduced operational costs. The cost of ownership may be further reduced if renewable energy sources, such as wind or hydro power, solar panels or fuel cells are chosen as the primary source of power. •

References

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INDIA'S FIRST GREEN SHIPYARD

Pipavav Shipyard Limited (PSL) is located on India's west coast in the State of Gujarat and is the largest shipyard in India. In addition, it is one of the biggest drydocks in the world and has a shipbuilding, ship repair and offshore fabrication complex. The shipyard has installed and commissioned some of the most modern shipbuilding facilities available.

Thanks to its four 250 kVA PCS100 static frequency converters (SFCs) from ABB, it is the first and only "green shipyard" in India →05a. ABB's leading-edge solution has helped the shipyard to reduce emissions, pollution and noise levels while achieving significant cost saving by allowing ships to use grid power instead of diesel generators. PSL also benefits from improved availability and reliability compared to facilities that use rotary frequency converters.



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IRELAND'S ATLANTIC FISHING FLEET: DEEP EMISSION CUTS

PCS100 Shore-to-ship static frequency converter (SFC) units from ABB are saving 96,000 liters of diesel fuel and cutting 2,000 tons of CO₂ emissions per year at Ireland's Department of Agriculture, Food and the Marine as they provide grid power to fishing boats at Killybegs Fishery Harbour Centre →05b in Donegal, on Ireland's north-west coast [4]. The converters – the first to operate in Ireland – are now boosting sustainability at 12 berths.

Killybegs is one of around 100 ports in Northern Europe where pelagic fish such as herring and mackerel can be landed. The port has a local fleet of around 25 large trawlers. Until recently, the trawlers relied on 70 kVA diesel deck generators when in port to power loads such as lighting, heating and electronic navigation and control equipment in the wheelhouse, as well as pre-heaters for starting the main engines.

Thanks to the port's new static frequency converters, however, the ships can power down their deck generators, reducing local emissions by the equivalent of removing nearly 500 cars per year from the road. The installation has also improved the harbor's quality of life by cutting noise emissions and reducing fire risk and maintenance requirements for trawlers.

The converters will future-proof the harbor by complying with legislation being introduced by the International Maritime Organization as it works toward its target of reducing shipping emissions by at least 50 percent by 2050 compared with 2008.

The converters draw power from the standard 400 V utility grid and are housed in a dedicated indoor plant room along with switchgear and safety systems. Trawlers connect via industrial sockets on the quay-side, with access to power being controlled by the harbor master. Each converter provides remote monitoring for metering and can be isolated and switched individually between 50 and 60 Hz for flexibility.

BAHRAIN: CUTTING COSTS AND POLLUTION

Ships calling at Bahrain's port →05c can switch off their diesel engines and tap into cleaner onshore energy sources thanks to ABB's grid connection technology [5]. The three PCS100 SFCs (static frequency convertors) installed at the port can reduce a large ship's fuel consumption by up to 20 metric tons and reduce its CO₂ emissions by 60 metric tons during a 10-hour stay in port. ABB's grid connection technology makes it possible to feed shore-side power (typically 50 Hz) into ships' power generation units, which typically operate at a frequency of 60 Hz.

The port's Arab Shipbuilding & Repair Yard (ASRY) is a leading Middle East shipbuilding and repair company. For many years it relied on rotary frequency converters. However, the converters suffered from pollution, reliability, and equipment availability issues; moreover, their efficiency was generally around 75 percent. Today, thanks to the PCS100 SFCs, which have no rotating parts and therefore no need for mechanical maintenance, efficiency is up to 95 percent. As a result, equipment operational and maintenance costs have been sharply reduced, equipment availability has increased, and noise and vibration-related pollution have been eliminated.

ASRY is among the first shipyards in the world to receive ISO certifications for quality, management, environment, and health & safety systems, in addition to the ISPS code for Port Security.



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