Connecting passenger ships to the future


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Port authorities and shipping companies worldwide need cost-effective techniques to reduce air and noise pollution, which in turn benefits those living and working in and around ports. Principal amongst these methods are shore connection systems that supply land-based electricity to berthed ships, thereby eliminating the need to burn heavy fuel oils with a high sulphur content to generate on-board power. This process is known as 'cold ironing', alternative maritime power (AMP), or shore power. In this article, we review the future of shore power technologies for the passenger vessel segment.

A solid environmental profile builds stronger brands

"Maintaining a positive brand image is a key factor for cruise lines and ferry companies in what are fiercely competitive industries," says Luciano Corbetta. Most cruise and ferry terminals are operated in, or close to urban areas, prompting many cruise and ferry operators to make substantial investments in technologies that reduce environmental impact. Shore power systems, such as those developed by Cavotec and Schneider Electric, reduce vessel emissions in port and help improve air quality in surrounding communities. Thus passengers and local residents breathe fresher, cleaner air; and with the added benefit for cruise and ferry operators that fresher, cleaner air becomes part of the positive experience of being onboard the ship.

Cruise ships have substantial power requirements, (up to 20 MVA), and therefore consume large amounts of fuel while berthed, which in turn is a considerable source of pollution. A typical cruise ship, with a power requirement of 12MW, at berth for eight hours, produces 1.2 tonnes of nitrogen oxides. This is the equivalent of 10,000 cars and 30 kilograms of particulate matter, or 6,000 cars being driven from Paris to Berlin (1,000 kilometres).

For passenger ferry applications, in addition to environmental benefits, return on investment for a shore connection system can be very fast. Due to their smaller size, shore power ferry applications tend to require a lower level of investment. In addition, occupation rates are often higher for ferry berths than for cruise berths. This makes shore connection attractive from a financial as well as an environmental perspective. Furthermore, in Europe ferry traffic operates in many areas where shipping emissions are tightly regulated. The Baltic Sea, the North Sea and the English Channel are listed as emissions control areas (ECAs). Ships operating in these zones will face further restrictions that come into effect in 2015. The EU is also providing technological support by granting financial incentives for investments in shore power. The trans-European transport network (TENT), an EU initiative, includes shore connection in its port modernisation programmes.

Sockets inside a cruise ship.

How has shore power for passenger vessels progressed?

Shore connection systems were launched in pioneering ports some 20 years ago. In North America, the cruise industry was among the first to implement shore power in order to reduce its environmental impact in sensitive areas, such as in Juneau, Alaska. Following the success of these applications, California started evaluating the technology and concluded it was the most cost-effective means of tackling ship emissions in ports. California subsequently mandated the introduction of shore power for all major ports in the state. From January 2014, ships without a shore connection system have been banned from Californian ports; and by 2020, 80 percent of the power used by berthed ships will have to be shore-side electricity. Consequently, major west coast ports such as Los Angeles, Long Beach, San Francisco, San Diego and Seattle use shore

power for cruise vessels. All these ports have recorded improvements in air quality. Canada has adopted another approach to encourage ports to invest in cold ironing for cruise vessels: cost-shared funding. As a result, companies such as Princess Cruises, Costa Cruises, Holland-America and Norwegian Cruise line have begun to retrofit their vessels.

Europe's ferry industry has arguably been the most proactive in deploying shore power technology. Sweden, Germany, Belgium, Norway, and the Netherlands have introduced shore power systems, mainly at ferry berths. "More recently, Port of Helsinki, Finland, has successfully connected Viking Line ships to a Schneider Electric ShoreBoX™ solution," says Lorène Grandidier.

Ports in Asia are also taking steps to reduce emissions with the help of shore power. One of the forerunners is the port Hong Kong, which is reviewing cold ironing for its cruise terminals. Many industry professionals promote shore power as one of the most effective ways of addressing emission levels in the Pearl River delta.

Shore power considerations for passenger ship berths

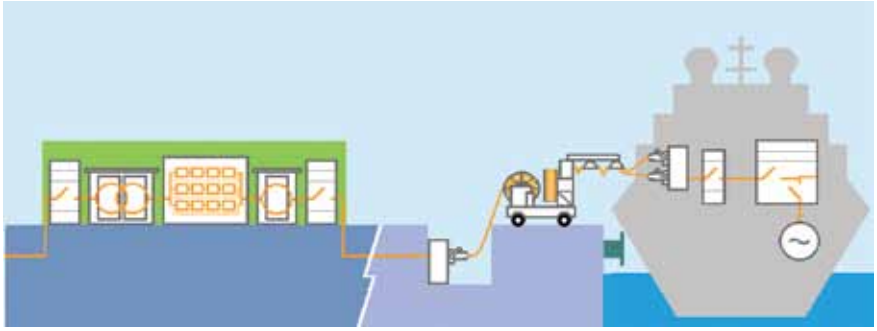
As the primary maritime freight routes are inter-continental, the international standardisation entities have decided to create a single standard for shore connection systems. The first part of the IEC/ISO/IEEE 80005 standard was agreed in July 2012, and established key requirements for safety, cables and plugs. These requirements vary according to vessel type. For ferries, the nominal shore connection voltage is 11kV; 6.6kV is accepted for waterborne transportation services and one cable, located at berth, is required.

For cruise ships, which have far higher power requirements than ferries, the standard requires four cables, located at the berth. The nominal voltage can either be 11kV or 6.6kV.

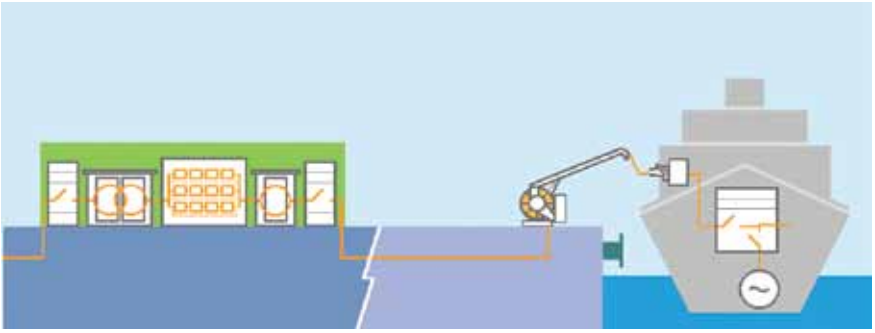
As approximately 80 percent of passenger vessels run on a 60Hz frequency, and most national electrical grids are 50Hz, a frequency conversion system is required for the majority of shore connection systems. To manage this, and ensure a safe, seamless connection between the vessel and the network, Schneider Electric has developed the ShoreBoX™, an all-in-one integrated solution. Similar in size to a shipping container, the ShoreBoX™ is mobile, modular and flexible: ideal for ports with limited space and multiple users. For example, a ferry company that adds or removes a route would be able to move the ShoreBoX to a new berth/port.

Cable Management system for a cruise ship.

Shore installation at a Californian port.



Standard requirement for a cruise shore connection.



Standard requirement for a shore connection solution for ferry ship.

It is a turnkey solution, standard plug and play: this solution can reduce engineering and civil work to a minimum during the implementation phase – a highly useful advantage for busy ports.

Cable management less is more

Much of the industry is developing shore power systems that are either built into the quayside (pits and vaults), or as mobile units that can be towed into place for use, and removed when not needed. Cavotec AMPVault systems is an approach the group first developed for aircraft servicing, and is now in use at several ports in North America for a variety of applications.

Pit and vault systems have the added advantage of maximising space on the quayside, reducing congestion and thus the risk of collision that can pose a threat to personnel and damage valuable equipment.

Cavotec AMPMobile systems have served cruise terminals at, for example, the Port of Los Angeles for several years. European ports are also now starting to see the benefits of mobile shore power systems. Mobile systems also improve the operational flexibility of berths because they can be repositioned and re-tasked for multiple vessel sizes and types.

Conclusion

Well established and continually being developed, shore connection technology is currently the most effective way to reduce emissions from passenger ships that are berthed, especially at ports in close proximity to densely populated areas.

The extent to which AMP systems are already in use in Europe and North America speaks strongly for the system to be adopted as a standard. The wide variety of AMP applications in service also enables the evaluation of the technology in diverse climates and operational situations. The technology is continuing to gain acceptance as it's environmental, operational and safety benefits are proven.

AMP system manufacturers, such as Schneider Electric and Cavotec, have been able to develop a variety of solutions ensuring ports comply with norms and regulations, safety standards, and different vessel types. Many cruise and ferry operators are now investing in new vessels that are configured with AMP as their standard specification.

While acceptance of the technology may no longer be the sticking point it once was, funding remains at the core of the debate over shore power. But with the willingness of government bodies to develop sustainable strategies to reduce pollution, AMP is increasingly a proven solution to be integrated as a standard berth feature.

Example of 3MVA ShoreBoX for a ferry vessel.

About the authors

Lorène Grandidier holds a Masters in marketing management from the Grenoble Business School, France. She has vast experience in industrial marketing and is now involved in the Shore Connection activity for Schneider Electric, managing strategic marketing and institutional relationships. She is part of the T&D Europe Association, under the Gimelec, to promote greener solutions towards European institutions and she is the vice-chair of the environmental committee of the Port Equipment Manufacturers Association (PEMA).

Luciano Corbetta is Cavotec's group market unit manager, ports & maritime. He holds an MSc in mechanical engineering from Politecnico di Milano. He has worked as a mechanical engineer at TTR Srl. and as a sales manager at Brevetti Stendalto SpA. Corbetta has been responsible for the development of advanced maritime power supply solutions, and has been involved in a large number of high voltage shore-to-ship projects. He is also actively involved in the ongoing standardisation process of shore power equipment.

About the organisation

Cavotec is a global engineering group that manufactures power transmission, distribution and control technologies that form the link between fixed and mobile equipment in the ports and maritime, airports, mining and tunnelling and general industry sectors. In addition to AMP and MoorMaster™, Cavotec's range of technologies for the ports sector includes Panzerbelt cable protection systems, crane controllers, marine propulsion slip rings, power chains and connectors, radio remote controls and motorised and spring driven cable reels.

Schneider Electric is the global specialist in energy management and has operations in more than 100 countries. We provide integrated solutions that make energy safer, more reliable and efficient for areas like energy and infrastructure, industrial processes, buildings, data centres, and residential applications. We have more than 90 years of expertise in the maritime industry and have developed a shore connection solution that is green and reliable, and can help your port comply with local environmental requirements.

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