Silent Harbours, Cleaner Seas

Benefits of utilizing shore power when docked

Benefits
• Significant fuel savings by eliminating continuous generator use
• Reduced generator servicing and monitoring intervals
• Extended intervals between oil changes and savings on oil and filter costs
• Flexible compatibility with both 50 or 60 Hz shore power
• Maintains stable voltage with adjustable shore power capacity
• Eliminates maintenance needs for exhaust cleaning system if fitted
• Decreased servicing costs and labor for fuel purifier
• Lower engine room temperature enhances equipment longevity
• Reduced power consumption with lower engine room fan speeds
• Quieter engine room facilitates easier equipment servicing
• Crew gains more time for other equipment maintenance
• Enables silent operation without generator noise
• Minimizes cleaning efforts due to exhaust smoke
• Eliminates outside exhaust smell with changing wind directions
• Consistent lighting without flickering or dimming during load changes
• Extends generator lifespan, reducing rebuild frequency
• Mitigates galvanic corrosion concerns
• Substantially reduces carbon footprint, contributing to yacht's environmental sustainability

How shore power converters benefit the environment, and your wallet.

YACHTS AND GENERATORS GO HAND-IN-HAND

Everyone wins when mega-yachts don't need to run their ship's generators full time for power when docked. Being able to utilize shore power is a green solution for the environment. Where shore power is available, and with the installation of a state-of-the-art shore power converter, huge savings in fuel and longer service intervals can be realized, while owners can feel good about reducing their yacht's carbon footprint.

While running generators are necessary when at sea, many mega-yachts continue to run them dockside 24/7 because they can't utilize shore power. This could be due to inadequate shore power due to frequency or voltage. It could be that a ship's original electrical system design won't accept a different voltage from shore power. It could be concerns that fluctuating shore power voltage could damage electricals. Another roadblock is that most ship's electrical systems can only utilize a shore power frequency of either 50 or 60 Hz, not both, and this limits the ship's ability to travel to countries with different frequencies.

TECHNOLOGY ENABLES REDUCED USE OF GENERATORS

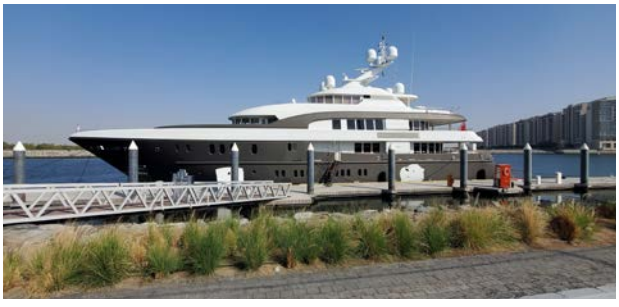
The good news is that all these issues can be eliminated through the installation of one of the latest shore power converters on the market. It also helps that over the past decade, mega-yacht marinas have upgraded their systems, and more and more are offering reliable 250 – 400 and 1,000-amp shore power connections. Some, to be greener, do not allow yacht generators to operate at all while docked.

A CASE IN POINT: 60M MEGAYACHT CAIPIRINHA

Running generators 24/7 is expensive. A case in point is the 60-meter mega-yacht Caiprinha, while based in Abu Dhabi in the United Arab Emirates (UAE). The vessel could not run on shore power because its original shore power system only offered 250 kVA while it needed at least 300 kVA—much of that necessary to run three chiller plants in the UAE's summer heat.

To get that power, it needed to run one of its three 330 kW generators day in and day out, with fuel consumption averaging 1,200 liters per day. For the previous three years, she had been docked full time.

Her annual fuel cost, at an average of $1.00 per liter (in the UAE), was approximately $438,000 US. Added to this was the cost of servicing each of the generators every few hundred hours and replacing filters and buying hundreds of liters of oil and the cost of disposing of the used oil. Then there was the cost of tearing down and rebuilding each generator at the 8,500 to 10,000-hour mark. While switching between three generators extended each unit's service interval, a single generator running full time racks up about 8,500 hours each year. And rebuilding a generator takes the ship out of service.



CAIPIRINHA'S SOLUTION: ELIMINATING THE NEED TO RUN GENERATORS WHEN DOCKED

The solution for Caipirinha came from Blake Holloway of Shore Power Services based in Dubai. He solved the problem with two ASEA Power Systems 165 Q series with a total output of 330 kVA. Based in California, ASEA is the world's largest supplier of yacht shore power converters. Holloway's system easily upgraded the shore power from 250 to 330 kVA, which eliminated the need for using the generators when berthed.

However, there were many other savings for the Caipirinha than simply reducing fuel consumption and extending the service life of the generators. When dockside, because the ship isn't relying on generator power, it wasn't necessary to run and maintain fuel purifiers, engine room cooling fans, exhaust filtration systems, seawater pumps and other systems that require regular servicing and replacement. The elimination of all these significantly reduced the ship's carbon footprint.

ASEA POWER SYSTEMS SHORE POWER CONVERTERS

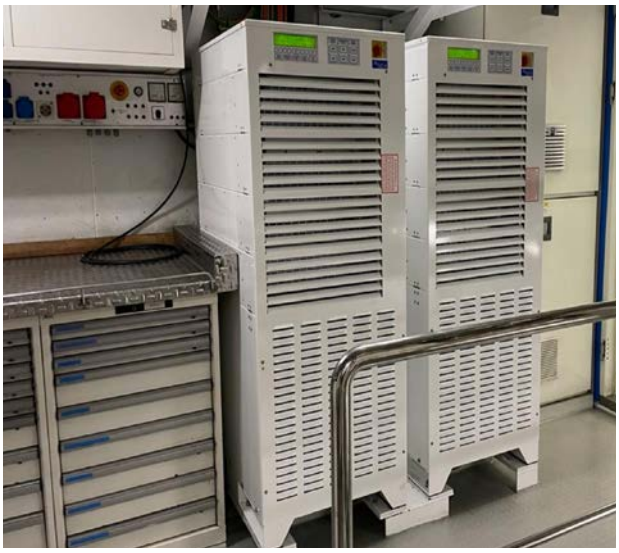
ASEA shore power converters provide clean power regardless of shifts in input voltage issues, voltage surges and frequency shifts. They eliminate the chance of damaging the electrical system from unfiltered shore power and they protect against galvanic corrosion. The power is perfectly filtered. It stays on voltage and frequency 100 percent of the time.

In simple terms, shore power converters take AC voltage from dockside, pass it through an isolation transformer and convert it to DC power with solid state switching, then turn it back into pure clean AC power.

By using the electromagnetism of the isolation transformer, the wires on the input do not connect to the wires on the output, so there's no physical connection. In the case of a high voltage strike or if something goes wrong with the shore power, it stays on the input (dock) side and protects problems from passing through. As a bonus, there is none of that flicker or dullness of lights as large loads come on and off the system that is common when using generators.

VOLTAGE BOOSTING, GALVANIC PROTECTION AND WORLDWIDE INPUT FREQUENCY

As noted, another benefit of shore power converters, as was the case of the Caipirinha, was the ability of the system to boost the shore power to the required 330 kVA. Similarly, shore power may be 415 volts when first plugging in, for example, then when the ship starts pulling more and more current, the voltage might drop to 380. With a shore power converter, the system will raise or lower the voltage to maintain the ideal 400 volts to match the ship's requirements.



These systems allow seamless transfers when switching between generator and shore power. This avoids the problem of blackouts when having to turn off a generator before turning on the shore power, and vice versa, so there are zero interruptions to the ship's electrical system—or to guest's activities while on board.

All vessels must be concerned about galvanic corrosion caused by differences between themselves and adjacent vessels. For example, if a steel boat is connected to shore power near an aluminum vessel, then the aluminum vessel could become, in essence, a sacrificial anode because it is lower on the galvanic table. Using an isolation transformer in the shore power converter, galvanic corrosion is no longer an issue.

Another function solves the problem of being unable to use shore power in different countries, which use different frequencies in their power grids. Most yachts' electrical systems can only use 50 Hz (typical of Europe and the Middle East) or 60 Hz (typical of North America). Converters can utilize either frequency, allowing ships to travel seamlessly anywhere in the world.

ROI: RETURN ON INVESTMENT

In the case of the Caipirinha, the cost of the two 165 kVa shore power converters came to $495,000 US and that included a significant amount of other related work. However, Holloway normally ballparks costs at about 1,000 US per kVA. Return on the investment, based on fuel consumption only, was estimated to be just over 18 months—but even less when the other service and replacement costs were factored in. The ship can now realize significant cost savings of fuel, fewer service intervals and lower running hours on the generators. Just as important is a more enjoyable atmosphere due to the lack of generator noise and the elimination of generator exhaust fumes. The ship's resale value is now higher due to its shore power converter system and the resultant lower operational costs. Perhaps most important is that the owner can feel good about reducing the ship's carbon footprint.

In essence, the Caipirinha's shore power converter could be considered the greenest upgraded product on the vessel.

FINALLY THE NUMBERS

Before installing their shore power converter, the Caiprinha remained docked for three years, relying on three 330 kW generators that ran 24/7, totaling 8,500 hours per year and consuming an average of 1,200 liters of fuel daily. At a cost of approximately $1.00 US per liter in the United Arab Emirates, this amounted to $1,200 per day or $438,000 annually, solely for fuel (based on 2022/2023 prices). Costs were even higher in Europe and other regions. When Caipirinha was docked 24/7, it cost app. $7500 in monthly electricity costs.

According to the Water Revolution Foundation's Yacht Environmental Transparency Index (YETI), 57 percent of superyachts spend more than half of their time docked.

Assuming a typical mega-yacht such as Caiprinha spends an average of 6,000 hours docked, installing a 330 kVA ASEA shore power converter reduced generator usage by around 70 percent. This translates to approximately $306,000 in fuel savings per year.

The shore power system for Caiprinha cost $495,000 in total. Consequently, the return on investment, solely considering fuel savings, was achieved in just over 18 months. After the shore power system was paid off, Caiprinha was able to enjoy annual fuel savings of $306,000. However, the savings extend beyond fuel. Additional savings result from reduced service intervals and replacement costs for other ship machinery, such as generators and associated components like water pumps, air filters, oil filters, oil, exhaust cleaning systems, and fuel purifiers. Among these, generator maintenance is the most significant. Typically, generator manufacturers recommend rebuilding every 8,500 to 10,000 hours, costing about $120,000 each time. Operating on shore power for 6,000 hours, usage of Caiprinha's three generators is reduced to 2,500 hours per year and only while at sea. Consequently, the rebuild period for each generator is extended to around 10 to 12 years.