



The amphibious assault ship USS Makin Island (LHD 8) steams ahead at night in this 2019 photo. LED lights may replace many existing lights on U.S. ships.

LED's Bright Future

IS IT TIME FOR A NEW STANDARD FOR NAVIGATION LIGHTING?

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Light emitting diode (LED) lights are rapidly replacing incandescent and fluorescent lighting on ships. New LED bulbs can easily be used in existing fixtures inside the ship, and heavy-duty, marine-grade lights and fixtures are available to replace floodlights, hangar bays and well decks, cargo spaces and waterline security lights.

They create better light, last longer, use less electricity and emit less heat. Less heat means less cooling, and that equates to a noticeable and tactically significant decrease in fuel consumption, which means a ship can sail farther or remain on station longer before having to refuel. Because they have to be replaced less often means less time is spent replacing them (which can be dangerous, in some cases), and less storage is required for replacements. With this precedent to guide the way, LED is now being developed for navigation lights on naval and commercial vessels.

"LED lighting is not new," said Ryan Hertel, vice president for business development with Phoenix Lighting in

Milwaukee, Wisconsin, "But intelligent LED navigation lighting on ships is new."

Collision at Sea regulations (COLREGS) require standard navigation lighting that must meet International Maritime Organization, U.S. Coast Guard and classification society regulations and requirements.

The USCG Navigation Rules require that vessels of 50 meters or more in length have a masthead light with a visibility of six miles, port and starboard sidelights and stern light with a visibility of three miles, as well as a towing light, and a white, red, green or yellow all-round light, each with a visibility of three miles. There are additional requirements for military vessels such as landing craft air cushion, minesweepers engaged in minesweeping and submarines. The Navigation Rules also specify the color and intensity of navigation lights.

Since functional navigation lights are required before departing port and when at sea, they must be 100% reliable. A ship will not be allowed to get underway without functional navigation lights. Although redundancy may be built in on some ships, traditional incandescent bulbs periodically burn out and must be replaced. Many installations have an alarm panel that indicates when a bulb has failed. In addition to the alarm indicator,

watchstanders periodically ensure the lights are burning brightly, but when they fail, a crew-member must climb aloft to change the bulb, a job made more difficult and dangerous when underway.

Exterior lighting on oceangoing vessels, including navigation lights, must meet more stringent requirements than the lighting inside a ship. They must work in a harsh environment with rain, salt spray, dust and temperature extremes, and must be protected from vibration, electromagnetic interference, corrosion and ice. Navy ships add the potential for shock and battle damage.

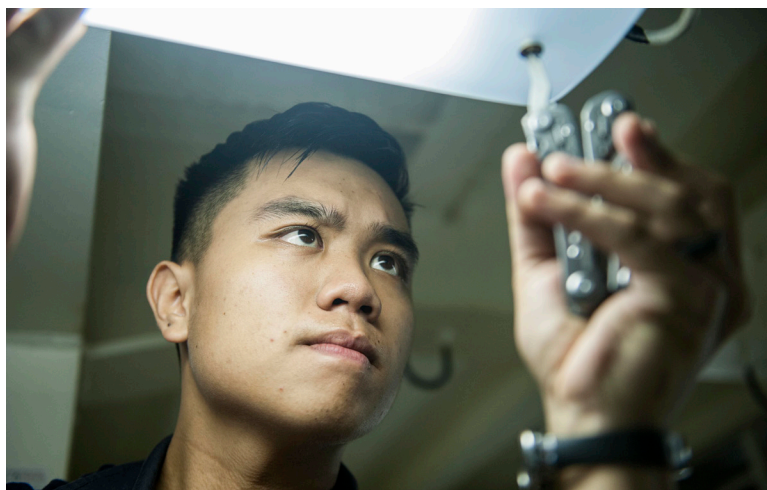
LED lighting is sturdier than fragile incandescent bulbs with delicate filaments or gas-filled fluorescent bulbs. Using LED navigation lights does require new fixtures, and the current alarm panels that detect a failed incandescent bulb must be updated to work with LED circuits.

LED lights last at least five times longer than other lights, and the technology is constantly improving so they not only last longer but can customize the physical light output — the color and intensity — itself.

And new “smart” LED navigation lighting can measure and monitor when a light begins to dim or increase intensity in heavy fog. Smart lighting can also deliver lots of useful data that can help ship managers and port engineers make better decisions. Smart technology allows for increased data collection to help with predictive maintenance, which can understand a lot of factors beyond the light itself, such as temperature or vibration, that could impact longevity, and can help determine what spare parts to carry.

Altogether, interior and exterior lighting are a big power consumer on ships. Lowering the power demand decreases fuel consumption. This technology can also be used with flight deck lighting and help pilots land safely while using their night vision goggles in low-light situations. The LED lights are so much cooler they don’t overwhelm infrared vision systems.

“It’s become difficult for us to be able to support traditional lighting because the components to make them



Aviation Support Equipment Technician 3rd Class Riz Bartolome, assigned to the aircraft intermediate maintenance department aboard the amphibious assault ship USS America (LHA 6), replaces a light fixture in an equipment storage room in this 2017 photo. LED bulbs can make this a less frequent activity.

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have become obsolete,” said Hertel. “But, as technology improves and the market matures, LED lights are getting smaller, they’re weighing less, they’re getting less expensive, and they’re getting brighter and more durable.”

When they were a new thing, LED lighting was more expensive than traditional lighting, but as their use becomes more common the costs have come down. Along with all the other benefits, LED has become an affordable choice.

The international standard for navigation lights dates back to 1897, and the standards can be updated to take advantage of new technology.

Glass incandescent and fluorescent bulbs haven’t changed much in the last 50 or 60 years. They’re fragile and they shatter. New LED lights are sturdier, but it’s not always a simple solution with exterior lighting, especially with navigation lighting.

Military Standards

All general-purpose and task lighting aboard a Navy ship must meet the requirements of MIL DTL 16377J, which was issued in 2014 and has its latest amendment in 2019, which covers fluorescent, incandescent and solid-state LED lighting, luminaires and parts used for general illumination on naval ships and submarines.

“You can’t just put any light fixture or light on board a ship. It needs to meet the requirements for shipboard installation,” said Christopher Nemarich, the engineering manager for shipboard electrical systems, lighting



Two recently built Maritime Partners boats, the Raymond Butler and the Dave B. Fate, both equipped with LED lighting.

and instrumentation at naval Sea Systems Command. “We have to make sure these new lights meet the lighting, durability and safety requirements for shipboard environment.”

For ships outfitted with traditional navigation lights, upgrading to LED would require a replacement of the fixtures and wiring. However, updating specifications for new construction would ensure those ships would have the best available technology.

“We have to make sure that the fixture or the luminaire we put up there isn’t going to fall apart — it has to be corrosion resistant,” Nemerich said.

LED navigation lights can offer greater redundancy, but LEDs degrade over time, and their light output gradually declines. “You can have two solid state bulbs and smart circuitry that can measure the output of the light, so we know if one is degrading. However, none of this is currently compatible with our legacy navigation lighting panels,” Nemerich said.

“The new technologies offer tremendous flexibility and so many different opportunities to provide the appropriate light for ships,” said Ben Hatch, the Navy’s in-service engineering subject matter expert for lighting at Naval Surface Warfare Center Philadelphia Division.

Hatch said the Navy is trying to balance the importance of the existing specifications with the flexibility that new technologies like LED provide. “We don’t need to have

the same size light fixtures anymore. We can make an LED array any size we want.”

LED lights have driver circuitry that provides an interface to LEDs with the right voltage and protects the lights from surges. But those interface drivers can be “electrically noisy” and emit RF energy. So, the lights must be designed and tested to ensure they do not interfere with topside sensors or communications equipment.

According to Hatch, that engineering and testing can be expensive. “Even if the Navy replaced every navigation light in the fleet with LED, it wouldn’t be a huge number, so the economics would have to be analyzed.

“There’s a real balance between trying to figure out which of the old ways of lighting are worth keeping and which of the new ones we should adopt. We’re trying to open it up for companies to show us new and different ways of lighting,” Hatch said. “We can now build something a special way or to create a unique light that can do something that we would never have been able to do before.”

Because LED technology is changing faster than the Navy’s standards and specifications documentation can keep up, it’s been a challenge for the Navy and industry.

Commercial Future

In the commercial world, LED navigation lighting is the way of the future. Austin Sperry is a cofounder and chief operating officer for Maritime Partners in Metairie, Louisiana, which owns a fleet of more than 550 push-boats, towboats and a variety of barges, such as covered hopper barges and liquid tank barges for the Jones Act trade. The vessels are leased to operators.

“We have a very young fleet, and we’ve specified LED navigation lights to the shipyards that have constructed our vessels,” Sperry said. “Our customers who operate our vessels and their customers who charter our equipment want reliable transportation and a safe environment for their mariners. So, we want the latest technology, and dependable lighting that will require little or no maintenance.” ■