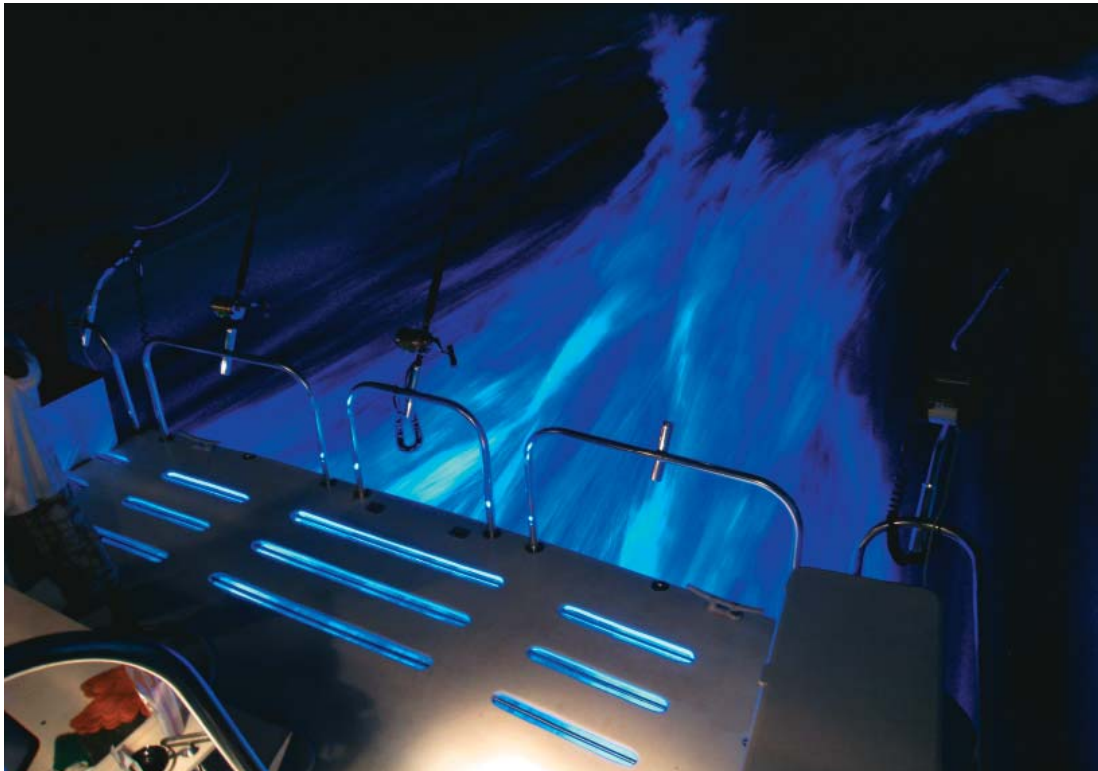


Light Up Down Below

SPECIFIERS' CRITERIA FOR UNDERWATER LIGHTS



DeepSea Power & Light approached us to write an article detailing the considerations and criteria of all kinds of underwater lights, and to explain how and where to use which. Here Kevin Hardy and Erik Goodin do just that. Their company has 25 years of involvement in commercial underwater light sources as well as (latterly) those used on leisure vessels. They even claim their product brought daylight (OK, to be fair, lamplight) back to the decks of the RMS *Titanic*, as well as being used on subs and ROVs (I first saw one of these on SEAmagine's *Lorelei*). The issue of underwater lights has been somewhat controversial even contentious in the past, so this is a different and non-comparative look at how and what to chose.

TO UNDERSTAND THE APPEAL OF UNDERWATER SHIP lights, one only needs to think of a backyard pool after dark to see the difference an underwater light can make to the appearance and extended functionality of the pool itself.

Through-hull lights are presently used by vessel owners for both function and ambiance, including attracting fish, illuminating a reef for night diving, a pleasant evening at the dock, illuminating a dock or shallow-water environment as an aide to the pilot, or simply for creating the elegant illusion of the yacht floating on a cloud of light instead of a surface of black water. Some superyacht masters are choosing to enhance their vessels with the installation of lights to distinguish their vessel at anchor in a serene bay, the lights offering a warm welcome as they return from shore on a tender. How many lights an owner chooses to use is a matter of personal preference, with some placing more than 50 with overlapping beams surrounding the entire vessel. Likewise, a superyacht tender may also be outfitted with underwater lights, providing higher visibility to other watercraft operators.

Lamp and Reflector Selection

Light sources may be divided into four groups based on how they create light: Thermal Radiation (Incandescent), Low Pressure Discharge (Fluorescent), High Pressure Discharge (High Intensity Discharge HID), and Solid State Semiconductors (LED). For superyacht through-hull lights, the best and brightest choices are HID and LED. While HIDs are, for the moment, the brightest

light out there, LEDs are close behind and closing in fast, whilst offering the lowest maintenance cost. High-brightness LEDs are now being delivered from the factory with labels warning that staring at the light for very long can cause retinal damage. In the lab, our engineers routinely wear welding goggles during power-on testing. LEDs can provide either cool or warm white or blue and green in a narrow colour band. It's expected before long that multiple-die RGB LEDs will provide colour shift capability to match mood and music.

Reflectors are used to channel light to create a narrow spot light for maximum projection away from the vessel, giving the appearance of long oars, or can provide wide-angle flood lights with overlapping beams that surround the ship in a uniform sea of light.

Driver Electronics

LEDs are known to have extremely long lifetimes under ideal circumstances, and should not require service for quite a long time. LEDs are part of a larger electronic circuit that can be affected by wide voltage inputs, excess heat, marine air, or normal component failure rates. Thru-Hull SeaLites®, for example, have many self-protecting and redundant features. Double electrical insulation is included to help prevent inadvertent electrolysis of all-metal housings. Addition of ground fault detection (GFI) is recommended.

Through-hull Fittings

Shipyards know that before they cut a hole below the waterline into an otherwise perfectly good hull, the first design problem they face is a mechanical one. Whatever they use to plug that hole must maintain hull integrity, performing as well as any other hull section in keeping the ocean in its rightful place. Light fixtures must be able to survive wave slap, impact with flotsam or pier pilings, exposure to hydrocarbon fuels or solvents, and other dangers that are part of normal yachting operations. A design must also work to minimise effects of stray electrical currents and galvanic corrosion due to dissimilar materials.

The addition of lights makes the tender safer in high traffic areas after dark



Superyacht hulls are formed from either composite plastic, low carbon or mild steel, 5000 series aluminium or lightweight aluminium alloys. Each has unique characteristics. Graphite fibre reinforced composites, for example, should be treated like a metal hull as graphite holds a very noble station on the galvanic series of metals and alloys, and conducts pretty much like metal.

The simple rule about minimising corrosion of metal yacht hulls is to avoid dissimilar metals, unless you want one of them to corrode, like zinc anodes do on a steel hull. When dissimilar metals are unavoidable, one needs to either break the ion path (keep dissimilar metals out of the water), or break the electrical path (use a plastic or rubber insulator between the dissimilar metals to break contact). This is the essence of American Boat and Yacht Council (ABYC) standard H27.6.6, and a part of Lloyd's Registry approval.

Installation

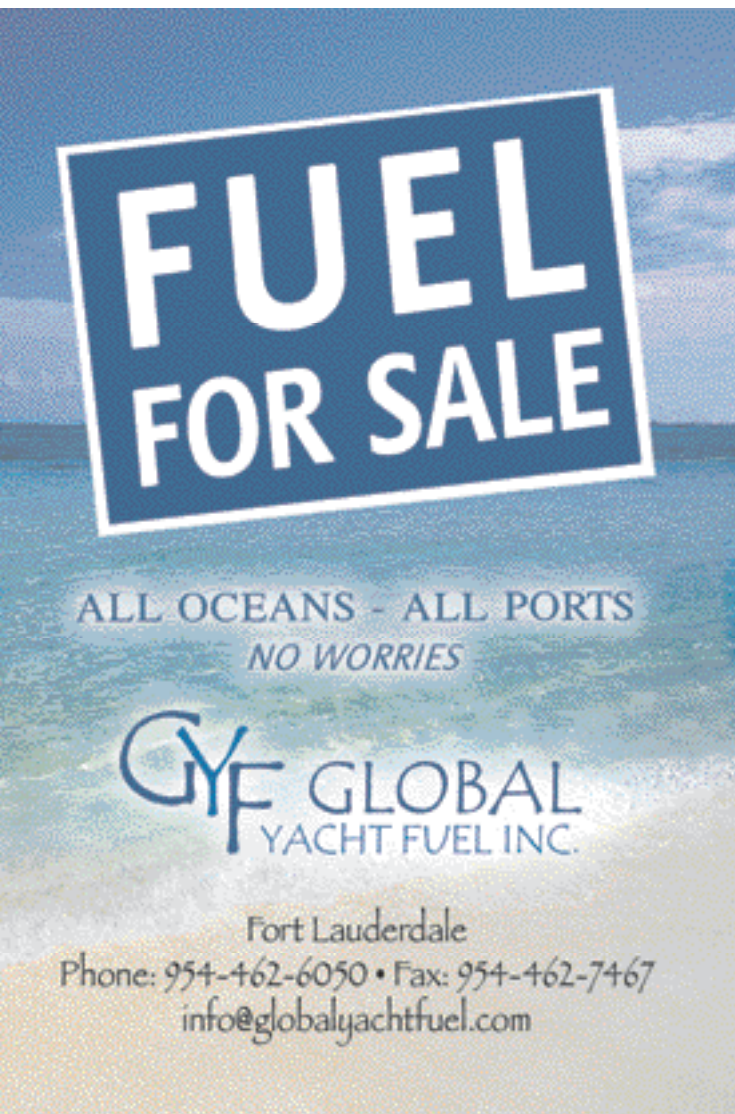
Through-hull light fittings may be installed by either weld-in modules or clamp-in assemblies. Different manufacturers provide through-hull fittings made from different combinations of materials that may include low carbon or mild steel, 316 SS, 5000/6000/7000 series aluminium, brass, bronze, sapphire windows, high impact plastics, and more.

For smaller yachts and less critical applications, some manufacturers use thin sections of impact-sensitive plastics, not something for a big cruiser. In others, bronze castings are often porous, and though that

Should an owner have an electrical problem with a through-hull light, perhaps as simple as changing a bulb, he would want to perform maintenance on the fixture without having to haul the yacht.

may serve well as an engine seawater intake, any leakage of moisture makes them unsuitable for use as electronics housings. We prefer wrought metals that provide the greatest strength and maximum material density, that is the clamp-in THSL designs provide two mechanical barriers and four seals between the ocean and vessel interior. A weld-in version in development provides three barriers with six seals.

Clamp-in through-hull fittings work very well in composites hulls. Clamp-in through-hull lights with metal housings require an insulating plastic sleeve for installation in a dissimilar metal yacht hull. Of the engineering plastics, UHMW-PE (Ultra high molecular weight polyethylene) is among the



FUEL FOR SALE

ALL OCEANS - ALL PORTS
NO WORRIES

GYF GLOBAL YACHT FUEL INC.

Fort Lauderdale
Phone: 954-462-6050 • Fax: 954-462-7467
info@globalyachtfuel.com



Natures Best **GELAIR** Tea Tree Oil

Simple and it Works!
www.gelair.com.au

The Problem Airconditioners In Boats High Humidity + Airconditioners = Mold and Bacteria	The Solution Control of Mold and Bacteria In Air Conditioners
Mold and Bacteria = - Health Problems - Odours - Staining - Costs - Unhappy Customers	Gelair Air-Conditioning Blocks Gelair Solution Fresh Fragrance of Tea Tree Oil Happy Customers

United States/Carribbean **Europe/Mediterranean**


www.yachtspares-online.com
+1 954 358 0288


www.iys-online.com
+31 252 532 341

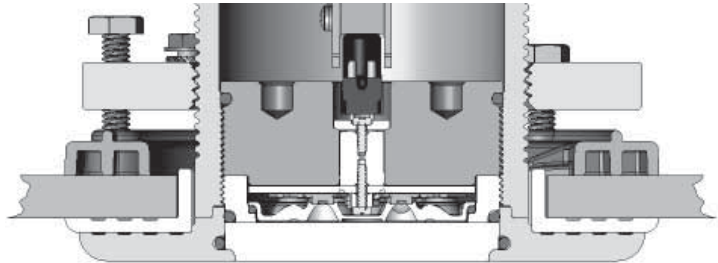
 **Stocks Available** 

best. Known as a tough, wear-resistant material, it combines outstanding impact strength, excellent chemical resistance, broad temperature range, and is readily adhered to by such marine adhesives, such as 3M 5200. Insulated lights must still be connected to the ship's bonding system.

A weld-in through-hull fitting may be required by Class (and standard good practice) for larger vessels. The designer of a weld-in through-hull light fitting may choose to move the window seal surface away from the weld-heat-affected zone, minimising potential heat distortion and possible damage from weld splatter. After the module is welded in, the yard crew must install the window, window seal, and window retaining ring. The light assembly is attached inboard of that.

Secondary containment may be required in some larger vessels. An interior cofferdam provides a recessed hull section behind the light. One can also provide for installation through interior tanks intended to later hold fuel, potable water, or other liquids. Where a lamp driver is used to power a HID (High Intensity Discharge) or LED (Light Emitting Diode), a remote light head, connected by a cable, can be installed with a small recessed fitting. The

A metal clamp-in through-hull light requires an insulating flanged plastic sleeve (white) for installation in a dissimilar metal yacht hull. Insulated lights must still be connected to the ship's bonding system. Not shown is the marine adhesive used to bond the insulator to the hull, and the fitting to the insulator



cable may then be passed through a standing pipe that passes through and out of the holding tank to a point above the waterline, providing additional design safety.

A weld-in fitting may be subject to thermal stress caused by a sharp temperature drop in the metal after heat is removed. The stress can create distortion warping seal surfaces, and promote premature cracking of the weld. 'Stress' reduces these effects. A portable, non-heat stress-relieving method using subharmonic vibration energy has been developed by Bonal Technologies®, called Metal-Lax® (www.bonal.com) that some shipyards have found useful. *(This lesser-known technology will be the subject of a future article – Ed.)*

World Class Systems for World Class Yachts

With your climate control system typically being the largest consumer of power onboard, wouldn't it make sense to have your generator and A/C system engineered together into one seamless system? Now you can. Northern Lights generator sets are reliable, durable and simple to use and maintain. Technicold by Northern Lights provides the best-built air conditioning and refrigeration systems on the market.

Easily integrated and fully customizable, Northern Lights and Technicold can provide a solution that saves time, energy and valuable engine room space. Technicold's new linear load bank provides variable output to manage each individual 3 phase leg for nearly infinite load control.

Industry-best engineering, craftsmanship, and service ensure that Northern Lights and Technicold provide world class systems for world class yachts.



TECHNICOLD
by NORTHERN LIGHTS

NORTHERN LIGHTS

+1.206.789.3880 • 800.762.0165 • www.northern-lights.com



Atlantis, a 80ft Sunseeker Predator with two 150W HID Thru-Hull SeaLites, rests at the dock awaiting guests to arrive for an evening harbour cruise

Should an owner have an electrical problem with a through-hull light, perhaps as simple as changing a bulb, he would want to perform maintenance on the fixture without having to haul the yacht. A through-hull light that may be opened from the interior of the vessel, with an outer window providing a fixed barrier to the sea, allows for continued vessel operation even if an interior component need be returned to the factory. This maintenance feature also provides a convenient upgrade path to a new colour option, or to take advantage of new and brighter LEDs.

Certification

Certification of through-hull lights provides an owner with the confidence of an independent review before they commit to a particular manufacturer or model. In a global marketplace, manufacturers must overcome the challenges of multiple sanctioning bodies with overlapping jurisdictions. Reciprocity agreements between the major certification agencies are helping to overcome this burdensome process by harmonising compliance requirements. A through-hull light certified under UL in the US may be recognised for certification under CE in the EU, just as American Bureau of Shipping (ABS) in the US may be equivalent to Lloyd's in the EU. Still, details of each agency's corresponding standard may not be entirely interchangeable.

Type Approval for both Lloyd's Register and ABS follows along the same three-step protocol: 1) An engineer's evaluation of a design to determine conformance with relevant specifications. This may involve testing by an independent laboratory; 2) Witnessing manufacture and testing of a sample of the product to determine compliance with the specification; and 3) A surveyor's evaluation of the manufacturing process and quality control to confirm that the product can be consistently produced in accordance with the specification.

Warranty

Yacht owners will want to pay attention to the light manufacturer's warranty and reputation. Is all of the light assembly covered? How long is the warranty term? Has the company been around long itself?

Conclusions

Yacht owners are increasingly finding that the addition of underwater lights changes the character of their vessel. From a comfortable dinner at the dock surrounded by a luminous aquarium, to illuminating a Polynesian reef for a night dive, joining your City's Holiday Parade-of-Lights on the Bay, to luring big game fish up from the depths of the sea, the addition of underwater lights is one aesthetic accessory of which it will take a long time to tire.

Kevin Hardy & Erik Goodin

DeepSea Power & Light

Images: DeepSea Power & Light

References used in this article and full author bios can be found online as a Synfo Extra

READ MORE
synfo extras
www.synfo.com
extras

To comment on this article, email issue104@synfo.com with subject: Underwater Lights