



A concept graphic for a modern superyacht from Dutch builders Icon, complete with a built-in aquarium. You can use some of the ideas found on this awesome monster on your own boat – but without the seven figure running costs

PART 1
CREATURE COMFORTS

Keeping the peace, stopping the roll and staying cool

Secrets of the superyacht yards

You don't need £££millions to give your boat a little luxury – just borrow ideas from the world's superyacht builders, says Jake Kavanagh

A superyacht is generally described as being a vessel of more than 24m in length, and usually requires a professional crew. If your yacht is less than that (which is likely, as only a few superyacht owners read PBO) you don't need millions of pounds to stretch your hull to join the jet set – just equip it a bit differently.

If you get the chance to look round a superyacht at a boat show, or better still see one in build or under refit, you'll recognise many of the materials and techniques used on much smaller craft, be it power or sail.

Vynils, hardwood veneers, electrical conduits, piping, two-pack paint systems and teak decking are all deployed on superyachts on a similar principle to mainstream production boatbuilding. It's the way they've been used, of course, plus the sheer scale involved, that make these magnificent yachts such head-turners.

The market for these new builds is doing very well, with notable growth in ice-class explorer yachts. These are designed to go pretty much anywhere, with polar charters becoming increasingly popular. In these wilderness locations a toughened hull, long-range tanks and energy self-sufficiency are key priorities.

As a practical boat owner, the bit you'll find most interesting is what you don't see. Look past the gold plated taps, the marble bathrooms, and the priceless art to appreciate how the builders have crammed so many complex systems behind the décor and used their ingenuity to meet an owner's needs.

Typical examples would be how the Dutch yard Moonen hid a powerful crane in a bulwark to launch a mini submarine, or how another Dutch yard, ICON, created a hangar in the foredeck to take a swing-wing seaplane.

Whether you aspire to own a five-deck superyacht or a 26-foot GRP cruiser, some of the ideas you'll see here will be equally effective on both.

This means you can 'superfy' your yacht without an eight-figure builder's bill. It's just a matter of adapting the idea, or embracing the principle, and knowing which suppliers can meet your budget – Gucci or Aldi.



FAR LEFT 'Explorer' yachts are gaining in popularity. Here is a former Icebreaker being converted into a 'go anywhere' pleasure vessel at ICON's yard. **LEFT** Meanwhile a new 'ice class' is in build with the Italian yard San Lorenzo

Better thermal insulation

Stepping aboard a superyacht in build is like entering a space station. Behind all the panels will be silver-backed insulation, often up to half a metre thick and made up of alternating layers of density. Running over these will be a maze of wires and pipes, with many of the latter insulated as well.

Insulation drastically reduces the flow of both heat and cold into, through, and out of the hull. The manufacturers of aluminium-faced thermal insulation claim that some types can stop up to 97% of radiant heat. This prevents the yacht getting too hot in the tropics (even when the hull has been painted the classy dark blue or black colours) or too cold in the Arctic. This takes a



great deal of pressure off the heating, ventilation and air-conditioning (HVAC) systems so less energy is needed to maintain a comfortable temperature inside. This in turn eases the demands on the generators, and so reduces noise and smoke, and saves fuel.

Insulation also helps prevent condensation, with the HVAC system providing a dehumidifying function as it circulates the air.

LEFT Yes, it's a yacht, not a spaceship. This is the saloon deck on a Dutch-built Amels superyacht. Note the extent of the silver-backed insulation, which will take a big load off the HVAC system

HOW SUPERYACHTS DO IT

Materials used by the world's leading superyacht builders are not particularly specialised, or expensive, just used in vast amounts. The superyacht yards often deploy large quantities of Rockwool, for example, available from any DIY store or builder's merchants. They cram it into overhead voids in large overlapping slabs.

They also use products we're familiar with such as 3M's Thinsulate, or the US-made Reflectix or EU-made Armaflex. Metal yachts, and even some composite ones, also use spray foam, much as you might find in your attic.



An aluminium bulkhead has been sandwiched, first with Rockwool (brown), and then with Thinsulate (white) and finally with a foil barrier. This will preserve localised temperature zones and dampen resonated noise



Rockwool is used in huge quantities to fill every under-deck void. This is especially useful in countering loss or gain of heat in areas with temperature extremes, such as the tropics or polar regions



Tanks are often sprayed with a thermal barrier coat of foam to stop big heat differences between the tank's contents and the interior of the yacht. Big temperature differences lead to condensation

THE PBO SOLUTION

Modern domestic insulation materials are both effective and fire retardant, the latter being a key consideration afloat. As a result, products from DIY outlets will prove perfectly adequate for a 'superfy your yacht' project.

Screwfix, for example, sell the YBS Superquilt product, which will give you a 5m x 1m sheet, for around £60. Specialist companies such as Hawke House Marine can also supply self-adhesive foam-backed insulation in various thicknesses (either 2mm or 6mm) which can be bonded

directly to the inside of the hull.

If your boat is prone to getting a little damp, an option is to use immersion heater jackets, or to wrap the Rockwool in plastic before installing it.

Domestic UK suppliers such as pipelagging.com (an Armaflex distributor) or low-E.com can deliver a wide range of insulation materials.

If you want to use marine-compatible spray foam on a steel hull, then check out Websters Insulation Ltd or Mass Foam Systems UK. They also have a lot of technical advice on their websites.



Thinsulate, a 3M product widely used in gloves and ski suits, is hydrophobic (resists water) and is easy to cram into vertical and horizontal voids. Here it being applied to a canal boat



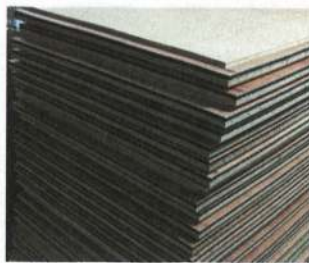
Marine insulation specialists can spray expanding foam strategically into overhead and under-deck voids for cost-effective and long-term insulation

Improving acoustic insulation

No superyacht owner wants to lie in a full width suite and hear the rumble of the variable-speed generator set, or the gurgle of the sewerage plant. Instead, the living quarters of a floating palace should be whisper quiet – well, usually. There are certain owners who want to host an offshore rave but these are relatively rare.

Most metal hulls, and some composite ones (including carbon fibre) can resonate easily, so insulation basically involves interposing a soundproof layer between the resonator and the interior décor.

The remedies include everything from dense acoustic barriers as a laminate within



plywood sheets, to special sound-absorbing paints that are applied to pipes and flat metal surfaces. Great efforts are also made to quieten the machinery exhaust with large mufflers, along with acoustic barriers and baffles throughout air intakes and ventilation shafts.

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Other types are more for thermal insulation, but will deaden sound too. They're typified by a thick layer of closed cell foam – in this case blue, by the Italian supplier Bellotti

At the recent Cannes boat show, for example, Turkish builders Numarine announced a 34m motoryacht that is claimed to be 'quieter than a library' when under way. "The only thing that you can't totally soundproof is flat sheets of glass," said Numarine's technical director "They can still

resonate slightly, and modern superyachts have a lot of glass! We can't do a lot about external water noise, either, but we can do a lot to suppress noise transmission through a hull. This has given us a big yacht returning just 34dB in the saloon under way, whereas the usual requirement is around 50dB."

HOW SUPERYACHTS DO IT

Sound insulation is a major challenge with so much machinery involved, so the builders go to trusted suppliers like Halyard for large exhaust mufflers and rubberised engine beds. They also identify the frequency of any unexpected droning or humming aboard, as this indicates the likely source. One yard found a

hull-wide rumbling was caused by the flow of water past the bow thruster tunnel. A quick mod and it disappeared.

Throughout the boat, equipment is isolated from the deck with large rubber mounts. Bulkheads are often thickened to prevent resonance, and tanks are heavily lagged.



Spray foam on the deckhead of a large Sunseeker motoryacht. This performs a dual role of both heat and sound insulation



This is the deck head of an Amels superyacht. Note how pipes that could vibrate are held in rubber-mounted brackets

THE PBO SOLUTION

Any type of insulation will help to deaden sound, but the PBO reader can find inexpensive solutions quite easily. Noisy bow thruster? Just lag the tunnel with a dense soundproofing material, as found from Halyard Marine or Advanced Acoustics, or use some acoustic plywood as a floorboard. Robbins Timber stock these, as do non-marine companies such as Specialised Panel Products and Welsh-based Winwood Products.

Foam linings will reduce the sound of slap and chuckle at the waterline.

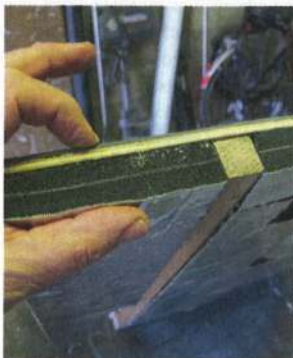
Using 3M insulating tape on tanks can stop them resonating so much, and you can beef up the engine spaces with another thin layer of dense soundproofing, or add more partitions below the floor.

Dutch motorboat builders Linsenn put heavy acoustic



Strips of metal tape, like this one from 3M, can be criss-crossed over metal tanks, and act like placing a hand permanently on a drum skin. Note the extra insulation to prevent big temperature differences between the tank and the bunk, which would cause condensation

mats inside the bilge directly above the propellers: this dampens any resonance from the pressure changes as the blades rotate.



Cancelling noise paths: here are some extra soundproofing layers each side of extra plywood partitions to 'eggbox' the engine and gearbox area. This kills off sound that could transmit through an otherwise open bilge



The builders of fast sportsboats have been using the ski-suit material, Thinsulate, as an acoustic barrier as it shaves a great deal of weight from the engine room



Eliminating soleboard rattles

There's not a lot of point in making your superyacht's hull resonance-free if your floorboards and panels rattle. A superyacht has acres of boards, all of which will need to be lifted at some stage to access cable runs, so they have to remain relatively loose.

To get around this rattling problem, and to add even more soundproofing, most superyacht builders will 'float' the entire cabin on a closed cell foam that is available in self adhesive strips. This is painstakingly laid across all of

the metal support beams above a metal deck. The deck voids and wall cavities are filled with Rockwool or foam before being criss-crossed with pipes and cables. The cabin becomes a 'box within a box.'

Long strips of green Silomar foam are being laid across the metal beams of this superyacht's floor. These strips will minimize any vibration and stop the boards vibrating and acting like a giant plywood speaker



HOW SUPERYACHTS DO IT

Several kilometres of Silomar are used on each project. Silomar is a closed cell foam with a high degree of springiness, and available in a range of dimensions.

Several suppliers also provide acoustic plywood sheets, which are reassuringly expensive but very effective, and are now becoming more used widely in housebuilding. The central filling of this ply is usually a dense, lead-impregnated rubber which deadens sound between decks.



A cross section of a typical floating floor. The plywood's built-in sound barrier can be clearly seen, and neighbouring sheets have been joined with a rebate to ensure no sound gaps. The whole thing rests on a bed of blue Silomar foam



The deckhead linings of a superyacht can float too. Here's a rubber mounting plate for a suspended ceiling on a 150ft Sunseeker. Note the lack of bolts holding it up – a powerful adhesive is used instead. Decorative panels will be attached to the grey wooden beams using plastic clips

THE PBO SOLUTION

Raw materials, while potentially a little costly, won't be needed in any great quantity. Keep your closed cell foam strips to just a few millimetres thick, otherwise a raised sole means you'll lose valuable headroom.

Companies such as Seals Direct or Polymax can also supply closed cell foam strips made from Neoprene up to 75mm wide and 5mm thick.

RIGHT Discovery yachts has solved the potential problem of rattling soleboards by bonding a thick rubber sheet to the underside

BELOW A locking mechanism holds the board firmly down to make a good seal. The rubber not only removes any rattles, it also acts as a shock absorber for heavy footfalls, and as an additional acoustic barrier



Smoothing out rolling motion

Large motoryachts are nearly always stabilised, particularly superyachts, where stabilisation is fitted as standard. Historic vessel refits can also lean towards a bit of extra stabilisation. 'Well, they would have put it in had it been available...' is the reasoning.

Most stabilisation systems use a set of underwater fins that protrude from the bilge area. A computer predicts the degree of roll via sensors and deploys a counterforce through the fins to dampen it down. The stabilisers themselves are so responsive that they also work at zero speed, so twitch back and forth when the yacht is at anchor – though they have been known to slap a passing swimmer.



Hydraulic or electric motors power the fins, but another system known as Seakeeper uses an internal gyro-stabiliser.

While some of us will enjoy the rough and tumble when

under way, we usually prefer to be relatively stable at anchor. Superyacht charter guests paying upwards of £100,000 for a week afloat demand the least movement possible.



LEFT Even historic motoryachts are being retrofitted with stabiliser fins... **ABOVE** On modern superyachts they come as standard, often in multiple sets

HOW SUPERYACHTS DO IT

Several companies serve the superyacht market, and many will be brands you will recognize. Sleipner, well known for its Sidepower thrusters, is one key player, and Italian-based CMC is another. The latter is bringing fin stabilisation to much smaller boats by using electric motors instead of hydraulics. Seakeeper is another brand now also available to the sub-superyacht market, although all these installations are still many thousands of pounds. However, they allow a boat to extend its cruising range by having a more relaxed crew, and are increasingly energy-efficient.



This 24ft White Shark tender is fitted with the Seakeeper 2, currently the smallest gyro stabiliser available, but the mothership can run several of the larger units in tandem, each flywheel weighing up to four tons a piece



Inside this sphere a gyro spins at 1,500rpm, with a tolerance of a few thousands of an inch. It takes 20 minutes to spool up, and 6 hours to run down



Here's what the internal workings of a stabiliser fin look like. These react very quickly to a roll, even when the yacht is stationary, but cost tens of thousands to install

THE PBO SOLUTION

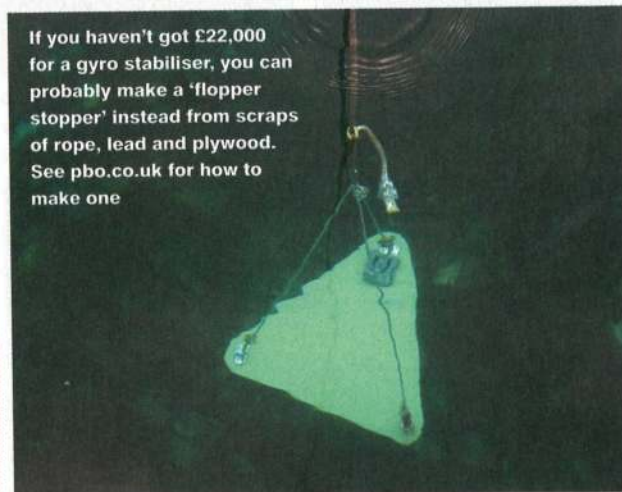
If you have a spare £22,000, you could buy the smallest of the Seakeeper gyro stabilisers. This remarkably compact unit runs off 12V, and a quiet electric motor spins the gyro at 500rpm in a vacuum. As PBO discovered, it really does almost eliminate the roll, replacing it with a suppressed bobbing motion instead.

Gyro's and fins aside, there are many ways to make your boat more stable both underway and at anchor. First, bring the weight out of the ends

as much as possible by stowing the anchor chain further aft, as this will reduce the pitching motion. At anchor, a simple flopper-stopper will dampen rolling. Also, rig a small staysail aft to keep your boat pointed into the wind at anchor.

On a motorboat, reduce top hamper as much as possible to lower the centre of gravity. Motorboats can also use trim tabs and power trim to bring the nose down and counteract any lean into the wind for a smoother ride.

If you haven't got £22,000 for a gyro stabiliser, you can probably make a 'flopper stopper' instead from scraps of rope, lead and plywood. See pbo.co.uk for how to make one



Andrew Simpson

Adding onboard air conditioning

On a visit to the superyacht yards in Florida I noticed that virtually every yacht under refit had large air conditioning ducts being fed aboard. A worker told me ruefully that Florida only became habitable when aircon was invented. Outside, the humidity is exhausting.

Aircon is not an option on a superyacht – it comes as standard, usually from cold water chillers in the engine room. The HVAC systems will be configured so the vents and grills form part of the décor, with the cold air 'falling' from

overhead ducts. Displaced warm air is sucked in at the sole level, and push out warm air when in heating mode.

With high start-up loads, HVAC systems are still power hungry when running, but technology has allowed them to be zoned for day and night operation. Only those sleeping cabins with occupants receive cold air, for example. A system from Dometic allows the chillers to work normally for just 10% of normal power use, allowing the HVAC to run silently on batteries overnight.



A portable aircon unit being deployed in Florida during refitting of a yacht. Without the yacht's own system in action, working below in this dark-hulled vessel would be uncomfortably hot

HOW SUPERYACHTS DO IT

'You'll never see anyone waving out of a superyacht window,' says the blogger for Coastal Climate Control.

'That's because superyacht windows don't open. The crew rely on a highly sophisticated HVAC system instead.'

The yacht is actually built around its HVAC system, with banks of chillers in the engine room pumping cold water to

distribution hubs, which blow air across the radiators and catch and remove any condensation.

Companies like Dometic, Penguin Refrigeration, Fischer Panda, Aquaair and Waeco provide the chillers and installation kits, and their expertise filters down to the likes of us at the smaller end of the boating market.



A bank of chillers serving a large motoryacht. Each chiller is assigned to an area of the yacht, much as in a hotel ashore. The temperature can be set locally on a bulkhead thermostat



An HVAC distribution hub set into the deckhead of a superyacht. The entire network can be centrally controlled by the skipper, cooling only those areas that are in use

THE PBO SOLUTION

Air conditioning on small yachts has now become very affordable, costs partly driven down by the automotive market where almost all modern cars now have AC built in.

A small, fixed unit suitable for a 25-35ft boat can be installed in the main cabin or sleeping area providing there is some spare locker space and a handy condensation drain point. Power can come from shorepower, a genset or inverter via renewables.

For a temporary mains-powered solution, Cruiseair Dometic's Carry-On 7020 is designed to fit in a standard



Transcool's evaporative air cooler runs on 12V or 24V as well as mains

boat hatch, and run on shore power (or the boat's 240V if you have it). Other boat owners simply use a household stand-alone unit when in port.

Small 12V or 24V portable units are available which run air over a reservoir of water for a cooling effect, one example



Other ways to keep a boat cool are to fit reflective film to the windows...

being the Australian Transcool which runs almost silently off battery power consuming just 1A. It costs around £350 and is made from GFR and marine grade stainless steel.

Cheaper still are simple hacks to keep the boat cool naturally. These include putting



... and use a sunshade, even if it is just an old sail that's been rigged up to do the job

reflective film over the windows, installing window blinds, adding large tents or adapting sails, fitting a lot of fans, and having temporary hatch covers to reflect the heat.

And don't forget all that lovely superyacht insulation. That will help keep the boat cool too.

ABOUT THE AUTHOR

Former PBO Practical's Editor Jake Kavanagh now travels widely to watch superyachts being built all over the world. Many of the ideas he has discovered he

is transplanting to his own 40ft concrete boat, which he saved from becoming an artificial reef. He's trying to make her look like a Halberg-Rassy.



NEXT MONTH

Bling her up! How to fit fashionable items ranging from glowing doorknobs to audio visual systems hidden inside mirrors. Outlandish ideas, or remarkably practical innovations?