The architecture of dreams

Paul Shallcross on the exclusive tastes of yacht owners, the future of propulsion systems and the globalization of the yacht market.
There’s a smell of salt and sea water on the breeze. Seagulls are circling overhead, apparently glad to see a little pale sunlight peeking through the clouds. People are still wearing thick winter coats but the first of the street cafes have already opened. Spring is in the air. And not only that – there is something else on the wind in the southern English city of Southampton – seafaring. The port has seven harbours. From small leisure-craft marinas to gigantic container ports, they can all be found here. It is hard to believe that one of the most disastrous voyages in maritime history started out from here – in 1912 the famous Titanic set sail from Southampton on her maiden voyage to New York but never arrived at her destination. A museum dedicated to her memory is currently under construction. After all, this port on England’s south coast is better known for many more successful episodes in seafaring history. The Southampton Boat Show draws hundreds of thousands of yacht enthusiasts to southern England every September. The British yacht-builder Sunseeker has its headquarters not far from Southampton. And many yacht designers and marine architects like to be close to the luxury yacht scene. Like Paul Shallcross, an engineer for the marine design consultants, BMT Nigel Gee. In this interview, he explains what makes yacht-building so special, mentions some of the exclusive special requests he has been able to grant his clients, and why he himself would rather have a small sailing boat than a large motor yacht.

Deck-top swimming pools and helipads are now almost a standard feature on megayachts. So where do standard specifications end and exclusivity begin?

Paul Shallcross: That’s a difficult question because, actually, almost anything you can build is possible. But swimming pools can be a major challenge even though they may appear simple. Owners want larger and more extravagant pools on boats, and these are always challenging, both structurally and in terms of vessel stability. Helipads are very often requested too. But legislation has been developed and enforced in recent years that makes it very difficult to achieve compliant helicopter pads on all but the largest yachts. Generally at the start of a project, the client comes to us with a long wish list. We try to satisfy as many of those wishes as we can, but some things just can’t be done. So, over the course of developing the yacht, the list gets shortened and we have to find compromises as a team. It’s an exciting period in which we are always pushing the boundaries. The designers are always coming up with new ideas for what else can be done and we constantly have to find new ways of making those wishes a reality.

Are there any particularly spectacular requests from yacht owners you can tell us about?

Paul Shallcross: Oh, there are certainly a few crazy requests: tennis courts, real palm trees, and sandy beaches that you can fold out. We have even been asked for titanium waterjets. And there was one that wanted to radically alter the concept of a diesel engine. Nevertheless, our
clients are always trying to push the limits of what’s possible;

Bigger, faster, more exclusive – that appears to be the mantra in yacht-building at present. There are rumours that the first 200-meter yacht is already under construction. When do you think the first 250-meter yacht will be unveiled?

Paul Shallcross: It’s unquestionably only a matter of time, because there are always yacht owners for whom bigger means better. The game of “who owns the biggest yacht in the world?” is definitely not over yet. But big yachts do have a disadvantage – you are hardly aware of being on the water. I call it the “cruise liner syndrome”. Many of our clients want to feel close to the sea, and even like to get wet now and again. For that, they will demand smaller yachts. Also, larger yachts carry the disadvantage that they can’t get into some of the shallower and more stunning anchorages which will put off some clients.

Paul Shallcross should know. He went to sea for six years himself, working as captain and chief engineer on various sailing yachts. He still talks in raptures of his trips to the Seychelles. Bruce Phillips listens in fascination whenever he does. He is a member of the sales team at MTU and so often in contact with Paul Shallcross.

Bruce Phillips: The bigger the yacht, the more powerful the propulsion system has to be, of course. I’m thinking here about gas turbines, which in combination with diesel engines offer vast power reserves at the same time as fuel-efficiency. On long-distance trips or at low speeds the diesel engines operate alone. But when you want to go faster, the gas turbines are brought into play. For all those systems, MTU produces complete packages consisting of propulsion units and automation systems custom-designed for the specific requirements.

Are there fashion trends in the yacht market? What did yachts look like 10 years ago compared to today? And what will yachts look like in 10 years’ time?

Paul Shallcross: Well we can certainly say that the trend is for yachts to get bigger and bigger. A medium-sized yacht today is much larger than ten years ago. But I would describe development as evolutionary rather than revolutionary. Yacht owners do want their vessels to be unique, but this is often through evolution rather than revolution. Modern vessels are more organic than vessels from ten years ago. It’s really in respect of “toys”, like swimming pools, health spas or helipads, that clients tend to push the boundaries.

Does the famous design principle of “form follows function” also apply to yacht building or does the reverse apply in this business?
Paul Shallcross: As an engineer, I would prefer form to follow function, of course. That's the way it is in the engine room of a yacht. We just finished working on the detail engineering and build support for a 85-meter yacht and the engine room is a work of art, at least I think so! But in general of course, the designers provide the form and we have to develop the function around it. If I developed a completely functional design, it would look rather unappealing except maybe to mechanical engineers! One thing is clear to the designers, however – the form must also have a function. What makes every yacht unique is that the design, and thus the way that the function is achieved, is always different.

Who sets the trends in the yacht business? Is it the clients who ultimately own the yachts, you as a consultant who develops the yacht, or the shipyards that actually build it?

Paul Shallcross: Admittedly it is the designers who force us to go beyond conventional boundaries. We have a lot of ideas too, but we can’t always put them into practice as they might not fit the project budgets and timescales, or don’t fit the desired design.

And what role will diesel engines play in the future?

Paul Shallcross: Undoubtedly a very important one. The diesel engine will continue to be the power unit in greatest demand. Of course, there are alternatives like LNG. But there is a long way to go before we get there.

How important is fuel consumption to yacht owners? Is it something you consider?

Paul Shallcross: Running costs are not something the yacht owners have traditionally considered. In older projects fuel consumption was given and tank capacity was set to achieve a certain range. Clearly, increases in bunker price will drive clients to take a greater interest in vessel running costs. Now we see more clients taking an active interest in fuel efficiency, we work with the client to understand their criteria as load profiles are rather difficult to develop for a yacht. We are working on a number of diesel mechanical and hybrid designs where the design is being optimised for fuel consumption against numerous criteria to develop a robust system for the client.

At this point, Bruce Phillips intervenes in the conversation again. He knows all about highly fuel-efficient MTU propulsion systems which, by combining multiple diesel engines, diesel engines and electric motors, or diesel engines and gas turbines, are able to utilise the power of the diesel engine to optimum effect (see box).

Bruce Phillips: There are propulsion systems available which can substantially reduce the fuel consumption of yachts. One example is the combination of four diesel engines transmitting their power through two multi-engine gearboxes. At full power, all the engines are in use, whereas at normal speeds, the captain can shut off one engine per gearbox. In that way, the engines are not constantly being driven at low to medium power, when they use disproportionately more fuel than at full power. That is because the engines are generally tuned for top speed, which is only used for five percent of the time, however. The other 95 percent of the time, the engine is running below full power. And that offers an outstanding opportunity to utilise the propulsion system as efficiently as possible.

Paul Shallcross: Some of the propulsion systems we are now working on are rather sophisticated CODAE arrangements, which are clearly more complicated and expensive to install but suit our clients and their criteria.

Is “green technology”, in other words emissions, an issue in yacht-building?

Paul Shallcross: Being “green” is always an issue. Yachts often anchor in the most beautiful parts of the world, and of course, the yacht owners want these places to remain unspoilt. While many systems to control emissions (black water, garbage, ballast water) are or will be mandated soon, we do see a number of clients trying to exceed mandated levels as part of their environmental responsibility. Many yachts already have soot separation systems on their engines and generators to prevent black smoke and oily residues coming from their yacht. We are working with yards who are actively seeking...

... It’s hard to tell that you are actually afloat.
to develop products that are clearly at the leading edge in terms of green yacht design.

From 2016, the issue of being “green” will no longer simply be a question of image. That is when the IMO Stage 3 emission standards come into force and the limits for nitrogen oxide emissions in particular will be tightened dramatically. It may well be that engines will not manage without exhaust treatment systems from then on. How are you preparing for that?

Paul Shallcross: I am in constant contact with the engine manufacturers, including MTU, to find out what direction things are moving in. As yet the issue is not so high on the agenda in the yacht-making business, as the new regulations don’t come into force until 2016. It does not affect any yachts launched before the end of 2015.

But we are already working on Tier 3 compliant designs for a few clients. I am already advising my clients to allow enough space for an SCR system. Of course, it is a disadvantage, especially for smaller yachts, because additional space is required for the SCR system and Urea tankage. That is why we are all hoping that the engine producers will manage to optimise the engines so that they don’t require exhaust treatment systems. That will mean that the space that we are now planning for will be free for other uses again. But that is better than the other way around.

If you could build a propulsion system that complies with IMO Stage 3 without having to think about technical feasibility, what would it look like?

Paul Shallcross: My propulsion system would be as close to CO₂ neutral as possible, extremely efficient, easy to maintain, virtually inaudible, and of course wouldn’t have an exhaust treatment system. A while ago I saw an interesting green concept, it was a yacht with an algae bioreactor that uses the CO₂ produced by a fuel cell and sunlight to make biodiesel from the algae. Isn’t that a brilliant idea? The US Navy recently mixed algae biodiesel with conventional diesel fuel and used it to run a ship. Although, I think a gallon costs 450 US dollars. The price of marine fuel would have to rise dramatically before that solution conquers the world. (Laughs)

Southampton is an Eldorado for yachting enthusiasts. The city has seven marinas and every year the “Southampton Boat Show” attracts hundreds of thousands of yachting fans to the south of England.

“My yacht would be small and would have a sail,” said Paul Shallcross who was skipper on a yacht for many years.

Bruce Phillips and Paul Shallcross get into a discussion on the future of propulsion systems. They have even seen container ships with sails. Both are convinced that LNG fuel will become an important factor. But not before the problems of worldwide availability have been solved. As yet, LNG is not obtainable everywhere and, in contrast with high-speed ferries, yachts do not ply fixed routes and so cannot plan in the same way where and when they will be able to refuel.
In the heart of Southampton, the Ocean Marina has berths for 375 vessels.
Paul Shallcross always draws the designs for his propulsion systems by hand. “It gives me time to think about what I’m doing,” he said. The details are then refined during discussions with his colleagues.
What are the things that matter most to you personally when you plan a yacht?

Paul Shallcross: The most important thing to me is that the client is pleased with the final result. I am often involved from the conception of a yacht and follow it over a number of years – from the initial idea through the design and detailed planning to construction and hand-over. So it inevitably becomes an important part of my life. When that part of my life is over, it’s a shame of course, but there’s nothing more rewarding than seeing the delight and excitement of a client, the first time they sail their yacht. We work very hard for that.

Until now, the yacht market has been firmly in European hands. The biggest megayachts have been made in Germany, Italy and the UK. But now there are big shipyards being built in Turkey and Asia. How will the market develop in future?

Paul Shallcross: There are already a number of big shipyards in Turkey. There is a 144-meter sailing yacht being built there right now. And in Asia the market is growing and there are a number of yacht-builders working hard to reach European standards. One of my colleagues was in Asia not long ago and visited some of the shipyards. Some are really well on their way but others are not. But those that have succeeded have had to invest massively. At the minute the high quality equipment still comes from Europe and this will make it difficult to build quality vessels cost competitively elsewhere.

And where will the future yacht buyers come from? Still from the Middle East or from Russia?

Paul Shallcross: We still see Europe and North America as important sources of clients as well as Russia and the Middle East. Of course wealth is increasing in other areas of the world, but the key markets will be those where a culture and tradition of sailing drives the desire for people to own a yacht.

One last question: what would the yacht you would build for yourself look like?

Paul Shallcross: The terrible thing is, I know what these things cost. (Laughs). But seriously, I love feeling the closeness of the water. My yacht would be small and have a sail.

Interview: Lucie Dammann
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Gas turbine as part of the propulsion system

Propulsion systems that combine diesel engines with gas turbines or electric motors utilise the benefits all power units to best effect. They all have one thing in common – they reduce fuel consumption and extend the engine servicing intervals. A distinction is made between combinations of multiple diesel engines, combinations of diesel engines with electric motors and combinations of diesel engines with gas turbines. MTU supplies not only the individual components including gearboxes but also the overall control systems.

CODAD: Combined Diesel and Diesel
Four diesel engines drive two propellers via two multi-engine gearboxes. At high speeds, all the engines are in use, whereas at normal speeds, the captain can shut off one engine per gearbox. In that way, the engines are not constantly being driven at low to medium power, when they use disproportionately more fuel than at full power. That is because the engines are generally tuned for top speed, which is only used for five percent of the time, however.

CODAE: Combined Diesel and Electric
Another variation is the combination of a diesel engine and an electric motor. The two units transmit their power through a shared multi-engine gearbox under the direction of an overall control system. At normal speeds, the power is delivered by the engine, which the system runs at the output it is actually designed for. That may often be more than the yacht requires for the speed it is travelling. The surplus power is then fed back into the electric motor through the multi-engine gearbox. In that mode it operates as a generator and feeds the electricity into the onboard electrical system.

CODOG: Combined Diesel or Gas
Two diesel engines and two gas turbines alternately drive two controllable-pitch propellers via two main gearboxes. The gas turbines are connected via self-synchronising clutches. On long-distance trips or at low speeds the significantly more economical diesel engines operate alone, while the gas turbine is kept in reserve for the highest speeds.

CODAG: Combined Diesel and Gas
The propellers are driven by two diesel engines and a gas turbine via two main gearboxes and one cross-connect gearbox. If only one of the diesel engines or the gas turbine is running, the drive is divided evenly between the two propellers by the cross-connect gearbox. If both diesel engines are in operation, the CCG can be disengaged.