Shaped **by ice**

There's a difference between ice and ice – it's not always the same thing

CAPT DUKE SNIDER explains: "One of the fallacies is that ice is just ice, the only difference being the thickness – but Baltic is mostly first year ice, while polar ice is multi-year, heavier and far more dense."

Likewise, explains Gisbert de Jong, this means that taking local effects into account opens up unexpected ways to shape a support vessel's build to its particular environment.

"While rules and regulations take design parameters as a given, those profiles are quite broad, not site-specific," says Mr de Jong. "For example, salinity, along with temperature, differs. If you take off the salinity, the ice becomes weaker." He adds, each geographical area is characterised by its own ice types, ice conditions and, consequently, ice collision scenarios.

Bureau Veritas has been involved for a while in the development of first principle strength assessment methods for ice-hull interaction, allowing novel designs to be analysed, as well as stern-first ice operations.

So, for offshore support boat builds destined for the Baltic, Bureau Veritas firstly enacted tank-replicated ice destruction tests on different thicknesses.

"This not only gave us the strengthening needed on the hulls, it also gave a way to put figures to the power – after all, one thing is withstanding the ice – another is being able to move through it." He adds: "If you take a closer look at exactly what kind of ice you are dealing with you can decide on operational parameters for the power onboard and even calculate the specific speeds."

This leads neatly to the subject of propulsion systems. Capt Duke Snider explains that podded drives have proven themselves incredibly valuable in the Baltic and Caspian seas, yielding high manoeuvrability and, more importantly, breaking open paths in the ice much wider than the breadth of the ship.

However, the Arctic is a very different game, and he describes himself this minute as "still being one of the sceptics", adding that as yet, there are "still some unknowns" to deal with.

"There hasn't yet been so much experience of using podded propulsion on heavy, multiyear ice – or the survivability of these systems on being struck by a 10 tonne piece of multi-year or glacial ice," he says.

Despite this, he thinks that time will tell: "There are indications that when podded propulsion has proven its resilience to impact, we will see a new generation of polar ships utilising the pods ability to turn around and drive the vessel stern first into the ice."

He concludes, "I think we will be seeing more ships where the bow is optimised for open water while the stern is used for icebreaking, not least because most icebreaking designs are really inefficient in normal seas." By STEVIE KNIGHT

Icebergs in the High Arctic

Evolution in **cold water**

There will be a pressure on Ice-class OSVs in the future that won't just come from the ice itself. **Stevie Knight** investigates

The Arctic is set to become a focus for oil and gas exploration, and the change in arena will, says Gisbert de Jong of Bureau Veritas, result in an evolution of specific ice-class support vessels.

While operations will need heavy duty icebreakers to assist the exploration vessels, they simply can't do it all by themselves and it can't be avoided that their services are sometimes in short supply. Further, visiting tankers may also need assistance, as they are generally of a lower ice class and might not be able to take on a transit unassisted.

"So, it makes sense to use high ice-class OSVs that can operate as independently as possible, and even occasionally help other vessels," says Mr de Jong. Captain Duke Snider, CEO of Martech Polar Consulting explains that the necessary capability will "drive up the game across the board" leading to a rise, not just hull strength, but also sheer power for all concerned.

Further, since drill ships may well face seasonal issues there are questions to answer about how you deal with heavy sea ice or icebergs floating towards you: you have a couple of options. The first is to move the drill ship and return when it's passed. Certainly that is the only option with the large ice floes which can be truly massive – for example, there is a 270km^2 piece of ice that's just calved from the Pine Island Glacier (PIG). The ability of the high North to produce such scenarios does mean a number of support vessels are needed on hand to tow any drilling units right away from the danger zone – although there is usually quite a lot of warning with this scale of event. However, lesser icebergs can still present a big challenge and the ice itself can be as hard as concrete.

Capt Snider points out that although sea ice is regularly broken up into manageable chunks by an icebreaker, this action is virtually impossible due on icebergs to their density and strength. Glacial ice (icebergs, bergy bits and growlers) are either avoided completely or if small enough maybe towed clear of a drill platform.

But this 'towing away' option, says Mr de Jong may itself be challenging. Even if it is of the right scale for such a manoeuvre, you have to get a tow line onto it which is itself is problematic, "after all, you don't have anyone to catch the rope". Certainly it's going to be a whole new challenge for the coming breed of ice-class OSVs to consider.

However he believes that subsea processing will become more and more interesting as if all the equipment is underwater, you don't have to worry too much about the ice. So, instead of fuel supply and anchor handling, the vessels in the support role will edge further into being subsea construction and maintenance vessels, more able to handle large modules with large knuckleboom cranes and A frames, big moonpools and towers, alongside a greater personnel requirement.

Obviously this means more vessels with more and larger equipment, and it could get expensive. However, Mr de Jong says: "One way to keep the costs down is not to build just one, but to build ten or even 20 on the same multipurpose design platform, with all the fittings ready to be connected, for example, the foundation for deepwater cranes already in place." He adds if this sounds familiar, it is: it's already a trend you can see in other deepwater locations, with companies like Bourbon taking advantage of the flexibility this gives.

Following a **tough act**

Both physical and legislative challenges have come together to give rise to the first LNG icebreaker, writes **Stevie Knight**

TIME IS OF the essence when it comes to ice, and the larger icebreakers are in demand as they can keep a high assistance speed, shortening the waiting times in severe winter conditions – a necessity when the weather can close in.

But despite the conditions, these ships also have to be long lived: the new icebreaker presently being built at the Arctech Helsinki Shipyard will have an expected life of 50 years. It will be a true workhorse, although, as Arctech Helsinki's MD Esko Mustamäki says, "it will also be unique".

The aim of the Aker Arctic design is to push the aging Finnish icebreaker fleet into the 21st century and forestall a decrease in capacity; however, Mika Hovilainen of Aker Arctic explains that even though 40 years old, these older icebreakers (operated by Arctia Shipping) are a tough act to follow and the new design, a first for the Finnish Transport Agency, has to be "at least as capable".

The specification for this new vessel is for a minimum 16 knots capability in open water plus the ability to break a 25m wide channel in 1.2m ice while keeping up a steady pace of 6 knots with assistance speeds still being somewhere between 9 and 11 knots.

It is easy to say, but this is quite something when you consider the conditions: Mr Hovilainen explains that the icebreaker will have to cope with the Baltic Sea and Bay of Bothnia: "Here the prevailing winds push heavy ridges of ice up against the coastline, these are often around 8m deep but they can reach up to 15m or 20m."

So, the vessel has been designed for both stern-first and bow-first ice entry as it will often be engaged in contact towing operations. Underneath this new vessel will have not just two azimuthing propellers, but three, one in the bow and two aft which will add a great degree of manoeuvrability plus "allowing the bow-mounted propeller to act like a milling machine, drilling into the ridged ice".

The hull also has to be strengthened against nipping and designed to minimise resistance, having a short parallel section at the sides to lower the huge friction forces inherent in ice transits.

However, while the lines of traditional icebreaker tend to make them susceptible to rolling and slamming, this vessel will be also be used for emergency tows in all kinds of open water conditions as well as oil spill response operations in up to 2m significant wave height. So, it was necessary to design the hull with a reduced flare above the water line, giving the bow a distinctive shape. This, along with passive antiroll tanks, results in much better seakeeping abilities.

VOTE OF CONFIDENCE

Giving it the power will be around 21 MW of dual fuel engines, which diminishes the vessel's emissions and operating costs. Mr Mustamäki explains it's the very first application on an icebreaker like this – and although there are at the moment few LNG bunkering points in Finland, this vote of confidence in the ability of gas to meet the new levels of environmental concern may just help tip the argument in favour of more gas filling stations.

The draught of the vessel with full fuel tanks was also kept to a maximum 8m. Mr Mustamäki points out that this helps the vessel both with restricted channel depths and also with the ship's ability to get in and out of some of the Finnish ports it may be called to serve.

However, although the new vessel remains a unique for now, there is a very good chance that orders for renewing the rest of the fleet of seven will follow over the next few years.

PHOTO FTA

Finnish Transport Agency vessel