

Arctic shipping's ice load monitoring to increase

Last year, Russia's Northern Sea Route (NSR) posted its busiest navigation season. Technical Editor, Ian Cochran looks at the risks involved.

Total traffic reached 33.5 mill tonnes by mid-December and was expected to exceed 34 mill tonnes by the end of the month, compared to 33 mill tonnes in 2020 - a rise of 350% over the past five years.

Due to Russia's huge Arctic oil and gas growth, today LNGCs and tankers make up the majority of the NSR's traffic.

Russia is planning to achieve annual traffic of 80 mill tonnes by 2024 and, according to the Kremlin's recently adopted Arctic Strategy, shipments along the NSR will reach 90 mill tonnes by 2030 and 130 mill by 2035.

A warming Arctic is opening up new economic opportunities in the region, as the average ice cover retreats and the average ice thickness declines.

However, these high latitudes still hold unique risks for shipping, as shown by the sudden icing along the NSR in late November last year.

To counter the risk, one company offering ice load monitoring equipment is Oslo-based Light Structures (LS).

LS recently won an order from Samsung Heavy Industries (SHI) to deliver comprehensive ice load monitoring systems for 10 Arctic LNGCs building at Zvezda, in co-operation with SHI, to be operated by Sovcomflot (SCF).

The first of the next generation 172,600 cu m Arc7s was due to be delivered before the end of last year, with six more due in 2022 and the final three in 2023.

Using LNG as a primary fuel, each vessel will produce 45 MW of power, comparable to that of a nuclear

icebreaker, to 2.1 m thick in temperatures down to minus 52 deg C.

Operating in such extreme conditions, the Arc7s will be subject to powerful dynamic forces that could potentially impact hull integrity and operational safety, but with LS' patented SENSFIB system on board providing uninterrupted real-time ice load monitoring and alerting, the Masters and navigators can make informed decisions based on live structural stress data, the company claimed.

SENSFIB has already been proven on Arctic routes, following its installation on the first icebreaking Arc7, 'Christophe de Margerie'.

The systems fibre optics technology is based on Fiber Bragg Grating (FBG), a solution that delivers more accurate data while reducing cost and complexity when compared to less resilient electro-mechanical systems.

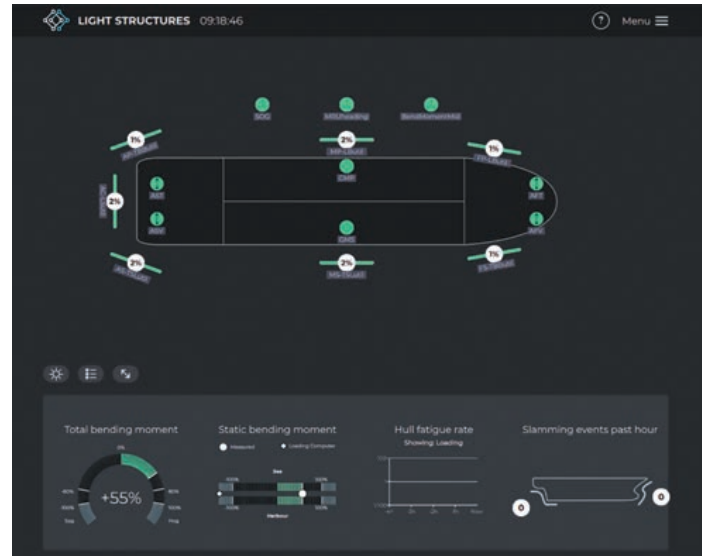
Uniquely, SENSFIB sensors are installed using an adhesive, negating the need for any welding and with no moving parts, users can save the cost of annual recalibration required by electro-mechanical systems. LS' solution is also EX and ATEX approved, making the system suited to hazardous environments, such as those found on LNGCs.

"We're delighted to receive such an extensive order for our SENSFIB ice-load monitoring technology, especially as it reflects the long-standing and positive working partnership we have with SHI," said Niklas Hallgren, LS' CEO. "The contract also shows that leading shipyards and owners are willing to invest in precision structural stress monitoring

due to safety and operational advantages, despite the lack of any regulations forcing the use of such technology."

Arctic LNG 2

In conversation with LS' CCO, Terje Sannerud, *LNG Journal* was told that the newbuildings will make up the majority of the fleet needed to transport NOVATEK's Arctic LNG 2 project's gas through the



SENSFIB's capabilities can clearly be seen in this screenshot

NSR, including the eastern part, all year round from 2023 onwards.

Despite their size, there is no official regulation that mandates the installation of ice load monitoring systems on these ships, or indeed any other vessels, the company said.

All of the major classification societies provide guidance on how to arrange ice load monitoring sensors, however they leave the scope of monitoring to the owner or operator in collaboration with hull designers and equipment suppliers.

"In this context, we have created a customised solution for Arc7 vessels to provide warnings and critical decision support information to provide operational safety during ice navigation under even the most extreme conditions," Sannerud said.

He also explained that the company can deliver systems for all ice load monitoring levels. This depends on rules and regulations of which there are little, class notation and just as important, the owner's expectations.

"We always ask, 'what do you want to monitor' before we start to customise a system for any type of vessel," Sannerud explained.

"We have proven our technology and solutions within ice load monitoring for a decade with a good number of deliveries. We expect a higher demand for Light Structures proprietary technology and

solutions, due to our specialist experience in combination with maritime Arctic operations.

"We also see the potential for a strong retrofit market, considering that our use of fibre optics means that SENSFIB systems are extremely easy to install, without the need for any welding at all," he added.

LS was founded in 2001 as a spin-off from the Norwegian Defence Research Establishment and is now established as a leading provider of turnkey fibre optic stress and fatigue monitoring systems based on FBG technology.

More than 300 SENSFIB systems have been installed globally for different applications, vessels and customers. The SENSFIB range includes diverse solutions that can be customised for specific applications, such as hull stress monitoring, FPSO monitoring, ice load monitoring, sloshing monitoring, plus the customised HullInfo application.

In addition to real-time operational data for decision support on board, the system also provides data for active fatigue management reports, which can contribute to reducing operating costs and extending a vessel's lifetime.

Data from the systems is available on dedicated user terminals, through integrated automation and control systems, and as part of IoT networks and cloud-based operational platforms. ■

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icebreaker, to break ice up