

Automated shipping coming to Europe's waters

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Automated or semi-automated shipping, which requires fewer people aboard vessels, could help expand the capacity of Europe's shipping industry. Credit: Kongsberg Maritime

Moving more goods by water could reduce pressure on roads and cut emissions, yet Europe's shipping industry is held back by labour shortages. Automated shipping—which would work in a similar way to self-driving cars—could help expand capacity but safety and regulatory

hurdles remain.

Imagine a ship sailing into port, only with no captain on the bridge, and nobody to be seen on board. In the past such a vessel might have been known as a ghost ship, but in the future it might just be our new normal.

European researchers are participating in this push and designing ships with varying degrees of autonomy. Two ships bound for automation already sail across Europe today. The first is a carrier that delivers fish feed along the west coast of Norway. The second is an inland cargo barge that operates in Flanders, the northern region of Belgium. Both are to be retrofitted for autonomous sailing as part of a project called [AUTOSHIP](#).

"The use-cases are very different," said Jason McFarlane, Research & Innovation Manager at the Norwegian company Kongsberg Maritime, a participant in AUTOSHIP. "One is a short sea route off Norway, which has significant weather challenges. The inland route, in turn, requires the ship to operate in a confined waterway, often in areas where navigation is more challenging than in open seas."

Three parts

The technology that will make these boats autonomous is composed of three main parts. "First you have the vessel control systems," said McFarlane. "Second there is digital connectivity from vessel to shore. And finally you have the shore-based systems."

The first part is what makes the ships sail autonomously. This includes the sub-systems for situational awareness, such as sensors, positioning systems or cameras and other technologies that enable detection of obstacles. The data from these sensors is then joined together, something called sensor fusion, and feeds back into the ship's autonomous

navigation system which makes steering decisions based on it.

It's similar to self-driving cars in terms of scanning surroundings and detecting obstacles using AI-based computer vision systems. But there are differences too. McFarlane for example notes how every ship over a certain size is tracked using a transponder under a system called Automatic identification system (AIS), which potentially provides more information to vessel autonomous navigation systems than is available for cars. Ships on the open sea also go slower and have more space to manoeuvre than cars.

Two systems Kongsberg Maritime has developed are auto berthing and auto crossing. "Essentially the crew press a button, and the ship will dock," said McFarlane. "A range of sensors, that, for example, know the position or orientation of the boat, interact with our system. That allows the ship to dock without a captain on board."

For now, the crew is still on the vessel and can take action if they see a problem. The automatic system is installed on a passenger and car ferry operating in the Oslofjord and has been used in more than 80% of voyages. Yet even when a ship that uses this technology is fully uncrewed it would still be connected to a control centre on shore. Here, humans would remotely monitor the ships and its sensors, and be able to take over control manually.

Costs

McFarlane says there are several reasons to automate shipping. One is to increase the attractiveness of water-based transport, where labour can often be a significant proportion of operating costs. Another is to reduce road traffic and cut emissions. McFarlane notes that one barge, like the one they are testing in Flanders, can carry 300 tons of cargo which would replace 7,500 truck journeys per year. According to calculations from

AUTOSHIP, this would reduce CO₂ emissions per km by 90%. McFarlane says that automated ships could also sail more efficiently than if they had human operators, optimising for engine power and speed.

Nevertheless full autonomy isn't always the first step, and intermediate levels of automation might reach us before we go fully uncrewed. The [NOVIMAR](#) project works on 'platooning' for inland and short-sea transport, where a partly automated ship follows a fully crewed leader vessel.

"We don't sail fully autonomously," said Danitsja van Heusden-van Winden, project coordinator of NOVIMAR and innovation manager at the Dutch company Netherlands Maritime Technology. "For now there's always at least one person on the ship."

In their model, a lead vessel sets out a 'line' or course along a waterway, which is then imitated by the follower vessels. Instead of full autonomy, the follower vessels copy the route the lead ship took, keeping it on the desired path, while maintaining its distance to the next vessel. It's a concept they want to demonstrate at the end of the year in the Netherlands, and which they already tested using one-sixteenth-scale model ships in a laboratory basin in the German city of Duisburg.

Labour shortage

This partial automation could be important for reducing costs and filling in labour shortages. Instead of having to operate a number of ships with full crews, a company could operate one fully crewed lead ship and a few follower ships with limited staff.

"Labour shortage is a known problem in shipping," said van Heusden-van Winden. "It's hard to find qualified people."

In 2016 BIMCO, the largest association of shipping companies in the world, published [a study](#) which projected that by 2025 there would be a shortage of 150,000 maritime officers worldwide. Automation, whether full autonomy or a partial system like NOVIMAR's, could help fill that gap.

It's also why van Heusden-van Winden argues that NOVIMAR wouldn't deeply impact the prospects of workers in the shipping industry. "Our technology is not a threat to them," she said. "It will probably require workers to become more qualified, but it will also mean that their skills and labour will be utilised more efficiently. '

A study of the social impact is also a part of AUTOSHIP. McFarlane notes that there might be job losses for workers in inland shipping, and even for truck drivers. Yet their technology doesn't always replace workers. In the case of the Norwegian fish-feed carrier, the operating company mainly wants to use autonomous systems for efficiency, for example by allowing crews to rest right before docking and unloading the ship. At the same time new jobs might be created, like retrofitting boats for autonomous operations or controlling them remotely.

"Our boats have a constrained form of autonomy," McFarlane said. "There will always be a control centre. It will mean a shift of jobs. Instead of people living and working on barges, which young people sometimes don't want to do anymore, we can move to office jobs. '

Hurdles

Nevertheless, there are hurdles to overcome before autonomous shipping will be rolled out. "There are risks to having less people on board, which could undermine the business case," said van Heusden-van Winden. A vessel train might be caught in a storm, which might be more dangerous when there's only one person on board instead of a full crew, a problem

for which NOVIMAR is currently searching for solutions.

Regulation equally remains a key issue. Many jurisdictions require a certain amount of people to be on board a vessel, defeating the purpose of automation. Both projects are in touch with regulators. "Some regulations, for example, require ships to have a watch on the bridge," explained McFarlane. "But does that mean a physical person needs to be there? Or can we specify that it doesn't have to be a person standing watch?"

For now both projects are moving full steam ahead. NOVIMAR wants to do a real-life test at the end of 2020. And AUTOSHIP wants to follow with a demonstration of their own in 2022. After these trials, which includes a sea crossing from Norway to Denmark for AUTOSHIP, ships could start becoming more autonomous, although much depends on how fast regulatory changes are implemented. So in a few years ghost ships might be a common sight across European waters.

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