# Ships without skippers

September 8 2014

Autonomous ships, vessels for the future. Credit: Rolls Royce

A 200 metre long vessel moves slowly across the dark sea surface. There is no one at the wheel. It is quiet on the bridge. There are no signs of life in the engine room or on deck. A scene from a horror film or science fiction, perhaps? No. This is the bold aim the EU project MUNIN is working to achieve.

Researchers at MARINTEK believe that in ten to twenty years time there will be 200 metre cargo vessels plying the oceans without the need of a captain or crew. But before this can happen, we will be seeing the technology working on an existing vessel.

The SINTEF company MARINTEK is one of eight partners working intensely to develop systems which can function without human intervention. Both day and night watches will be taken care of by a control centre onshore, and the Norwegian researchers believe that a 3 to 4 Mbit broadband connection will ensure effective communication between the vessel and the control room.

"There aren't many willing to believe it, but if the project partners succeed in overcoming the challenges we are currently working with, vessels such as this will in fact be safer than many of those on the high seas today", says researcher Ørnulf Rødseth. "Human error, solely or in part, is the cause of more than 75 per cent of today's vessel accidents", he says.

## Lower speeds, less fuel

The basis of the project is that merchant shipping in Europe is suffering from the fact that fewer people are interesting in working at sea. It's not an attractive job sitting cooped up in a vessel looking out over the empty ocean for 14 days, and with only limited contact with family and friends. At the same time, the volumes of goods being transport are increasing considerably and the freighters must be crewed. There are more than a hundred thousand merchant ships in operation around the world, and some areas, such as the English Channel, are constantly overcrowded.

Unmanned vessels, looking after themselves, may be the answer to the problem of making the maritime industry more attractive and sustainable. Such ships can reduce speeds, for example from 16 to 11 knots, and in doing so save 50 per cent of the fuel they burn today. CO2 and other emissions will be reduced and the shipping industry will make massive savings due to lower fuel consumption. Currently, fuel represents by far the largest share of operational costs. If the industry can also save on salary expenditures, it will accept that journeys may

take a week or so longer than they do today.

## Prove it's safe – then change the rules

Status monitoring and on-board satellite communications are key to the work currently being carried out by the Norwegian researchers. Ørnulf Rødseth emphasises that it is not their job to build a new vessel.

## What are you going to do then?

"Well, the technology for electronic positioning, satellite communications and anti-collision measures already exists", he says. "Many vessels are also equipped with advanced sensor systems. It is one thing to have the technology, but quite another to bring it all together and demonstrate that it works well enough to satisfy the authorities and the industry", says Rødseth.

"This is why there is a lot of talk about the costs issue, as well as the concerns of shipowners and the general public. We mustn't forget that current rules and legislation all assume that there are PEOPLE ON BOARD", he says.

In order to change the law, researchers will have to demonstrate that safety is as least as good as on existing vessels. For example, even if a sensor system detects an obstacle, the vessel has to be intelligent enough to process the information in order to avoid a collision. Researchers believe that developments such as this will emerge gradually. For example, there will be a transition phase during which it will be safe for crews to sleep at night with the bridge unmanned.

## SINTEF investing 12 million

Even tougher is the requirement that technical equipment on board has to be fully functional for periods of two to three weeks. There will be no-one around to carry out repairs. "This is perhaps our biggest challenge", says Rødseth thoughtfully.

In order to carry through its tasks, SINTEF has invested NOK 12 million of its own funds in a project it has called Seatonomy. MUNIN is one of four projects with the aim of identifying problems and developing methods and tools to provide safe and cost-effective autonomous systems.

"There is a need for safe, inexpensive and more robust autonomous vessels in many of SINTEF's research fields, including aquaculture, the offshore wind and subsea sectors, and in connection with oil and gas production and mineral exploitation. Safety is key across all these fields, and the systems developed must be cost-effective", says Rødseth.

## Many players on the bandwagon

The German research institute Fraunhofer is heading the MUNIN project. Sweden is working on research into the control centre, and Germany on the machinery and navigation. Ireland is looking into the legislative aspects.

There are similar projects taking place in many other places. In its futures report, Det Norske Veritas GL considered autonomous vessels to be a realistic prospect in the longer term.

Rolls Royce has published conceptual sketches for its own autonomous vessel design, and Oskar Levander, who heads Rolls Royce's research activities in this field in Ålesund, believes that a single 'skipper' on land will be able to operate ten vessels.

This idea still appears to be on the drawing board, and Ørnulf Rødseth is confident that the MUNIN project has advanced much further in terms of both technology and analytical work.

## From playful ideas to reality

This is the vessel of the future. And you are allowed to toy around with future trends. Rødseth freely admits that many different and peculiar ideas have appeared on his team's drawing boards. One good example is the use of water jets.

"Large cargo vessels are equipped with a main engine and a reserve engine", he says. "The latter supplies reserve electricity, and is powerful enough to power a water jet which can be used for propulsion and steering if the main engine fails.

Changing the type of fuel is another idea. The heavy oils used today are tar-like dregs. In order to avoid maintenance, autonomous vessels will probably have to run on lighter, more expensive, fuels.

"Less expensive, liquid natural gas might be the answer here", says Rødseth. "But this will involve designing the vessels from scratch".

The research team has to be realistic and design a model which they know is achievable. This means that some of their original ideas have already been discarded. For example, there is nothing to be gained in terms of costs by developing an autonomous system for navigating in and out of port. There will have to be people on board for an hour or two.

## Slowly does it

On longer passages, however, autonomous vessels will be on their own.

## This sounds very strange. Aircraft follow pre-defined corridors based on safety considerations. Will these vessels have to do the same?

"No," says Rødseth. "The major difference being that aircraft travel at 1000 kilometres per hour. We're talking about vessels moving slowly across the open ocean meeting very little in the way of traffic", he says. "Radar will keep an eye on everything going on. The passage will be adapted to the rules requiring that vessels keep to the right.

And the vessels will be carrying cargoes such as maize and other cereals, or mineral ores. We aren't talking about high-value commodities. Nor do the cargoes represent an environmental hazard if something unforeseen should occur," says Rødseth.

Provided by SINTEF