Autonomous and unmanned ships

Unmanned ships remove many existing constraints on ship design and can enable the construction of completely new transport systems. These ships need no deckhouse, can remove most safety equipment and can be designed without needing to consider crew comfort. High automation of ship and cargo handling is also part of this picture.

SOME HISTORY

Research and publications related to autonomous and unmanned ships have appeared from time to time since the 1980s. However, the first large and widely published project was the EU-project MUNIN (from 2012 to 2015), coordinated by Fraunhofer CML, and where MARINTEK (now SINTEF Ocean) had the scientific management.

The MUNIN project investigated how to retrofit a Handymax dry bulk carrier to operate without crew, which turned out to be doable, but not a very good business case. But the project proved that unmanned ships was a viable proposition and paved the way for a number of other and more economically interesting proposals.

SINTEF Ocean is now an internationally leading research organization in the area of autonomous ships, a central party in establishing the first interest group (NFAS – Norwegian Forum for Unmanned Ship) and later the INAS network (International Network for Autonomous Ships) .

UNMANNED, SMART AND AUTONOMOUS SHIPS

Unmanned ships are often supervised by crew on land, which also have the possibility to intervene when necessary. This is useful both from a regulatory perspective, as one still has a natural and legal person in the loop, and for reducing complexity and increasing reliability of the automatic sensor and control systems.

We use advanced automation ("**autonomy**") to reduce the workload for the shore operators, partly to remove tedious monitoring tasks, but also to enable each crew to supervise and operate more than one ship.

A **smart ship** is often used to describe a ship with a high degree of automation, but still with crew on the ship.

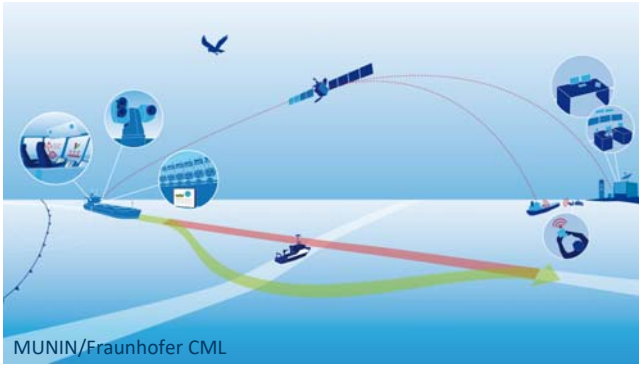
WHY UNMANNED SHIPS?

The main driving force behind unmanned ships today are improvements in supply chains. This often involves using several smaller ships rather than one big, automated cargo handling and electric operation with batteries. In these cases, autonomy is used to increase automation, avoid that crew costs increase with the number of ships and to implement greener transport systems. Many of the new supply chains are designed to replace traditional truck-based systems. Thus, the autonomous ships enables improvements in road congestions, noise and dust pollution as well as reductions in greenhouse gas emissions.

We also expect autonomous and smart ships to play a role in reducing CO_2 emissions from international shipping. Unmanned ships reduce many of the drawbacks of slow steaming and can provide more flexible transport systems with smaller ships. More direct connections may provide more efficient services with overall lower energy consumption per cargo unit. New and more costly fuel types may also be more suitable for automated ships.

THE AUTONOMOUS SHIP IS PART OF A SYSTEM

Today, an autonomous ship is always a component of a larger system. It needs port support for charging, mooring and cargo handling, new ship and shore based instrumentation, a shore control center, interfaces to other ships and new types of management and operational expertise.



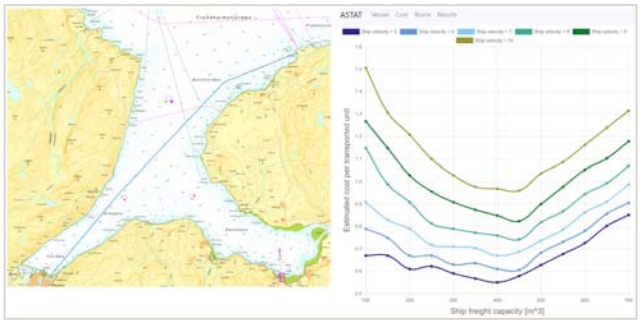
MUNIN/Fraunhofer CML

This requires that the designers of the system have a wide range of competencies and not only on ships and ship systems. It is also necessary to understand authority requirements, cyber security, wireless communication, reliability of new sensor and control systems and much more.

SINTEF, with its wide range of expertise, is uniquely positioned to do the initial analysis of new autonomous ship transport system designs.

THE NEED FOR A GOOD BUSINESS MODEL

As the MUNIN project showed, not all business cases are suitable for autonomous ships. In fact, new transport chains and the effects of introducing autonomous ships require complex analysis. It will normally require operational changes in the transport systems, new types of infrastructure on land and new ship types, often substantially smaller than what one would normally choose.



SINTEF has developed a set of methods and tools to simplify the analysis and can do independent and confidential cost-benefit analysis of new system proposals.

LABORATORY TESTS

SINTEF Ocean has a range of large laboratories that can be used for testing of scale models of autonomous ships and operations. Heavy weather operation and berthing are examples that can be suitable for laboratory experiments before being committed to full scale sea tests.

We also have access to the autonomous ship test area in Trondheim that can be used for full scale tests of sensors, control systems and ships.

TECHNOLOGY DEVELOPMENTS

SINTEF is also cooperating with several industrial partners in more specific technology development projects. Elated to autonomous ships This includes computer vision, cyber security, control systems, safety and risk assessment, ship and ship system design and more. Cooperation between institutes in SINTEF will always ensure the best possible combination of competences for our clients.

SINTEF

MORE INFORMATION:
http://www.unmanned-ship.org/
http://nfas.autonomous-ship.org/index-en.html

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