Discussing the MOSES project:
Automated technologies for green and efficient short sea shipping

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* the total container throughput in the Mediterranean increased from 20 m TEU (2000) to 51 m TEU (2015)
The EU container supply chain

Maritime transport is efficient and green, mainly due to economies of scale!

The EU aims at shifting cargo from land-based transportation to more environmentally friendly modes.

Land-based transportation is still preferred in many cases!
Challenges of Short Sea Shipping

No door-to-door delivery

Cascading delays

Complex cost structure

To increase the share of SSS in the container supply chain:
- Feeder routes must reach more destination ports.
- Feeder vessels must carry less cargo cost effectively.
Facts about the MOSES project

- **Project Title:** AutoMated Vessels and Supply Chain Optimisation for Sustainable Short SEa Shipping
- **Duration:** 01.07.2020 - 30.06.2023 (36 months)
- **Budget:** 8 million €
- **Consortium:** 17 Partners
Goal and Objectives

Significantly **enhance the SSS component** of the European container supply chain

Create sustainable feeder services from large container terminals to **small ports with no infrastructure**
Goal and Objectives

Develop an automated manoeuvring and docking system for DSS ports

Develop and promote a logistics matchmaking platform to boost SSS

Design innovative, hybrid electric feeder vessel outfitted with a robotic container-handling system

Reduce the environmental footprint for SSS and ports

Improve efficiency and end-to-end delivery times of SSS mode

Promote smart port development with minimal investment

Develop concrete business cases

Improve efficiency and end-to-end delivery times of SSS mode

Promote smart port development with minimal investment

Develop concrete business cases

Societal

Technical

Market
The focus of MOSES along the route of a container
The MOSES Concept
Autonomous tugboat swarm and automated docking

The tugboat swarm will manoeuvre and dock large containerships

- 20% Decrease in docking time for large container ships
- 70% Decrease in manoeuvring time for large container ships
Autonomous tugboat swarm and automated docking

Training environment for AutoPilot

Architecture for retrofitting tugboats

Detection
- Sensors
- Data Acquisition (DAQ)

AutoPilot (Path planning)

Propulsion Steering Control

Agent A1
Agent A2
Brain
Academy
External Communicator
Learning Environment

Python API
Innovative feeder with Robotic Cargo Handling

The innovative feeder will transport container cargo, with minimal environmental footprint, to small ports with no infrastructure.

- **20%** Decrease of loading time for feeder vessel
- **10%** Decrease of large crane usage in DSS port for (un)loading feeder vessel
- **70%** Decrease in docking time for feeder, when combined with MOSES Automated Docking
Innovative feeder with Robotic Cargo Handling

Greek case

• Max 180 TEU capacity
• Service speed 10 kn
• Range approx. 260 nm

Spanish case

• 670 TEU capacity
• Service speed 5 kn
• Range approx. 85 nm

Common innovative features
• Enhanced manoeuvrability (azimuth thrusters)
• Environmentally friendly (Hybrid, all electric, fuel cell)
• Automated cargo handling
Innovative feeder with Robotic Cargo Handling

Intelligent Operator Support System (IOSS):
It uses AI to solve issues caused by another AI!

Remote supervisory control
- Enabling local situation awareness
- Robot self awareness in problem detection
- Control Intelligence
- Dynamic task allocation
- Risk assessment

Human-robot collaboration
- 3D world representation
- Anomaly detection
Is this enough to attract cargo to Short Sea Shipping and create **sustainable feeder services**?

Sustainability in terms of **steady cargo demand**, which means that stakeholders will prefer Short Sea Shipping over other transport modes.
Matchmaking Platform

The platform will implement horizontal collaboration among logistics stakeholders and will match demand and supply of cargo volumes.

- Increased visibility of available SSS routes, demand maximization
- Clear mapping of B2B processes within the entire supply chain
- Optimization of distribution routes and improvement of empty container management
- Changing freight flows handling and increase of partial cargo loads cost-effectiveness
Matchmaking Platform

Platform Stakeholders/Users
Shipping agents, Terminal operators, Warehouse operators, Freight forwarders, Shippers, Trucking companies, Rail operators

- Platform visualization web-based, georeferenced interface
- Selection of preferred user interactions based on needs
- Sharing empty container information cost effective solutions
- Scenario building capabilities (cost, energy efficiency)
Expected impact for supply chain

- Minimum decrease of end-to-end costs for container transport with feeder services (5%)
- Increase of feeder traffic between large terminals and small ports (15%)
- Modal shift to Short Sea Shipping in designated areas (10%)
These are the things we have accomplished so far...

what’s next for MOSES?
Pilot demonstration #1

Objective
Showcase the automated maneuvering, docking, and mooring scheme for large ports

Method
• Two workboats will simulate a swarm of autonomous tugboats
• They will guide a floating vessel towards a berthing spot
• The re-engineered AutoMoor prototype will safely moor and secure the floating vessel at berth

Location: Denmark
Objective
Showcase the innovative characteristics of the MOSES feeder vessel by demonstrating its seakeeping and energy performance capabilities

Method
Free sailing scaled ship model of selected Feeder Vessel design
  • Propulsion
  • Seakeeping and added resistance
  • Autonomous operation

Location: Netherlands
Objective
Showcase the (semi)autonomous operation for (un)loading containers from the MOSES innovative feeder with the Robotic Container-Handling System

Method
• A full-scale crane will be outfitted with a sensor package to enable remotely controlled and autonomous operation
• The interaction between the MOSES Robotic Container-Handling System and the Innovative Feeder will be simulated

Location: Sweden and the Netherlands
Paving the way towards the future of Short Sea Shipping

- The problem addressed by MOSES does not have an obvious solution!
- It will strengthen the presence of SSS within the EU supply chain by taking advantage of the benefits of automated technologies.
Thank you for your attention!

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