

S-100 Demonstrator Project - Norwegian S-100 Testbed Report

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ELECTRO	NIC CHART	CENTRE	

S-100 Demonstrator Project

Scope:

To define how the new combined IHO S-100 standards can create considerable value for the maritime industry.

Ports, Navy and Coastal Administration

Period: 2019 - 2023



S-100 Demonstrator Project



The Basic Approach

- 1. Identify challenging maritime operations.
- 2. Produce S-100 data where these operations are conducted.
- 3. Conduct operations by using the S-100 data end user application S-100 Demonstrator.
- 4. Gain experience on potential added value.





Operational test - Sleipnir to Haugesund



Test reports, videos and more: https://s-100.no/

Test	SLEIPNIR to Haugesund	
Focus	The world's largest crane vessel through narrow shallow waters to pickup module to oil platform.	
Data	ENC , S-102, Land info	
Involved parties	Heerema, Crew - Sleipnir, Insurance company, Equinor Aibel, Port of Karmsund, Coastal Administration, Norwegian Hydrographic Service & the project team	
End user systems	S-100 Demonstrator, SEAiq + (Njord Pilot)	
Results	The operation not possible without the use of S-102 data and the use of them in S-100 Demonstrator. Operation conducted safely - huge economic benefit for the customer.	

Test	Historical Voyages to Port of Kristiansand based upon AIS tracks	
Focus	Identify how far margins were stretched before having access to new S-102 data - 3 vessels\Voyages (Federal Nakagawa, Balkan, Haven)	
Data	ENC , S-102, Land info, Historical AIS traacks	
Involved parties	Port of Kristiansand, Norwegian Coastal Agency, Norwegian Hydrographic Service & the project team In addition ship owner companies	
End user Systems	S-100 Demonstrator	
Results	 The involved parties gained increased understanding of how S-102 data used in S-100 Demonstrator could have been used for: Ensurance of acceptable depth along quay. Avoiding grounding (which did happen in one occasion) 	

Test	Pioneering Spirit in narrow waters - Port of Stavanger and Kristiansand	
Focus	World's largest catamaran crane vessel into areas of limited depth and breadth	
Data	ENC, S-102, Land info	
Involved parties	AllSeas, Bergen agent, Norwegian Coastal Agency, Ports Quays, onbord crew, Project team	

End user Systems	S-100 Demonstrator, SEAiq + (Njord Pilot)	
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Results	Improvements done to original sailing plans based upon the improved information provided by the S-102 data.	A second se
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Test	New harbour simulation - Port of Stavanger	
Focus Simulation using a model of the world's largest cruiseship (Oasis of the Seas) when entering narrow waters into new planned quay in Bjergsted		
Data	Data ENC, S-102, Land info, additional critical area information , quay plans	
Involved parties	Port of Stavanger, Norwegian Coastal Agency, Captain Oasis of the Seas, Norwegian Hydrographic Service & the project team (film crew)	

End user Systems	S-100 Demonstrator	
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Results	A movie displaying the challenges in the narrow waters when accommodating new infrastructure for arrival of this type of large vessels.	
	Used for input to governmental authorities and national Transport Plan.	



Test	Under Keel Clearance Management- Tjeldsundet
Focus	Use S-129 (UKCM) to navigate through narrow and challenging waters through Tjeldsundet to Port of harstad.
Data	ENC(S57), S-101, S-102, S-111, S-129, PRIMAR RTZ, Sehavnivå (water level information), seabed area information
Involved parties	Terntank (ship owner), Crew Tern Ocean, Norwegian Coastal Agency, OMC International, Norwegian Hydrographic Service, Norwegian Meteorological Institute, Project team
End user Systems	S-100 Demonstrator, SEAiq, (Njord Pilot)

Results	Tested on commercial voyage. Economical benefits and increased navigational safety	
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S-129 Concept



S-129 Under Keel Clearance Management Operational Test - Tjeldsundet



- Produce S-129.
- Produce S-1xx products.
- Use S-1xx products (S-102 and S-111) for S-129 generation.
- Integrate data in end user tool
- Use for voyage planning.
- Use for voyage execution.
- Commercial voyage.

Location: Tjeldsundet



Tjedsundet Distances



Vessel: Tern Ocean

IMO no	9747986
Length Overall	<mark>147.00 m</mark>
Breadth (moulded)	22.00 m
Depth (moulded)	11.70 m
Draught (scantling)	<mark>9.00 m</mark>
Deadweight	14.827 t
Gross tonnage	11.374 t



Terntank – Shipping, Chartering, Ship management https://terntank.com/

Test Phases



Phase 1 Products

S-57 Traditional ENC S-101 Future ENC S-102 High resolution bathymetry S-111 Surface current (dynamic) S-129 Under keel clearance (dynamic) S-104 Water level S-421 Routes

- Experience
- Challenges
- Standardization
- Production tools
- Automation
- Static vs Dynamic
- Validation



Phase 2 Dataflow

Between participating entities
 PRIMAR Remote Update Protocol
 S-100 Part 15 Data protection
 APIs
 IHO application process

- Experience
- Challenges
- Testdata and documentation
- OEM Experiences
- QA for test purpose



Phase 2 Dataflow



Phase 3 Demonstrator implementations



- Experience
- Challenges
- Usability
- New ideas



Phase 3 Demonstrator implementations



Phase 4 Test execution



- Experience
- Challenges
- Usability
- New ideas
- Situational awareness
- Safety of nav.







Phase 4 Test execution

Water Level difference: 2.41 meter



"After review, it turns out that ship must be postponed. This occurs when using the S-100 Demonstrator. New departure 0930".



Conclusions

 S-129 used in end user application expanding navigable available space.



Conclusions Planning Purpose

- Perception and understanding of available navigable space.
- Useful for safe passage considerations – identify optimal conditions.
- Unfamiliar waters.
- Assist the Pilot in his area of responsibility.
- Information sharing Pilot Captain.



"For planning purposes, the products available in the S-100 Demonstrator would be of good use when familiarizing with the circumstances and conditions in the area of planned voyage".

"The S-100 demonstrator gives all the information I need in one place, so it gives added value to assist me in my area of responsibility".

"If the pilot makes a plan for the voyage, and then is able to show the captain how the sailing will be done, this may improve the cooperation between the pilot and the captain".

"In general, the more relevant information that is available, the better it is for decision making during voyage planning and voyage monitoring".

Expected Benefits accomplishment

Expected Benefits	
Benefit 1 Fuel reduction	More cargo onboard and a shorter sailing route will contribute to reduction in fuel consumption.
Benefit 2 Environmental savings.	The CO2 and NOx emission will be reduced due to reduction in sailing distance. More cargo onboard reduces the number of voyages necessary to transport a fixed size cargo, and as such contribute to emission reduction.
Benefit 3 Economical savings.	A reduction in fuel consumption and a potential reduction in necessary voyages indicates potential cost savings.
Benefit 4 Better vessel exploitation.	A demonstrated potential for better exploitation of vessels operating in narrow waters.
Benefit 5 Increased situational awareness and information sharing	S-100 Demonstrator is expected to portray navigational significant information being more human recognizable than traditional tools by using 3D portrayal on the underlying S-102 data model. As such it is deemed to be more suitable for information sharing/understanding of the situation. <u>E.g.</u> between Pilot and Captain/crew.
Benefit 6 Uptake of S-1xx production.	Increased knowledge within national and commercial data producing organisations on production of data on the S-100 format.

S-100 Demonstrator:

https://s-100.no/

S-129 Operational Test:

- https://s-100.no/operational-test-s-129under-keel-clearance-managementtested-in-tjeldsundet-norway/
 - Summary
 - Full test report download.
 - OMC public report.

Articles and video:

- https://blog.ecc.no/iho-s-129-test-provessituational-achievements-in-maritimeoperation
- https://www.kystverket.no/en/news/pilottests-new-digital-tools/
- https://www.youtube.com/watch?v=yVtc_0w Feso

Pilot tests new digital tools



Pilot Karl Helge Haagensen during pilotage when new digital tools were tested in Tjeldsundet. Photo: Svein Skjæveland, ECC.

The pilot service recently took part in a successful test of the digital product S-129. This new technical aid calculates where it is safe to sail at any given time, especially in shallow areas.

Published 12/15/2021 By Haugen, Lill Therese Opsahl.

New digital tools will help make voyages even safer and more efficient in the future. Karl Helge Haagensen of the Norwegian Coastal Administration was recently the pilot on board M/T Tern Ocean through the narrow and shallow Tjeldsundet sound. Here the digital tool "S-100 Demonstrator", with live updates from S-129, was tested on a commercial voyage – the world's first such test.

The aim of S-129 is to ensure good clearance in areas where depths are marginal.

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