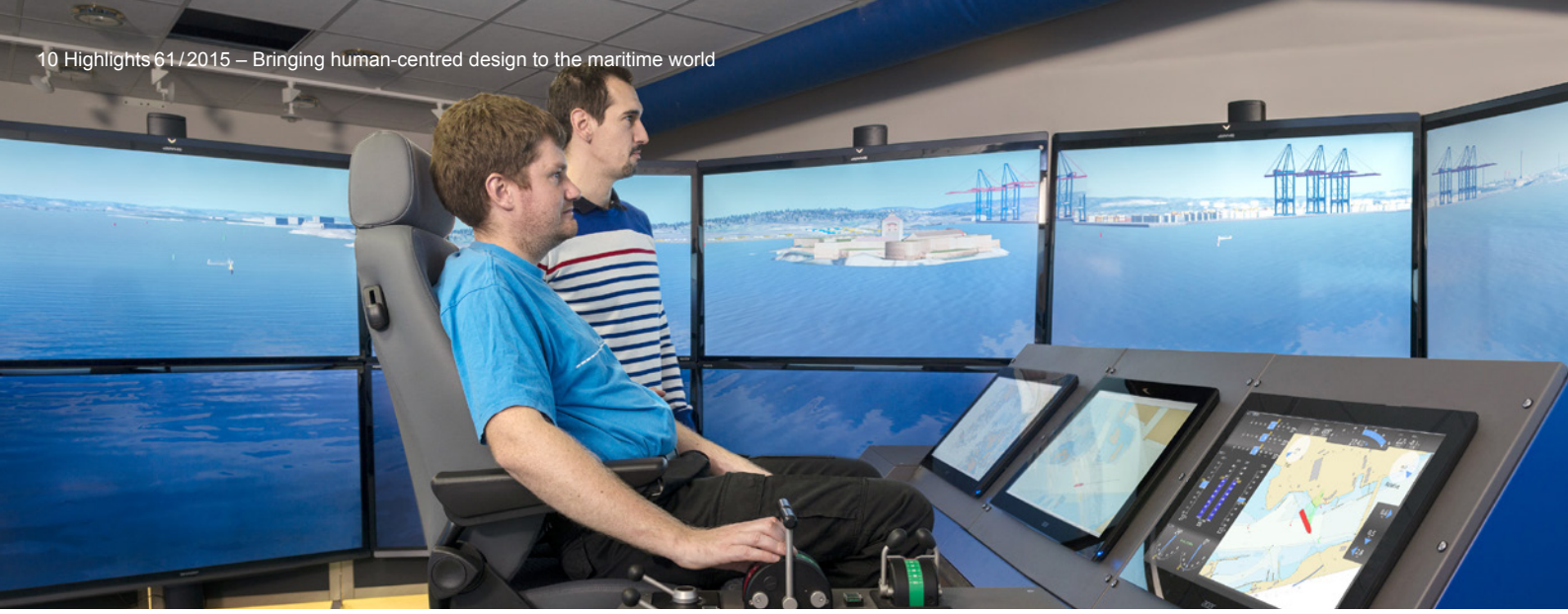


The conning design was tested and evaluated in the highly configurable SSPA SEAMAN simulator. Photo: Anders Mikaelsson.

Bringing human-centred design to the maritime world

SSPA presents a new, highly configurable design for a conning display in accordance with the principals of Human-centred Design as part of the recently concluded CyClaDes project. The aim of the project was to increase ship, crew, cargo and environmental safety by introducing a human-centred perspective. SSPA, with its extensive experience of manoeuvring and berthing simulations, took special interest in the design of the conning display for use on the bridge wing in these situations.

Things do go wrong due to bridge equipment design

In accident investigations, there are intriguing examples of bridge equipment contributing significantly to incidents. In June 2013, the ship Sirena Seaways collided with a berth in Harwich, likely because it was difficult to tell that the system was in back-up mode. The impact at 7.5 knots caused considerable damage to the hull and the collapse of the linkspan. The 207-metre cruise ship Royal Majesty ran aground due to a GPS fault while en route from Bermuda to Boston. Nils Holgersson, a 191-metre Ro-Pax ferry, hit a moored ship during a port manoeuvre, likely due to confusion resulting from operating modes. All cases were linked to design that did not focus on the human aspect.

The value of a well-designed conning display

Manoeuvring a large vessel in confined areas, such as when berthing and unberthing, is a demanding and complex task. The damage caused by a vessel striking a pier, quay or any object on land can result in very high costs for vessel repairs and in many cases the claim for damages from the harbour is even higher.

According to international insurance companies, damage caused by contact with fixed or floating objects is from experience usually a result of:

- Adverse weather conditions during berthing/unberthing
- Improper judgement on the part of the master or pilot
- Improper speed
- Insufficient tug assistance and/or machinery failure

During these situations, an often-used manoeuvring aid is the conning display, which shows information about the state of the vessel and predicted motions. If properly designed, it has the ability to increase situational awareness and counteract all four causes stated above.

Precision manoeuvring at the bridge wing during berthing. Photo: Jim Sandkvist.

Conning displays are found both in the centre console as a navigation aid and on the bridge wing as an aid for precision manoeuvring such as berthing and unberthing. The SSPA study within the CyClaDes project focused on the conning design for typical bridge wing manoeuvring situations.

The Dynamic Predictor visualises the direct effect of wind on the vessel's predicted motion.

Human-centred design of the conning display

The design work followed the principals of human-centred design as described in the fact box. Involving the users at an early stage is the very key to human-centred design and was a very useful and rather effective way forward.

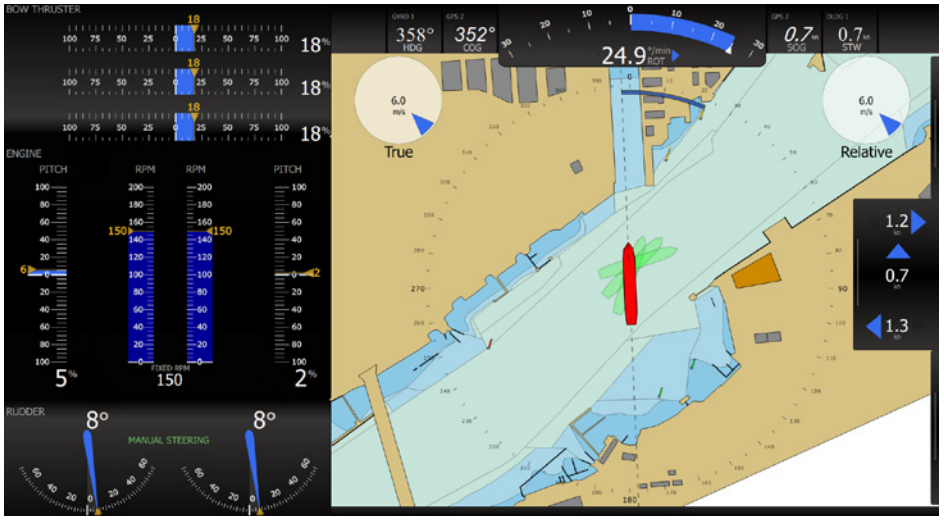
A large part of the design inspiration came from visits and interviews with officers on a large Ro-Pax vessel, a bunker vessel and large car carrier.

Human-centred design

There are five essential processes to be taken into account for the design process relating to the standard ISO 13407:1999 and later ISO 9241-210.

1. Plan the human-centred design process
2. Understand and specify the context of use
3. Specify the user and organisational requirements
4. Produce designs and prototypes
5. Carry out user-based assessment

Tasks 2–5 are part of an iterative process that will be repeated until a successful outcome is reached in task 5.



The new conning display, according to the principals of human-centred design.

The final conning design was evaluated in the SSPA SEAMAN simulator in co-operation with CyClaDes project team members from Chalmers University of Technology.

Design key elements

The users' consensus about what information should be included or excluded was quite homogenous and allowed an uncluttered design, or a design with minimal 'optical pollution', as expressed by one of the pilots interviewed.

Green and red are usually used extensively for starboard and port indicators, while additional colours are used for additional information to a varying degree. Besides making many conning displays look like angry fruit salads, important information or warnings can also be hard to recognise. To achieve a calm and consistent appearance, blue was used for all graphic state indicators. This was surprisingly well accepted by the users. This meant that red was now only used for the vessel contour and warnings.

To visualise predicted motion, green is used for the vessel contours to distinguish them from the actual position in red. The prediction is calculated using the SSPA Dynamic Prediction system, which also visualises the effect of wind on vessel motion, which was a much-appreciated feature.

The modular design approach allows for rapid customisation to accommodate different needs and vessel machinery layouts.

SEAMAN SIMULATION

The CyClaDes project

The CyClaDes project's full title is Crew-centred Design and Operations of Ships and Ship Systems and is intended to promote the impact of the human element in shipping across the design and operational lifecycle. The project is funded by the EU Seventh Framework Programme and VINNOVA, Sweden´s Innovation Agency.

CyClaDes

European Commission

VINNOVA

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