



High performance control technology for ships

Cutting-edge HMI technology onboard the multi-purpose vessel ›Mellum‹

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Figure 1: The multi-purpose vessel ›Mellum‹ (photo WSA-Wilhelmshaven/Hellwig)

Little happens in relation to maritime water protection in certain areas of the North Sea without the ›Mellum‹. The flagship of the Wilhelmshaven Wasser- und Schifffahrtsamt (Water and Shipping Authority) is one of the corner-stones of the airborne and seaborne surveillance system (Figure 1). Any marine pollution is initially located by a Dornier turboprop flying overhead, which then transfers the data to the ›Mellum‹. In this way it is possible to initiate protective and pollution control measures directly on location at sea. For this, IT, network and operating solutions for the technical systems onboard are constantly updated to the state-of-the-art. Modernization recently included the installation of explosion protected panel PCs for HMI functions (Human Machine Interface) below deck.



Figure 2: The explosion protected HMI in the engine room supports the data communication network and makes for a more user-friendly operation

The »Mellum« is a multi-purpose vessel that is fully equipped for the wide variety of tasks she has to carry out. While neither fire-fighting nozzles nor icebreaker stem are used very often, other equipment on board is in daily use. This includes the network and control technology, which, on the now twenty-five-year old vessel, is comprehensively and constantly modernized. For the implementation of the new HMI concept particular care was taken that the new system would not only fulfil current requirements, but that re-fittings that had already been planned also had to be taken into account. It had to be possible, for example, to implement future solution for data transfer without too much additional effort. Currently operating information for the engine room is transmitted by serial interface and is displayed on a Windows-based system at the Hyper Terminal tool. However, in the future the implementation of an optical fibre network, a new, modern process control system and communication via Ethernet is planned.

HMI systems for on board operation

The application environment of the engine room posed a particular challenge on the HMI system (Figure 2). For this purpose a self contained explosion protected system was needed that would also be able to withstand the particular ambient conditions at sea. Flexible panel PC systems from R.STAHL's Open HMI series are now used as the ship's the new operating and monitoring systems. Thanks to appropriate interfaces and connection options, the series supports the current as well as the future communication solution. These devices make the handling of the automation technology more comfortable. If an engineer below deck, for instance, notices that sensors in the engine room need to be readjusted, with the new operator interface this task can now be done directly, whereas before someone would have had to physically go to the bridge. The numerous unnecessary trips via stairs from the engine room to the bridge are no longer necessary with the new operator interface.

Designed for maritime installation

The entire Open HMI series is DNV-certified. Both the explosion protected versions and the versions for the safe areas have been certified by an independent certification laboratory as suitable for operation and monitoring tasks onboard ships. This world wide recognized certification also applies to installation on oil rigs and other offshore sites. Thanks to their materials resistant to sea water, vibration-proof design (Figure 3) and adequate immunity to electromagnetic effects, the HMI systems guarantee reliable operation as well as a long service life onboard ships. Due to the rough ambient conditions the devices are not equipped with hard disks. Instead a mechanically more robust flash memory is used. →



Figure 3: Using buffering mounts at all four corners of the stainless steel housing, typical ship vibration is reduced to protect the electronics of the HMI

Open HMI devices can currently be used for any task onboard without any further approvals, except for tasks on the ship's bridge, where certification is still pending. Due to their powerful PC hardware and large displays they are suitable even for the complex display of process visualization. The devices are available with screen diagonals up to 19 inches and with a touch screen functionality. With regard to software, their open platform guarantees a high degree of flexibility. Apart from ›Windows XP embedded‹, as an option they are also supplied with ›Windows XP Professional‹. Operation is possible in 25 languages and with 150 different keyboard layouts (Figure 4). Open HMIs can be used not only as stand-alone systems, but they can also be easily installed in inside control panels.



Figure 4: For international application the Open HMI series supports fonts and keyboard layouts for many different languages

Explosion protection in a modular design

Contrary to the usual design, panel PCs of this series are assembled from separate explosion protected modules, enabling trained users to maintain or upgrade the system themselves by replacing individual components. In the past in the event of defects or an upgrade, common HMI devices for use in potentially explosive atmospheres had, in the majority of cases, either to be completely replaced (in case of type of protection Ex m) or could only be repaired and sealed again under controlled conditions by appropriately qualified personnel (for example in the case of Ex q). For R. STAHL's Open HMI series, the optimum type of protection for each individual system component has been separately implemented, an aspect that significantly simplifies the otherwise often complicated handling of explosion protected equipment. A few modules are designed with type of protection encapsulation ›m‹, some like the CPU and the power supply unit are in flameproof enclosures, connection backplanes are either of increased safety or intrinsically safe design. A terminal box in increased safety provides connection options for USB 2.0 flash drives, currently available with up to 16 GB, and make it particularly easy to replace this mass memories. In addition to the two USB 2.0 standard interfaces, as well as the two intrinsically safe USB 2.0 interfaces, the operator interface have two serial ports, one Ethernet interface, a connection option for a keyboard and trackball (joystick), as well as optional interfaces for barcode and card readers. The lightweight outer casing for the HMIs does not require any further approval.

Conclusion

R.STAHL has been providing automation technology for ships since the early 1990s. It is one of the very few providers to offer users DNV-certified explosion protected HMI systems. Their flexible communication options, their powerful hardware and software, the high level of user-friendliness of the touch screen and the practical modular design of the systems make the Open HMIs a user-friendly and future-proof solution for operating control and visualization tasks on board like the ›Mellum‹.

Flagship in its prime

The ›Mellum‹, named after an sand dune island in front of its home port in the Wadden Sea of Lower Saxony, is used by the Wilhelmshaven Wasser- und Schifffahrtsamt (Water and Shipping Authority) for various tasks. In addition to water protection, the regular crew of 16 men is responsible for buoyage, maintenance of sea marks and the sea traffic control. However, if necessary the 80 metre long and 15 metre wide ›all-rounder‹ can serve as an emergency towboat, icebreaker or fireboat. The ›Mellum‹ was launched in 1984 and is therefore now in her prime. Ships of her kind are usually serve for around 40 years before they are replaced. This is the reason why regular upgrading is essential in order to keep the ship and her specialist equipment constantly up to date and ready for any new tasks. Even large additional equipment have been integrated on the ›Mellum‹. For example, in 1995 a gas detection and analysis system as well as a so-called ›excess pressure citadel‹ for the superstructure and engine rooms were added. These features enable the vessel sailing and safe operation even in atmospheres contaminated by toxic or explosive substances. The installation of new HMI technology is part of the comprehensive recent upgrade of the existing electrical and electronic equipment on board.