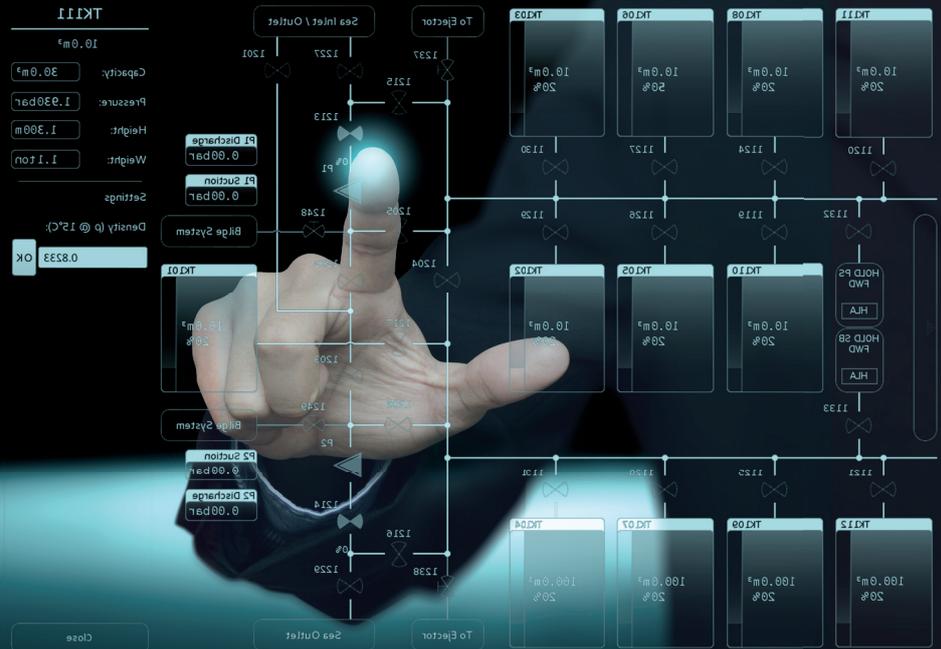


Marpower Tank Monitoring System (TMS)



How do you keep track of your onboard tank levels? The Marpower Tank Monitoring System is the total solution for reading and calculating values of actual tank content. The current fluid levels are presented to the operator in a clear and unambiguous way. The system visualizes the levels and alerts at extreme values.

The Marpower Tank Monitoring System visualizes the various types of liquid on the "General Arrangement" with colors. The information for visualization can be obtained in several ways (air bubble system / pressure sensors etc.) and calculates the actual content with use of viscosity and tank table information. For instance fuel, oil, potable water, black water or ballast water can be measured. Automatic or manual trim and list corrections can be made.

Integration in MAS

The system can be used as a separate tank measurement system with sensors and screen, or as a module (part of the Marpower Automation System - MAS). Consider, for example, the combination with the Marpower Valve Control system for the automatic control of valves and the overflow of liquids. Result: a complete information system for full control: the Total Ship Automation concept (TSA)



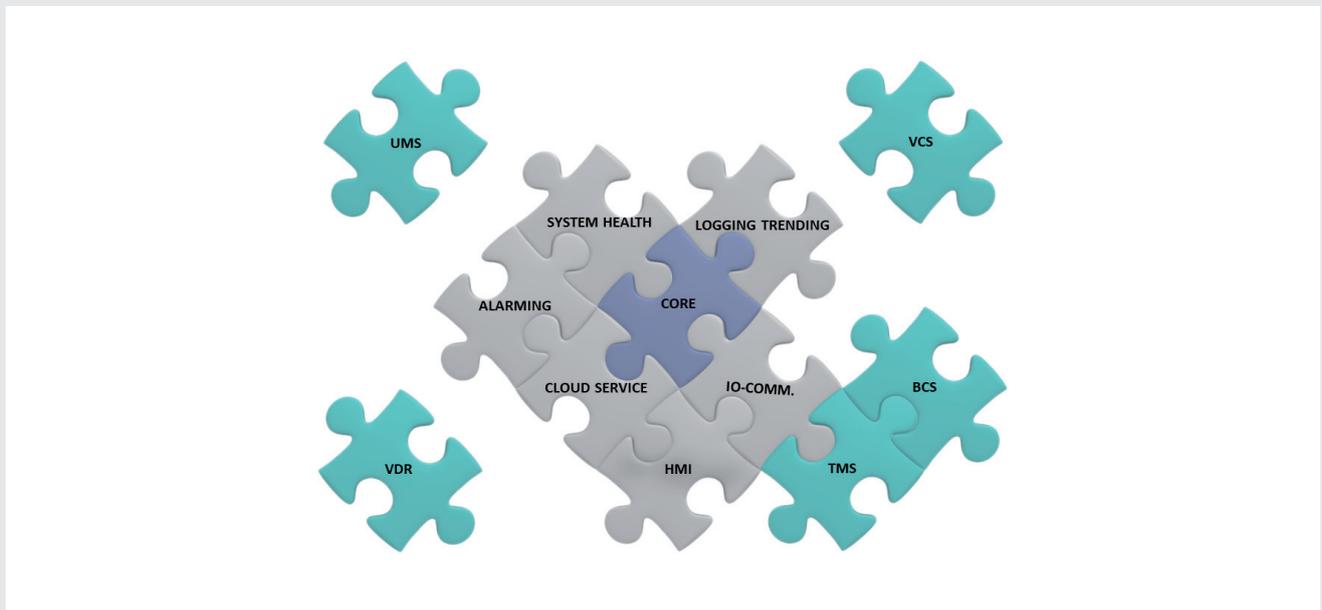
Advantages of the Marpower Tank Measuring System

- ✓ Visualization of various liquids
- ✓ Adjustable level alarming
- ✓ Various gauge system/sensor types
- ✓ Detailed item-status
- ✓ Trim-/list- corrections possible
- ✓ Custom built

The TMS collects rough data from measurements per tank to be able to determine the content of the tank. Due to the variable shapes of liquid tanks in a ship, the actual content of a tank will be calculated. Base of this calculation method are tank tables, which forms the relation between the tank height and the volume. Actual content will be calculated according these tables with use of interpolation.

There are several possibilities for optimizing the quality of the measurements in the system i.e. the system is able to process the trim of the ship in the measurements. The trim corrections can

be offered both manually and automatically (trim sensor). The system can be combined with different measuring systems and measurement principles such as; absolute measurement, relative measurement or air bubble systems. To set up a TMS system, a basic MAS system is sufficient. A basic MAS system is sufficiently equipped for monitoring and visualization of the system. A basic system uses 12 inch screens for visualization, which might be too small for tank overviews for larger systems. The system is flexible, so larger screens can be easily implemented. In addition, the logging and trending module is very useful for monitoring / trending unexpected consumption deviations.



Marpower is a brand name for automation systems, frequency converters, electronics and power converters which are produced in-house.

The Marpower Automation System is a flexible and scalable platform for alarming, monitoring and control of systems. The graphical user interface is intuitive, user-friendly and scalable, it can be adapted to user specific requirements. A unique feature of the Marpower Automation System is ability to configure the system in a multiple redundant configuration. In addition, the software components are hot-standby, so seamless redundant services can provide an optimal user experience in case of a system failure. The minimum system consists of 2 industrial workstations or industrial panel PCs, combined with PLC hardware and remote I/O.

The Marpower Automation System can process large I/O amounts (> 10000) without losing reaction speed. With optimum tuning of the system components via a gigabit network, reaction times of 250 ms maximum can be realized. The system is executed from a Linux environment for optimum speed, stability and security. Due to this operating system, no licenses are needed for our software. Another advantage is the use of commercial off-the-shelf hardware which is world-wide available. With the Marpower Automation System, a suitable solution can be offered for each ship, from coaster to cruise ship!

Marpower Automatisering System

- BCS - Ballast control system
- EMS - Energy management system
- FOMS - Fuel oil monitoring system
- PMS - Power management system
- TMS - Tank monitoring system
- VCS - Valve control system