OUR MISSION
We shall earn the respect and recognition for our dedication to provide innovative and reliable marine electronics that ensure optimal operation at sea. By utilising and integrating our technology, experience and competencies in positioning, hydroacoustics, communication, control, navigation, simulation, and automation, we aim to give our customers The Full Picture. The Full Picture yields professional solutions and global services that make a difference enabling you to stay ahead of the competition.

OUR PHILOSOPHY
Our success depends on the success of our customers. Actively listening to our customers and truly understanding their needs, and then translating these needs into successful products and solutions is central to achieving our goal. Our people are the key to our success and we empower them to achieve. Working together in a global network of knowledge, guided by our values, engenders innovation and world class performance. Every day we have to think a little differently, because every client is unique. We aspire to translate the imagination and dedication of our staff into successful technologies and solutions. Our commitment is to add value to your operations by providing you with The Full Picture.

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KONGSBERG SYSTEM PHILOSOPHY

K-Gauge for operational excellence
K-Gauge tank management enables monitoring, planning, validation and execution of cargo and ballast handling operations – a powerful tool for safe and efficient operations. K-Gauge is fully scalable from standalone radar based level gauging and instrumentation to remote control and automated cargo operations. The centre piece of the K-Gauge is the GL 300 radar tank gauge – the latest development in radar based level gauging technology. The small and unique parabolic antenna design makes GL 300 very versatile and suitable for most type of tanks.

The GL 300 and the purpose designed temperature sensors and pressure transmitters comprises the foundation for accurate and reliable readings – quality instrumentation suitable for quality and reliable operations.

Robust and reliable solutions
Kongsberg system philosophy relies on a distributed and open system design that employs a system-wide standardized communication network. The network facilitates free flow of information from all sub-systems, with vessel-wide information available on multi-functional workstations. A common base technology and user interface for all products ensures a safe, efficient and reliable operational environment.

- Level gauging of all tanks
- Remote control of pumps and valves
- Automated cargo and ballast operations
- Vessels strength and stability calculations
- Remote diagnostics
Reliability in operation

In concert, Kongsberg tank management, automation, propulsion control and navigation sub-systems enhance and ease the operation of tankers. The ultimate is attained when the subsystems work together in an integrated control system that includes a fully backed-up system-wide communication network.

All major system components such as the communication networks, process controllers, operator stations and power supplies are duplicated to ensure maximum uptime. Essential components such as deck sensors and radar tank gauges yield the best that technology has to offer in terms of reliability, accuracy and durability. By adding the functionalities available for automated cargo monitoring and control, the cargo operation will be executed both safely and efficiently.
Operate with confidence
The K-Gauge tank management concept consists of several application modules, ranging from tank instrumentation to fully automated tank management. The tank management concept is scalable and can therefore be tailored to individual operational needs. The tank management concept utilizes multifunctional operator stations, providing monitoring and control facilities, with remote operation of pumps and valves. Graphical process views provide the operators with a full picture of the cargo and ballast system as well as for the loading condition. Color coding distinguishes pressurized from none-pressurized pipelines to assist in providing clear presentation of information.

The main features of the tank management system include:
• Discharge of cargo with related ballasting
• Loading of cargo with related ballasting
• Exchange of ballast water

The modular concept
The Kongsberg Tank Management concept yields a modular design, where the various modules can be configured and combined to suit individual operational needs. The system can be configured and combined from basic tank gauging and cargo instrumentation, to remote control of valves and pumps, and to a fully automated tank management system.

Each module is fully compatible with each other and therefore provides seamless information sharing and a consistent operation environment. The functionalities have been developed in close co-operation with maritime professionals, to ensure system functionalities that work effectively and safely in real life operations.

The Kongsberg tank management concept in general and the individual modules in special utilize open standards, which provides for interfaces to e.g. different pump and valve manufacturers.
Multifunctionality
The multifunctional operator stations can be dedicated to one function, or they can be configured as multifunctional level gauging, cargo control, loading computer and ballast control stations. When integrated in the Tank Management system, multiple views and process information is available from other sub-stations.

Automated tank management
Pre-defined or previously stored loading operations are available for the operator and the system will guide the operator through planning and validation during preparation for new loading operations.

Once the plan has been validated, the loading can be executed. The operator starts by lining up the first tank in the plan to seaside as in manual mode for gravity run out. When the conditions have been reached, the auto execution can be initiated. The auto execution will end when all the tanks in the plan have reached final level.

- Full loading computer functionality for calculation of floating position, intact and damage stability and longitudinal strength.
- Planning of discharge, loading and water ballast exchange operations, with user guidance and restrictions.
- Simulation and detailed validation of loading plans.
- Automatic execution of validated loading plans - operator controlled with facilities for manual take over.
- Operator guidance messages to help during operations, and to assist during unwanted conditions.
- Remote operation of valves and pumps.
- Global monitoring and alarm functionality.
- Interlock functions to prevent incorrect usage of equipment and avoid unsafe conditions.

A powerful environment for tanker operation, with built in features for easy information access. For viewing alarms, detailed process information or the load condition, the common user interface is both consistent and intuitive.
LOADING COMPUTER

Safe loading
The Kongsberg ShipLoad computer utilizes a 3D model of the vessels’ hydrostatic, i.e. the full geometric definition of the vessels, as a basis for the calculation of e.g. loading conditions, floating position and stability and longitudinal strength. There are no pre-computed tables, no simplifications or assumptions, but a precise description of the actual loading condition. Thus, what you see is exactly what you have – no dead-freight or overload.

By utilizing the full geometrical definition of the vessel as basis for the computation, additional applications have been developed to improve the load planning and condition handling, e.g. water ballast distribution, water ballast exchange, damage stability and grounding scenarios to name a few.

Basic version
The loading computer provides a great advantage in improved safety, pollution prevention, efficiency and reporting, and meets the requirements of all international governing bodies and classification societies, as well as OPA-90.

Basic version includes computation modules for:
• Integrated reading of tank level, draught and trim / list data
• Intact stability calculation
• Loading condition handling
• Loading condition export functions
• Floating condition details and graphics
• Stability details and graphics
• API, ROB/OQB, GOV, Squat and Wedge calculations

Additional applications
The basic version includes all the required functions and in addition provides optional applications such as:
• Damage stability based on the actual vessel geometry, and according to the selected computation method and regulations.
• Strength verifications against class limits, advanced lightship weight distribution, hull deflection calculations based on Hull Girder inputs, and residual strength computation based on damage definitions.
• Emergency response version for user-specified damage cases, grounding/beaching calculations, outflow calculations and residual strength options.

High end applications
For total control and safest operation of the cargo handling, additional automated applications are available, such as:
• Cargo and Ballast planning and simulation function
• Integration to ballast control system for automated water ballast operations, including planning and automated water ballast exchange function
• Integration to cargo control system for automated cargo automations, including planning and automated loading and unloading operations.
• Hull performance/resistance calculations, trim optimization, optimum speed calculations, economic speed calculations
• Reporting functions on request
Reliability in operation
Kongsberg tank management enhance and improve the operation of tankers. The ultimate solution is attained when the subsystems work together in an integrated control system that includes a fully backed-up, system-wide communication network.

Essential components such as deck sensors and radar tank gauges yield the best results that technology has to offer in terms of reliability, accuracy and durability. By utilizing the HART® Field Communications protocol for deck and tank instrumentation, installation costs are reduced and the quality of data processing enhanced.

By adding the functionalities available for automated cargo monitoring and control, cargo operations can be executed both safely and efficiently.

Safe gateway to hazardous area The central cabinet comes with transmitter barriers and provides safe operation of all Kongsberg instrumentation installed in hazardous areas on deck.

The full picture Multi-purpose Operator Stations provides the operator with instant and complete overview of all instrumentation and processes in the cargo management system.
Focus on target
A concentrated and narrow radar beam is crucial to ensure optimal performance in all conditions and in all tank shapes and depths. The +/-4 deg radar beam and excellent signal-to-noise ratio for Kongsberg radar tank gauges guarantee superior level gauging of all liquid cargoes.

Complete instrumentation - a sharp eye on tank contents
Complete instrumentation for cargo and ballasting is provided for. Radar based tank gauges for the cargo tanks and level gauging by pressure transmitters for the ballast and service tanks enables high accuracy level gauging. Additionally, purpose designed temperature and pressure sensors ensure reliable process monitoring. With modern communication and data distribution, installation and cabling costs are significantly reduced.

Feeling the pressure
Integrated vapour pressure sensors provides reliable and continuously monitoring of tank pressure.

Get temperature in 1-2-3
Temperature sensors are delivered in tailored lengths according to tank heights. The connection box and signal converter are designed for installation of up to 3 sensors each.
LEVEL GAUGING AND INSTRUMENTATION

Reliable and accurate measurements
The K-Gauge radar tank gauges are designed according to the marine industry best practice and utilize only components with superior reliability, performance and durability. The measurement principle is based on the Frequency Modulated Continuous Wave (FMCW), where the distance (ullage) is derived from the time delay of the reflected signal.

One dedicated signal processing unit for each radar antenna segregates the system components and provides system robustness.

The unique off-set parabolic antenna provides self-cleaning abilities and require limited maintenance while set in operation.

Modernized signal communication, together with temperature and pressure transmitters communicating by HART, has reduced the cable requirement on deck.

Radar tank gauges
The unique off-set parabolic antenna combined with high centre frequency offers a small radar sensor which is easy to locate and install on any tanker, regardless of internal structures or deep narrow tanks. The high signal-to-noise ratio performance and the signal processing ensure accurate readings and outstanding performance.

Overfill protection system
The independent overfill protection system based on capacitive level switches has no active elements or moving parts inside the tanks. Different configurations including single or double switches are available. The system comprises level switches, control panels, audible and visible alarm devices to meet IMO requirements.
Temperature sensors
Temperature sensors tailored for marine applications, includes resistance (Pt100/Pt1000), thermocouple (NiCr/NiAl), thermistor elements (NTC), and our unique wireless temperature sensors based on Surface Acoustic Wave (SAW) elements.

Pressure sensors
Kongsberg has created a range of sensors uniquely adopted to marine and offshore applications. All sensors and transmitters are constructed using top quality materials ensuring high reliability and trouble-free life.

Ballast and service tank – draught
The pressure transmitter designed to be submerged in ballast and service tanks is available in AISI316 or Titanium. When used to measure draught, the transmitters are installed after an approved closing valve connected to the ship’s hull, with a ventilation pipe installed above the ship deck.
**INSTALLATION**

**Unique antenna design**
The unique off-set parabolic antenna design ensures to direct the radar beam correctly down the tank regardless of installation direction.

**Flexible location**
The radar tank gauge radiates the energy in a beam. Obstructions or liquid in the beam will reflect this energy. The Kongsberg radar tank gauge offers the narrowest beam in the marine market, with a half power beam of only 3 degrees, making it simple to install and location less critical in tanks with complex internal structures or deep and narrow shape. Obstructions should not appear within the primary free-space cone of 4 degrees from centre line.

**Easy handling**
Special attention has been given to robustness, easy maintenance and low life cycle costs. The radar tank gauge electronics are fully moulded and thus easy to replace if needed. The vapour pressure sensor is likewise available from the radar tank gauge unit and can also be replaced under closed tank conditions. With the parabolic antenna reflector tilted inclined – drip off design – moisture and sediment will drain off and thereby reduce the need for maintenance that would interrupt operations.

**Easy maintainance**
The radar tank gauge fit onto a tank socket of only 200 mm diameter, and are designed with a JIS 200 flange. Tank sockets should be equipped with inspection hatch for easy maintenance. As an option, Kongsberg can provide solutions with spray-nozzles for antenna cleaning without need for opening of tank.
Upgrading that pays
Kongsberg Cargo monitoring and control systems have successfully been retrofitted on many types of vessels including oil carriers, product- and chemical tankers. The modular design, small physical appearance of sensors, and flexibility in system configuration makes it easy to install, and minimizes cost by utilizing existing field cabling as much as possible. Previous tank penetrations and hull openings to be used for radar tank gauging, tank temperature and vapour pressure measurement.

The modern signal communication makes less needs for cables, only 3 pair cables handles radar-, pressure- and up to 3 temperature signals.

Kongsberg may take the full responsibility for planning, engineering, installation and commissioning of the new retrofit system.

Upgrading can for example include:
- Cargo monitoring and control system
- Cargo tank temperature measurement
- Cargo tank pressure measurement
- Vapour line pressure measurement
- Cargo line temperature and pressure measurement
- Manifold pressure measurement
- Draft measurement
- Ballast tank level measurement
- Cargo tank overfill protection system
- Cargo and ballast pump pressure measurement
- Pump room monitoring
K-GAUGE - AN INVESTMENT THAT WILL MAKE YOU MORE COMPETITIVE AND THUS PAY PROFITABLE DIVIDENDS
LIFE CYCLE SUPPORT

Designed to purpose – maintained to last
Our life cycle management service will assist our customers throughout all the phases, from design to commissioning and during the operational life time.
Solid in-house competence, both in system design and user competence enables us to provide solutions that are fit to purpose and thus yields efficiency in operation.
Our common base technology provides robust designs, with few and reliable parts, an excellent foundation to maximize the output at competitive costs.
The distributed and open system design employs an industry standard communication network. Standard hardware components used for various applications and the open network approach results in:
• Increased reliability
• Competitive life-cycle support
• Easy up-grade solutions

Evergreen
We offer continuous hardware and software upgrade to keep your vessel at maximum efficiency. Our system is designed with consistent boundaries between individual systems and control segments. This design strategy makes it easy to add new functionality or complete new control segments thus enable us to offer up-grades step by step to keep your system evergreen.

Training
Qualified personnel are one of your major assets in efficient and safe operations. Thus, we offer modular training courses for all major subjects – from operator training to technical training that keeps your crew fit on the job.

Supported by professionals
Our systems are easy to install and maintain – supported by professionals either on-site or through remote connectivity. They are designed for optimal operational availability and allow for favourable lifecycle expenditure.
We are always there, wherever you need us. Kongsberg's customer service organisation is designed to provide high-quality, global support, wherever and whenever it is needed. We are committed to providing easy access to support and service, and to responding promptly to your needs. Support and service activities are supervised from our headquarters in Norway, with service and support centres at strategic locations around the globe – where you are and the action is.

As part of our commitment to total customer satisfaction, we offer a wide variety of services to meet individual customers' operational needs. Kongsberg support 24 is a solution designed to give round-the-clock support. For mission-critical operations, Kongsberg support 24 can be extended to include remote monitoring. We can adapt the level of support needs by offering service agreements, on-site spare part stocks and quick on-site response arrangements.

Global and local support
We provide global support from local service and support facilities at strategic locations worldwide. Service and support work is carried out under the supervision of your personal account manager, who will ensure that you receive high-quality service and support where and when you need it.
Your account manager will ensure continuity and work closely with your personnel to improve and optimise system availability and performance.
Under the direction of your account manager, and with a local inventory of spare parts, our well-qualified field service engineers will be able to help you quickly and effectively.

SUPPORT 24
Call +47 815 35 355
E-mail: km.support@kongsberg.com