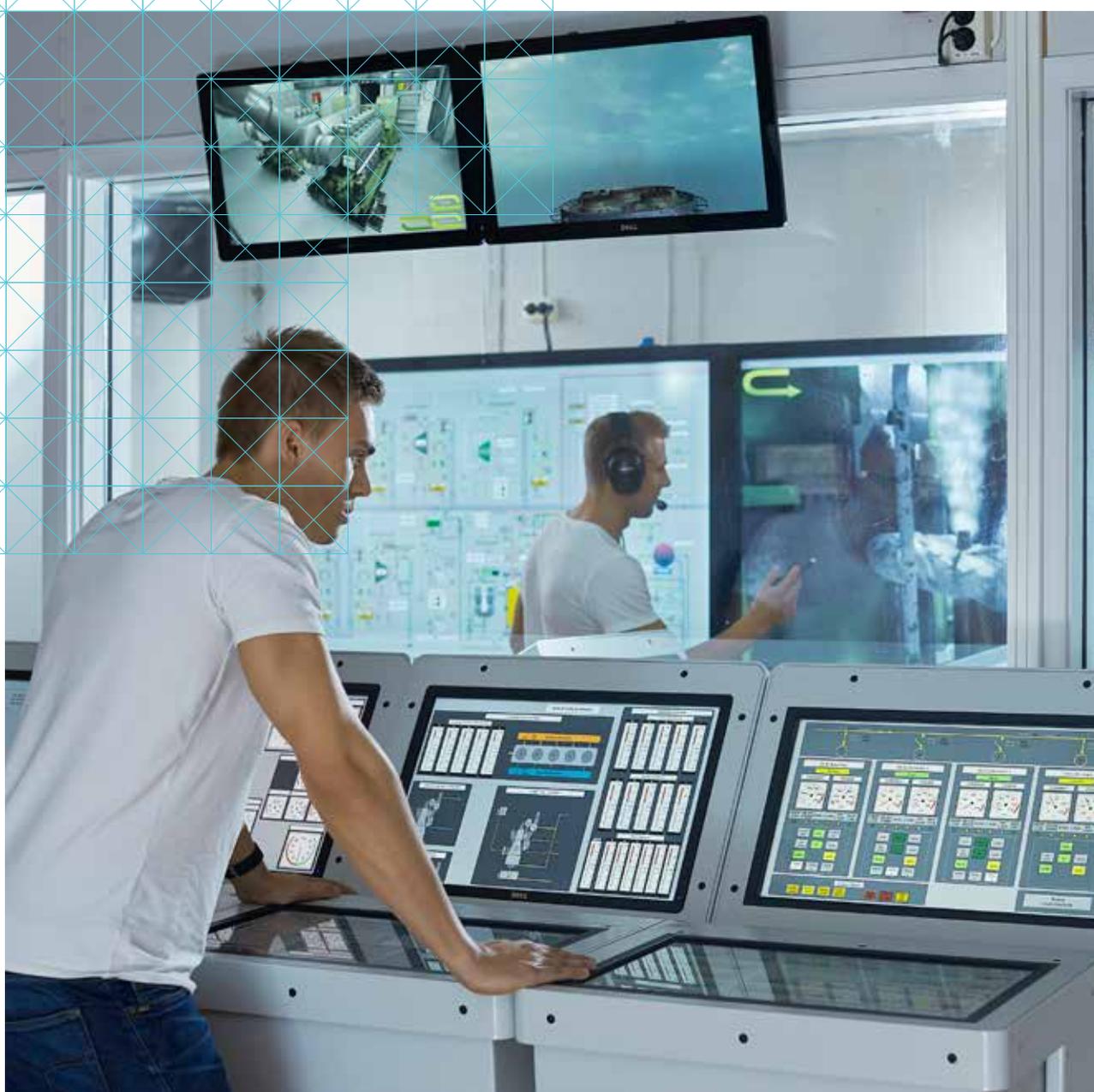




KONGSBERG

K-SIM ENGINE

Simulator system maximizing performance



MAXIMIZING PERFORMANCE PROVIDING

The full picture

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.

KONGSBERG DIGITAL AS
MARITIME SIMULATION
K-SIM ENGINE BROCHURE

JANUARY 2020
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Students exercising in the K-Sim Engine's control room, at Bergen Maritime Vocational School, Norway

Maximizing performance

Competence saves money & environment

KONGSBERG's engine room simulator, K-Sim Engine, enables high quality training in every aspect of the complex behaviour of an engine room; from single sub- and auxiliary systems to the overall running of the operation.

Compared to conventional training, simulators offer a more structured method of building high levels of competence. During simulation training, one can isolate and freeze each sub-system to understand and acquire knowledge, perform critical operations repeatedly to train skills and test and develop attitudes by training in situations that demand complex decision making.

Covering both ordinary and extraordinary training situations, engineers are given the possibility to learn and practice daily procedures, reduce fuel consumption, optimize economy and gain vital skills crucial for handling emergencies.

Proper simulator training is an effective way to build competence and provide engineers with confidence and relevant experience. Simulators can maximize performance, leading to enhanced operational safety and efficiency.

Fulfilling the requirements

K-Sim Engine exceeds requirements in the STCW convention, Regulation 1/12 and DNV GL's Standard DNVGL-ST-033 for Maritime Simulator Systems.



Student exercising at the K-Sim Engine's BigView system at Bergen Maritime Vocational School, Norway

Leading simulation technology

KONGSBERG's solution

As a major world-wide supplier of ship automation and control systems, KONGSBERG has a thorough understanding of the industry's training needs and detailed knowledge of the systems used on board.

To meet the present and future training needs in the maritime industry, we have developed an extensive range of K-Sim simulator systems, which are the result of detailed studies that have defined the optimum solution.

The world's most advanced simulator

Our market leading engine room simulator, K-Sim Engine, provides high fidelity real-time simulation, enabling unique training and education possibilities.

Behind K-Sim Engine lies an investment of more than 140 person-years of development. This major investment has resulted in the most advanced engine room simulator available in the market today.

Key features

Through the use of physical models, we are able to offer real-time simulation models providing a knock-on effect on adjacent subsystems. Faults and alarms will have cascading effects throughout the system if not acknowledged properly. In addition to an extremely high level of realism, K-Sim Engine offers user-friendliness and flexibility, key features for providing high levels of instructor control and greater variety of course offerings – capabilities demanded by shipowners and training institutes worldwide.



Optimize the learning experience

Solutions for any budget

KONGSBERG is dedicated to making K-Sim available to as many users as possible. K-Sim Engine is extremely flexible and can be configured from a PC desktop to an operational full mission simulator using custom panels and ship equipment.

While our desktop system is ideal for process and engineering studies, the full mission system offers a physical familiarity with the real shipboard environment, and includes a fully equipped engine room, engine control room and instructor room.

In addition, we provide a cloud-based training solution through our K-Sim Connect portal enabling students to get access to simulators for training anytime and anywhere. With a full range of simulation systems available, we have a cost-effective solution to fit every requirement and budget.

Customized solutions

K-Sim Engine can be tailored to fit any specific requirements. This means that all equipment normally associated with an engine room is available. The operation of the engine room's subsystems can be carried out on interactive mimic panels and consoles or monitor-based local operating stations in any combination.

Maximum configuration flexibility

The flexibility in the K-Sim Engine architecture makes it possible to expand the system at any time, with additional models, panels, workstations or complete integrated engine rooms depending on changing training needs. Interchangeable switchboards in the control room allow conversion between different propulsion plants, which increases customer training possibilities. K-Sim Engine can be equipped with touch screens integrated with real-life engine room consoles and panels, which allows instructors to change from one engine model to another in seconds. This provides added value, enabling customers to offer a far wider range of courses with lower initial investment in hardware and faster change-over times.

Realistic training environment

The full mission version of K-Sim Engine offers a true physical shipboard environment with all equipment normally associated with an engine room. To enhance the experience, dynamic engine room sounds are included in the system, which reproduce sounds of e.g. variation in main engine speed, malfunctions in turbo charger air filters, start/stop of pumps, oil fired boilers and compressors, drain and safety valves. By adding realistic engine room sounds, noises and alarms, total realism is achieved.

ENGINE ROOM



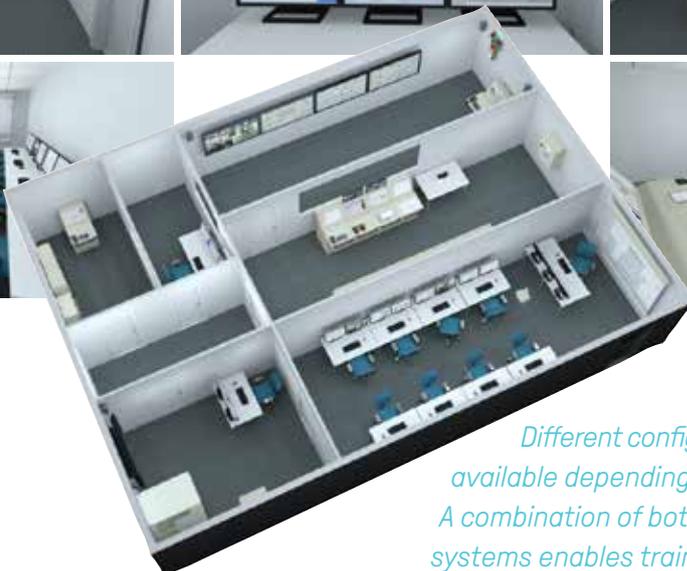
INSTRUCTOR ROOM



ENGINE CONTROL ROOM



DESKTOP SYSTEM



ENGINE CONTROL ROOM

Different configurations and solutions are available depending on training requirements. A combination of both desktop and full mission systems enables training capacity for any level.

Surveillance camera

A simulated Closed Circuit TV (CCTV) surveillance camera view can be integrated into K-Sim Engine models, giving students the ability to see live views of the vessel's funnel, main engine areas or diesel generators area. The funnel view allows students to monitor the exhaust from the ship's engines while visual effects like oil leaks, fire, blackout and a water mist release can be observed in the engine room spaces.

Integrated Automation Systems (IAS)

All K-Sim Engine models features an IAS that covers the user interface for important remote control and monitoring functions, such as:

- Power management
- Auxiliary machinery control
- Ballast/bunker monitoring and control
- Cargo monitoring and control
- Alarm handling
- Trend systems

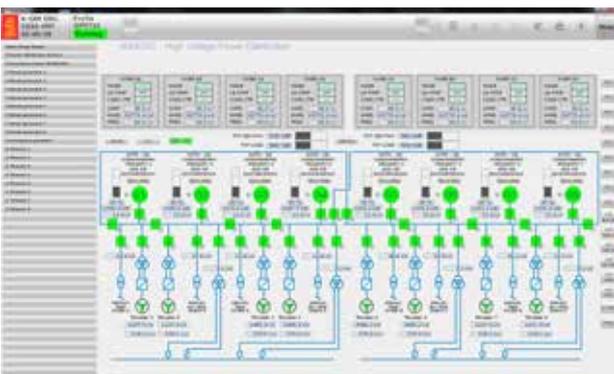
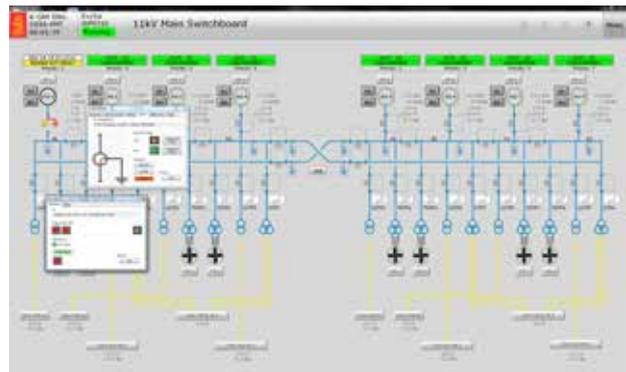
ControlView is an IAS specially designed for K-Sim Engine and is based on our latest human machine interface (HMI) standard, used for the market leading K-Chief control systems. K-Sim Engine has an impressive track record of customised emulation of ship specific automation systems. In addition, K-Sim Engine can be integrated with our real K-Chief and AutoChief vessel control systems. This gives an even higher level of realism, as engineers can train on the identical equipment that they will later operate on board ships.

High Voltage

The revised STCW, requires that all seafarers working with or around high voltage systems are properly trained. KONGSBERG provides a high voltage module for various K-Sim Engine models, enabling training on practical procedures and maintenance on marine high voltage equipment. The module makes it possible to isolate and remove a main circuit breaker in accordance to the correct safety procedures. It also includes training for correct use of interlock keys.

When using simulators during the high voltage courses in combination with the real hardware, KONGSBERG believes that more realistic operation scenarios can be performed. An Engine Room Simulator model in combination with real switchboard equipment such as a high voltage breaker can be used as the main training tool in order to perform training scenarios identical to on board operations and meet the client's expectations in high voltage courses. By using a simulator the operation will have an impact on the entire ship since the process on board is affected.

Photos: CCTV as simulated and displayed in K-Sim Engine, High Voltage mimics and students training on the High Voltage breaker interfaced with K-Sim Engine.



3D virtual simulation systems

Familiarisation benefits

By using the latest available 3D technology, KONGSBERG provides simulator systems that optimise the students learning experience.

Our 3D virtual systems are ideal for engine room familiarisation and give the user an understanding of the complexity of an engine room. Engine room equipment such as specific valves or pumps are often hard to find and time consuming to reach in real life, so focus on communication and case planning is vital. The 3D walkthrough system is therefore an ideal tool for management and communication studies, since realistic time consumption is a mandatory requirement for local operation in the virtual engine room system.

KONGSBERG's 3D applications are available for several engine simulator models, and depending on training goals and requirements, we offer three solutions:

- BigView - interactive mimic with 3D pop-up display
- 3D walkthrough application for class rooms
- 3D walkthrough application for full mission simulators

BigView with 3D pop-up display

BigView is an advanced interactive mimic system displaying K-Sim Engine model process diagrams on large HD monitors with touch functionality. The interactive mimic includes 3D pop-up display of vital parts of the engine room, where students can familiarise and operate equipment found onboard.

3D virtual walkthrough

A selection of K-Sim Engine models are available as 3D virtual walkthrough systems. The system allows students to navigate through the engine room with detailed sub systems such as the boiler, compressors, pumps, pipes and coolers used on board. The student can operate the equipment from within a virtual environment.

The 3D walkthrough system can be delivered for class- room training or for full mission simulators, where students use an X-box controller to navigate around.



Photo on top: K-Sim Engine for classroom with 3D virtual displays. Photo 2: student operating equipment through the pop-up displays in BigView interactive mimic system. Photos 3-4: 3D virtual walkthrough applications.

Integrated crew training

Integrated complete training scenarios

There are many reasons why training the entire crew in the same exercise is beneficial. A strong coordinated crew will likely communicate and collaborate better in operational advanced and emergency scenarios, and likely reduce the possibility of faults caused by human errors.

The K-Sim Engine architecture allows it to be used across a range of different interfaces, offering benefits in value and realism. K-Sim Engine can for example be connected with a KONGSBERG ship's bridge simulator, like K-Sim Navigation and K-Sim Offshore.

The integrated solution enables focus on:

- situational awareness
- interaction and team-work
- interpersonal communication
- leadership and decision making

By integrating simulator systems, customers can run Crew Resource Management training, enhancing interaction skills, improving performance and building even stronger teams.

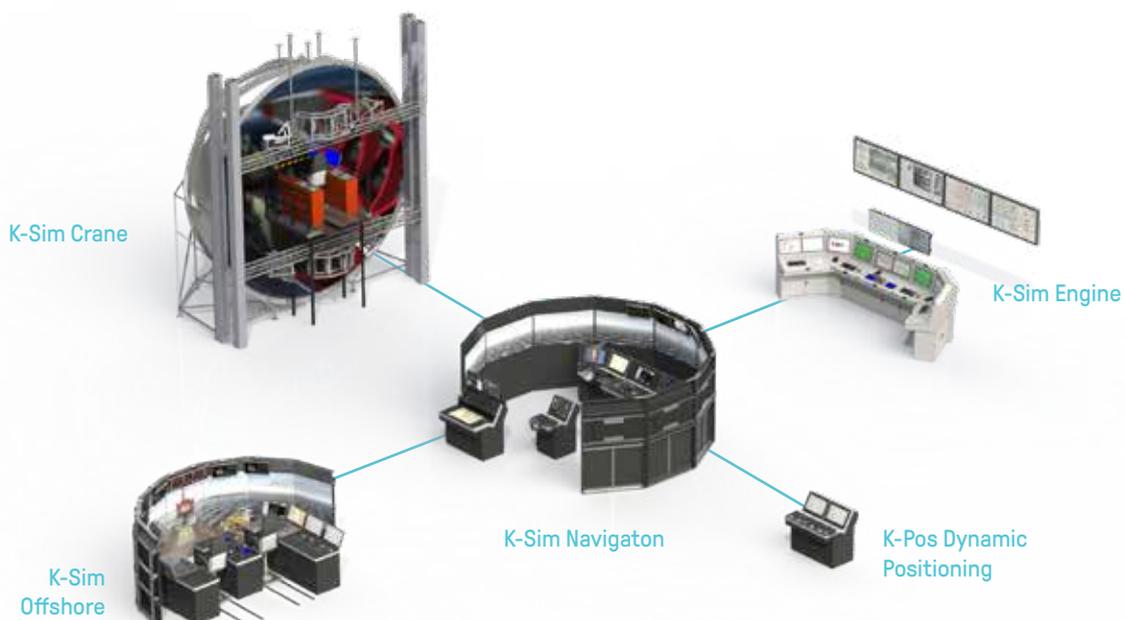
“Maersk Training has a close and professional long-term relationship with KONGSBERG, which for decades has delivered highly realistic simulators including customer specific models. Because of this, it was natural to choose K-Sim Engine when we decided to add engine room simulators to our facilities.

Due to growing complexity of Dynamic Positioning (DP2 and DP3) in drilling and offshore vessels, and zero room for errors due to the environmental and economical impact, the opportunity for both new and experienced offshore personnel to practice emergency situations, is crucial to safety.

With the new K-Sim Engine models customized for offshore rig & vessel training (DE-88, DE-66 and M-42), we are able to offer our high-end customers a training environment identical to what they will experience on board. Features like the sophisticated Power Management System, new Integrated Automation System and interface to DP and K-Sim Offshore are a big leap forward in taking safety and efficiency to the next level.”

- Per Larsen, Instructor, Maritime Department, Maersk Training

Integrated Training Possibilities



Engine simulator models

High fidelity models

All our engine room simulators are high fidelity dynamic real-time process simulators, based on real engine physics and specifications. This means that all sequences will automatically be in proper order and duration, regardless of the operational condition, which is important for real process understanding.

The model library includes models of high, medium and slow speed diesel engines such as MAN Diesel, Wärtsila, Pielstick, MaK and MTU, as well as gas turbine, diesel electric, water jet and steam propulsion.

The model library includes:

Slow speed engine models:

- ERS L11 MC-90-V MAN B&W, VLCC
- ERS L11RTA-III Sulzer, container vessel
- ERS L11 RT-Flex Wärtsila, container vessel
- ERS L11 MAN 6S70ME-SCC, crude carrier

Medium/high speed engine models:

- ERS M11 MaK-IV, trawler
- ERS M11 MaK 8M453, navy logistic vessel
- ERS M11 MaK, container vessel
- ERS M21-II Pielstick, multi purpose vessel
- ERS M22-IV Pielstick, ferry
- ERS M22 MaK, river vessel
- ERS M42 MaK, AHTS
- ERS H22 Water Jet MTU, catamaran

Steam turbine engine model:

- ERS SP-Dual Fuel, turbine ship

Diesel Electric engine models:

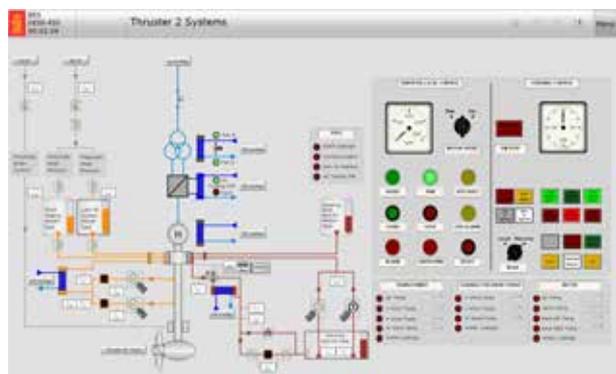
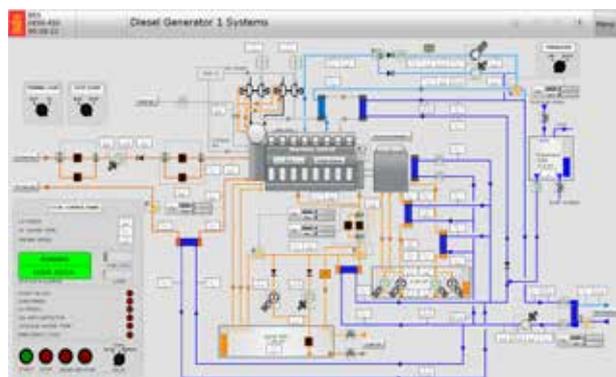
- ERS DE-DF, LNG carrier
- ERS DE22-III, cruise ship
- ERS DE32, landing helicopter dock
- ERS DE66, drill ship
- ERS DE88, semi submersible drilling rig
- ERS DE-DF, cruise ship

Power Management models:

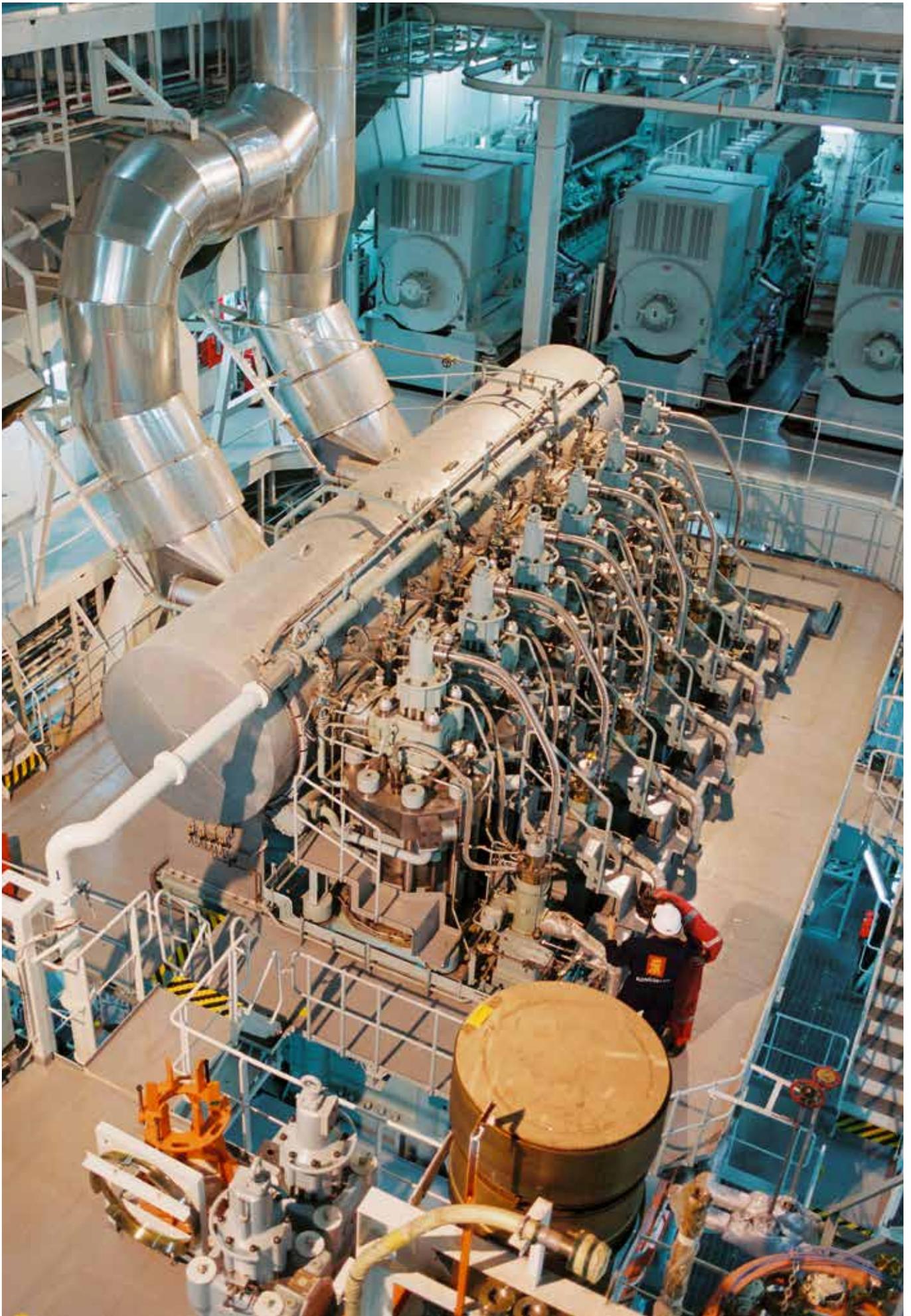
- PMT DE66, drill ship
- PMT DE88, drilling rig

Special task models:

- GE LM 2500 30, gas turbine trainer
- TPP, thermal power plant



The pictures shows different engine views and process mimics of various engine models in the K-Sim Engine model library.





Instructors monitoring a student exercise from the Instructor room. The picture is taken at South Tyneside College, UK

K-SIM Instructor System

The monitoring, assessment and configuration tool for our K-Sim Engine training solutions has been designed to enhance the quality of simulation training by providing complete, intuitive and user-friendly control of student exercises.

K-Sim Instructor enables the instructor to develop customized exercise modules for individuals, teams or a combination of both from any PC running the application, with fully controllable areas such as:

- Initial Condition – describes all the variables at the start of the exercise
- Triggers – a combination of events that initiate an Action, e-Coach message or assessment
- Actions – derived from input variables and malfunctions, which can be initiated instantaneously, or preprogrammed as part of the exercise
- e-Coach messages – an electronic guidance and performance feedback system
- Student Station Configuration – define what information is accessible and visible to students
- Assessment – monitor and assess alarms, and any of the many variables in the simulation models

Recording of all activity during the simulation exercise takes place automatically and review/debriefing can include the replay of parts of or the entire exercise in order to focus on specific learning objectives.

An unique 'resume' functionality also enables an exercise to be stopped and started at will. If a student begins to have problems or fails in a particular operation, the instructor can pause the simulation to give guidance or advice and then resume the exercise. The instructor can also go back to any earlier point in time and restart from there.

With the K-Sim Instructor system, monitoring, assessment and debriefing have never been easier.



Skills Transfer

The leading objective is to understand and operate the entire engine room system in a safe, timely and cost-effective manner. Whether you choose a full mission or desktop version of the K-Sim Engine, your students or employees will learn a vast array of skills thanks to the pedagogical values and high fidelity realism that K-Sim offers.

Typical basic operational training for junior officers:

- Preparing for getting underway
- Maneuvering to open sea
- Steady steaming
- Approaching harbour
- Finishing with engine
- Operation of auxiliary boilers and cargo turbines

Typical advanced operational training for senior officers:

- Failures and Emergencies
- Team training
- Fault diagnosis and tracking
- Crisis management
- Restoring to normal operation

Typical economy/optimizing studies for senior officers:

- Fouling & wear
- Combustion performance
- Control loop optimizing
- Heat balance/recovery
- Variable pitch
- External conditions

Photo: in front a student exercising in K-Sim Engine's control room and behind another student using the BigView system with pop-up display to familiarize and operate equipment found onboard.

“As an instructor, K-Sim Engine allows me to develop standardised exercises and assessments that monitor the student’s progress, providing evidence of successful completion. The system also enables me to develop exercises on the go, providing ‘just in time’ training and to disseminate the training individually or to desktops connected as a group.”

- Jeff Smith, Senior Marine Engineering Instructor, BAE Systems Australia.

“Working with the K-Sim Engine Instructor system really is a pleasure. It is fast to create exercises, but at the same time you can adjust even tiny details, making the scenarios highly realistic, and enable us to test both the technical skills and human factor abilities of the experienced course participants.”

- Per Larsen, Instructor, Maritime Department, Maersk Training Centre, Svendborg, Denmark

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 installation 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 system is designed with maximum flexibility, which makes it easy to add new functionality or complete new control segments thus enable us to offer up-upgrades step by step meeting your changing requirements.

We take pride in knowing that KONGSBERG will give your training an additional competitive edge by:

- Increased system reliability
- Competitive life-cycle support
- Easy up-grade solutions

World-class support program

KONGSBERG's customer support program provides world-class flexible system support to our global simulation system customers. The Long Term System Support Program (LTSSP) consists of two different levels of support: Priority and Premium Customized Care. Each support level offering is designed to address the customer's needs. Investing in an LTSSP ensures that your simulation system is always current and operating at peak capacity; and provides the assistance you need in order to deliver the best simulation training available.

Training

Qualified personnel are one of your major assets in efficient and safe operations. Thus, we offer modular training courses to instructor and technical personnel.

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



WORLDWIDE OPERATIONS

KONGSBERG is an international corporation with strong Norwegian roots. Collaboration with our customers, partners and suppliers, and a commitment to understand the context where our technology is applied, are important driving forces behind the corporation’s international development and growth.

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