



KONGSBERG

Scope of Work

Quotation No.: NO109097A / 19 February 2018

K-Sim® Cargo Desktop Simulator Software Licenses

Fagskolen i Hordaland Avd. Nygård



© 2018 Kongsberg Digital AS

All rights reserved

No part of this work covered by the copyright hereon may be reproduced or otherwise copied without prior permission from
Kongsberg Digital AS

DOCUMENT STATUS

Issue No.	Date	Inc. by	Issue No.	Date/Year	Inc. by
A	19 February 2018	PHA			

CHANGES IN DOCUMENT

Issue No.	Paragraph No.	Paragraph Heading/ Description of Change
A		First Issue

Approved: Bjarne Torkelsen
Date: 19 February 2018

Address:

Kongsberg Digital AS
PO Box 111,
N-3191 Horten, NORWAY
Telephone: 47 67 80 48 00
E-mail: maritimesimulation.sales@kdi.kongsberg.com
Web site: <http://www.kongsberg.com>

TABLE OF CONTENTS

Section		Page
1	INTRODUCTION.....	1
1.1	Statement of Compliance	2
2	TRAINING PHILOSOPHY	3
2.1	Philosophy of Simulation	3
2.2	Professional Demands	3
2.3	General Training Objectives	4
2.4	Specific Training Objectives	5
3	PROPOSED SOLUTION	6
4	SOFTWARE CONFIGURATION	7
4.1	Instructor SW Applications.....	7
4.2	Student SW Applications	7
5	SIMULATION MODELS DESCRIPTION	8
5.1	CHS SCC-II Software Model	8
5.1.1	The Simulated Vessel	8
5.1.2	SCC Software Models	9
5.1.3	CHS SCC II Selected Illustrations	10
5.2	CCTV	13
6	SOFTWARE LICENSES	15
6.1	K-Sim Cargo System Licences	15
7	DOCUMENTATION	15
8	PROJECT MANAGEMENT	15
9	QUALITY ASSURANCE AND QUALITY CONTROL	15
10	INSTALLATION AND START-UP.....	15
11	SALES PRICE.....	16
12	GENERAL TERMS AND CONDITIONS.....	16
12.1	Expenses Excluded in Sales Price.....	16
12.2	Payment Terms.....	16
12.3	Time of Delivery	16
12.4	Terms of Delivery	16
12.5	Validity of Quotation	16
12.6	Equipment Warranty	16
12.7	Product Recycling	17
12.8	Other Terms and Conditions	17

1 INTRODUCTION

The offered Scope of Work is configured to meet the perceived software and hardware requirement set forth by the customer.

By choosing Kongsberg, the customer will have a flexible pedagogical training tool that will assist the instructor to transfer his experience and knowledge to the students.

All Kongsberg simulation models meet the STCW requirements. Furthermore each individual K-Sim Cargo model has achieved DNV GL Statement of Compliance as a Class A simulator based on latest DNV GL Standards. This ensures the customer to have access to a training tool that meets most training objectives.

Kongsberg project execution processes and procedures utilise highly competent and experienced personnel and is anchored to our Quality Audit procedures. It provides regular status reporting, design check points, acceptance testing procedures, comprehensive system training and a long term service and support program.

Kongsberg has developed a modular SW configuration utilising logic blocks for pumps, valves, filters, controllers, etc., that are linked together according to the system design documentation to form a real-time simulated version of the actual system. The use of true physical and gas laws in each system SW configuration ensures that individual systems and interconnections between systems act and react as in real life, which will provide the users with confidence that the simulator training carried out is as close to the actual situation as possible.

The HW cabinets, consoles, switchboards and panels are configured and will be located in a simulator building layout such that the student carries out procedures and operations in a similar way to being on-board.

Kongsberg has an extensive reference list of installations, which include government and commercial institutions, universities, training and research centres. The accuracy of the Kongsberg models ensures training is meaningful and positive, and results in marked improvements of on-board operations, economy and efficiency. Research centres also value the accuracy when studying and predicting the effects of changes in various cargo operations.

With more than 40 years of accumulated experience realized through a huge number of installations world-wide, Kongsberg, the pioneer and the largest supplier of maritime simulators, trust you will find an attractive Scope of Work that addresses all your training requirements and needs. Furthermore, Kongsberg hopes that the enclosures will contribute and convince you to make the right decision.

1.1 Statement of Compliance

Each individual K-Sim Cargo model has achieved DNV GL Statement of Compliance

DNV-GL	
STATEMENT OF COMPLIANCE	
Statement No: 002/170301 DNV GL Id. No: 10564901	
Particulars of Product	
Function area:	Liquid Cargo Handling Simulator
Type designation:	TANKER FOR OIL COW, INERT K-Sim Cargo . VLCC Very Large Crude Carrier - DH
Particulars of Manufacturer	
Manufacturer:	Kongsberg Digital AS
Manufacturer address:	Maritime Simulation, Horten, Norway
This is to confirm: That the above product is found to comply with Class A- Standard for Certification of Maritime Simulators No. DNVGL-ST-0033 2017.	
Application The above Standard is based on requirements in the STCW Convention, Regulation I/12.	
This Statement is valid until 2022-03-01, provided the requirements for the retention of the Statement will be complied with.	
Issued at Sandefjord on 2017-03-01	
 Nils Gunnar Bee Head of DNV GL SeaSkill	 Lars Markusson Auditor
	
	
Form code: 48.066a Revision: 2016-10 www.dnvgl.com Page 1 of 2	
<small>This Statement is subject to terms and conditions overleaf. Any significant change in simulation performance may render this Statement invalid. © DNV GL 2014. DNV GL and the Horizon Graphic are trademarks of DNV GL AS.</small>	

Example of a DNV GL Statement of Compliance for one of KDI simulation models

2 TRAINING PHILOSOPHY

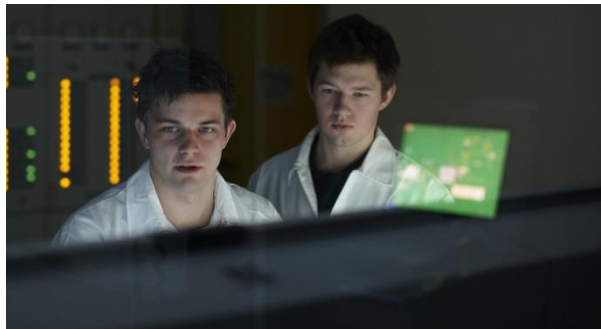
2.1 Philosophy of Simulation

Simulator training has over the last years proved to be an effective training method when training shipboard personnel, especially where an error of judgement can endanger life, environment and property. A dynamic real-time computerised simulator can compress years of experience into a few weeks, and give knowledge of the dynamic and interactive processes typical for a real cargo operation.

Proper simulator training will reduce accidents and improve efficiency, and give the crew/operator the necessary experience and confidence in their job-situation.

The best way to acquire practical experience is to learn from real life on a real vessel, but today the efficiency requirements do not allow for enough of this kind of onboard education, hence the training has to be carried out on a simulator. Practising decision-making in a simulator environment where decisions and their effects are monitored opens a unique possibility to evaluate the effect of the decisions.

The opportunity to experiment on specific problems and get answers on questions as: “what happens if?” without leading to wrecking of components and resulting off hire costs is unique. A simulator will give an easy introduction to background theories through the realistic operation of the simulator.



It is important that the trainees experience life-like conditions on the simulator and that the tasks they are asked to carry out are recognised as important and relevant in their job-situation. The trainees should be challenged at all levels of experience in order to achieve further experience and confidence.

2.2 Professional Demands

The professional demands are gathered from the following sources:

- International IMO - rules
- National certificate rules in some trend-setting countries
- Pedagogical demands
- Technical demands to equipment



2.3 General Training Objectives

The maritime training centre will be able to train junior officers in basic cargo handling operations, senior officers in emergency operations and trouble-shooting, and to train senior personnel in optimal operations during cargo handling. This will be achieved by controlled training, leading to better understanding of the total cargo operation, as a function of realistic simulation of the various model dependant cargo systems.

In order to fulfil these requirements the simulator shall be suitable for, but not limited to:

- Basic and advanced training and education of students leading to professional qualifications and a higher officer qualification
- Refresher and recurrent training for qualified officers
- Training officers in the operation of cargo equipment together with the most vital auxiliary equipment
- Enabling detailed studies in the different processes of a ship's cargo system
- Training officers to localise faults and deterioration, and to clearly demonstrate the impact of various types of faults and deterioration on the system's total efficiency
- Study of overall operational economy

2.4 Specific Training Objectives

Dependent on background knowledge and experience of the trainee, the simulator shall at least be capable of creating situations ensuring appropriate training in:

System familiarisation:

- Tank arrangement
- Pipe line arrangement
- Pipe line control valves
- Cargo compressors (model dependant)
- Pumps
- Instrumentation
- Controls
- Basic procedures

Special operations and procedures:

- Gas freeing
- Tank atmosphere evaluation
- Use of inert gas system
- Nitrogen purging (model dependant)
- Cool down of pipes and tanks (model dependant)
- Draining and stripping
- Oil discharge monitoring

Cargo and ballast operations:

- General provisions
- Ballasting
- De-ballasting
- Loading cargo
- Discharging cargo

Operational problems:

- Normal working conditions
- Introduction of:
 - System faults
 - Malfunctions
 - Accidents
- Emergency procedures.

Planning/preparation of cargo operations

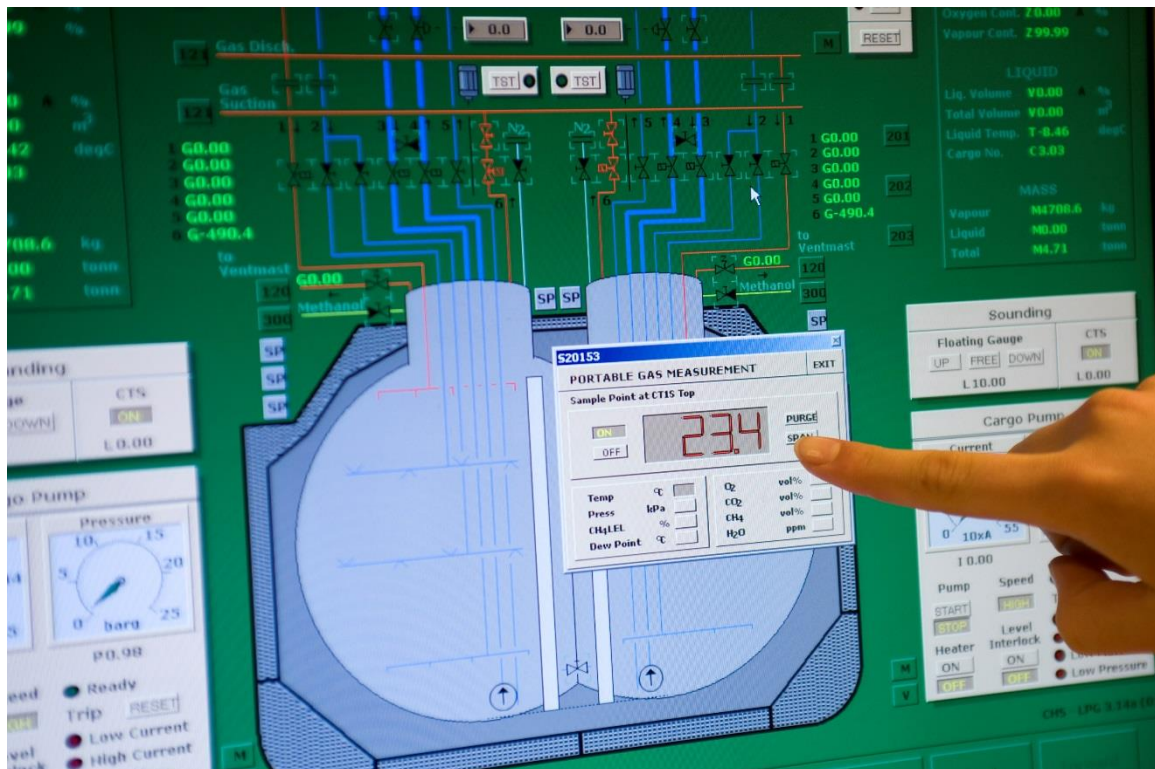
- Use of load computer to validate the load discharge plan with focus on load line conventions and load zones as well focus on limitations to cargo operations from lack of space (volume) or buoyancy (loading marks) and usage of consumables before entering the limiting load zone.
- Cargo expansion due to temperature changes.

3 PROPOSED SOLUTION

Kongsberg Digital is offering Bergen Maritime Fagskole Cargo handling simulator software to be installed at the existing Desktop Simulator System in Bergen. Following main delivery items is included:

- Model Software
- Documentation
- Quality Management
- Remote Installation

All items listed in this Scope of Work will be provided as part of the quoted system.




4 SOFTWARE CONFIGURATION

The following Kongsberg SW applications are included as part of Scope of Work.


4.1 Instructor SW Applications

Instructor Applications	Fixed License(s)
K-Sim Cargo Instructor System Professional	Reuse Existing License

Simulation Models available on Instructor Station(s)	Fixed License(s)
 K-Sim Cargo CHS SCC II Suezmax Crude carrier with K-Load loading calculator 82 159 GRT	1

4.2 Student SW Applications

The following Kongsberg Student SW applications are included as part of Scope of Work:

Simulation Models available on Student Stations	Fixed License(s)
 K-Sim Cargo CHS SCC II Suezmax Crude carrier with K-Load loading calculator 82 159 GRT	14

5 SIMULATION MODELS DESCRIPTION

5.1 CHS SCC-II Software Model

The liquid cargo handling simulator SCC-II, simulates a Suezmax crude oil carrier with 12 cargo tanks and 2 slop tanks.

The vessel is equipped with an inert gas plant, which cleans the flue gas and replaces the combustible gases in the cargo tanks with low- or non-flammable gases. The pump configuration represents a typical crude oil carrier with three cargo pumps, two ballast pumps, three oil/gas separators, stripping pump and ejector.



The cargo handling simulator models of tanks and ballast system is based on a real Suezmax Crude Carrier. The simulator has a sophisticated integrated automation system in order to do the CCR operations. There are additional process mimics for operation of the systems outside of the CCR. The model contains a CCTV system with 3 camera views, both manifolds and a 3rd camera with view from the jetty.

Additionally the state of the art K-Load (load calculator) integrated in the model. The K-Load uses the various tank levels and the corresponding specific gravity and calculates hydrostatic conditions, intact stability, longitudinal strain, relative tank content and damage stability. It can also produce ullage reports, loading reports, ROB/OBQ reports, ballast/consumable reports and water ballast exchange reports.

The model is certified by DNV GL according to their latest Class A-Standard for Certification of Maritime Simulators No.DNVGL-ST-0033 January 2011. This Standard is based on requirements in the STCW Convention, regulation I/12.

5.1.1 The Simulated Vessel

Vessel Type	Suezmax oil tanker
LOA	269,16
Breadth	46
Depth Moulded	24,40
Draught, at design DWT	16,20
Light Ship Weight	24,300 mt
DWT, scantling	152,522 mt
DWT, design	138,393
GRT, international	79,903 mt
GRT, suez	82,159 mt
NET, international	48,804 mt
NET, suez	76,318 mt

5.1.2 SCC Software Models

The following SCC software models will be provided:

- Integrated Automation System:
 - Alarm Handling
 - Trend Systems
 - Remote operation Valves and Pumps
 - Tank Monitoring

- Shore tanks

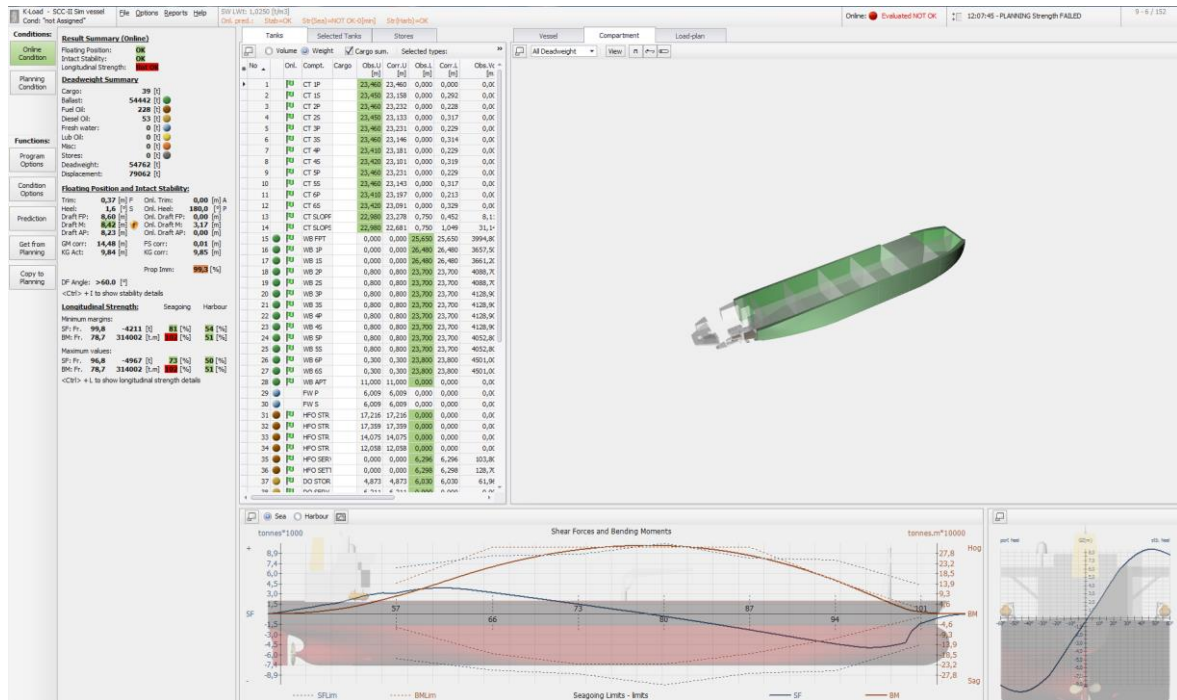
- Cargo System 1:
 - Cargo Pumps with Vacuum Separators
 - Cargo Eductors
 - Stripping Pump
 - Cleaning Heater

- Cargo Sys2:
 - Cargo Bottom Lines with Valves
 - Cargo Tanks & Slop Tanks with:
 - Ullage & Pressure
 - Average Temp, Top, Middle and Bottom temp
 - Heating Coil and PV Valve

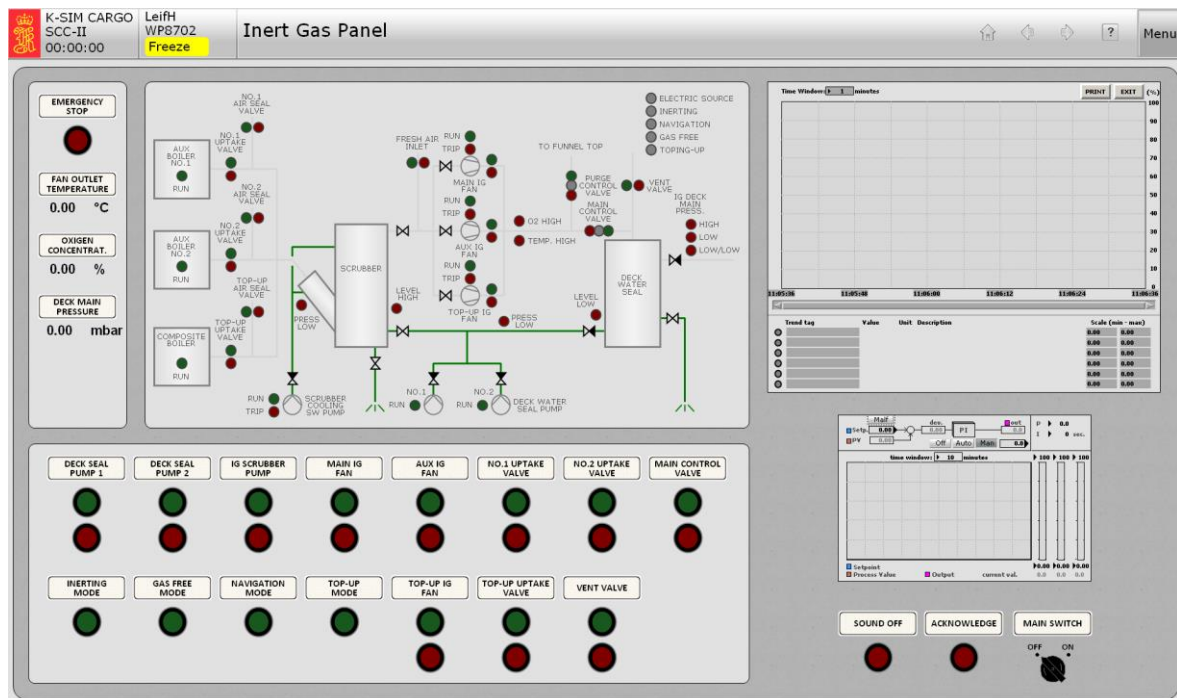
- Deck Lines
- Cargo Pumps
- Cargo Cleaning System with Heater
- ODME
- Inert Gas System with Distribution
- Ballast System include lines, tanks, 2 pumps & ejector
- AUS- Automatic Unloading System
- High and High-High Level Alarms
- Intact Stability
- Longitudinal Strength – Bending Moment and Shear Forces
- Offline Load Calculator
- CCTV



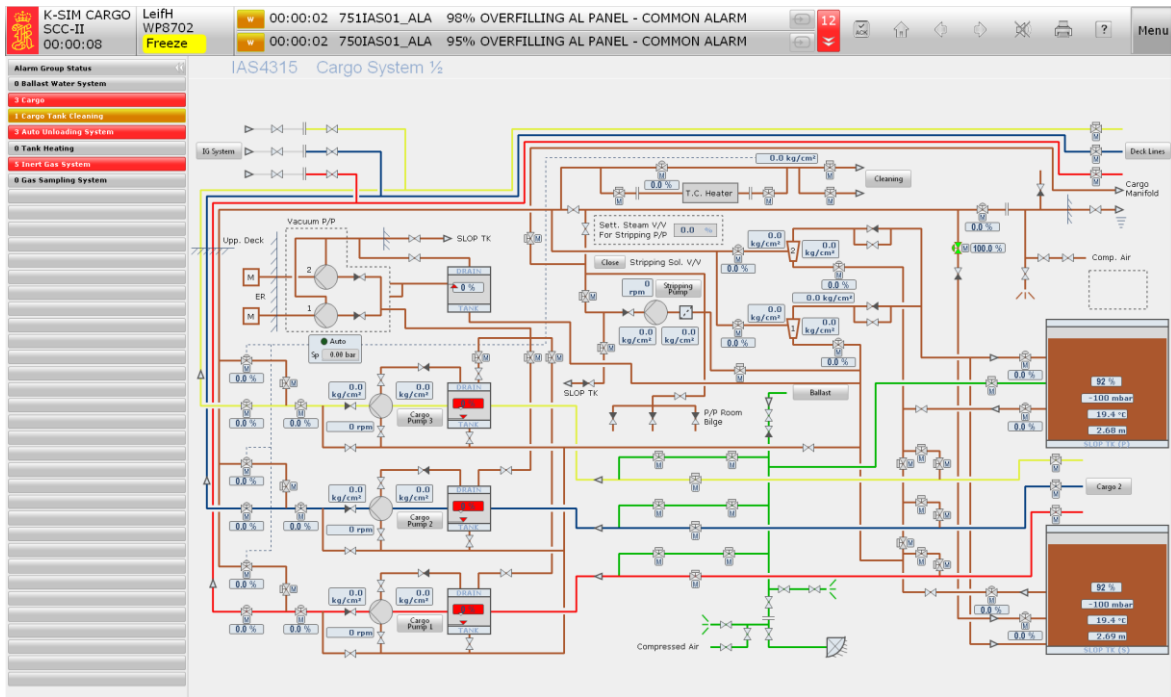
5.1.3 CHS SCC II Selected Illustrations



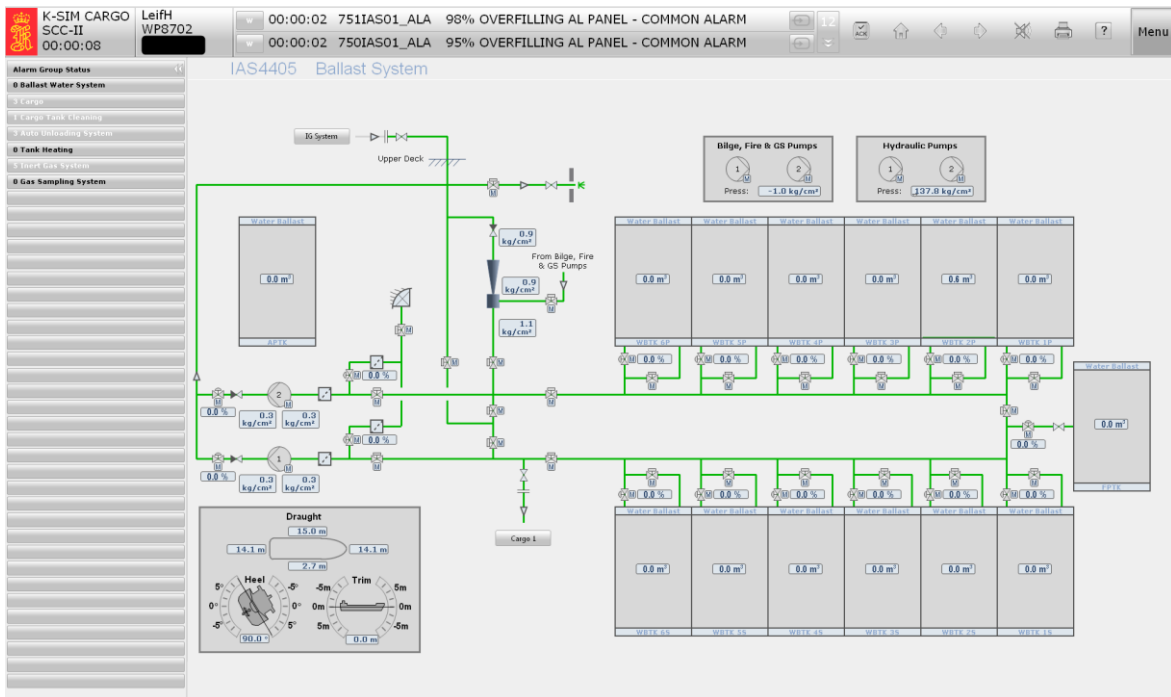
Load Calculator K-Load



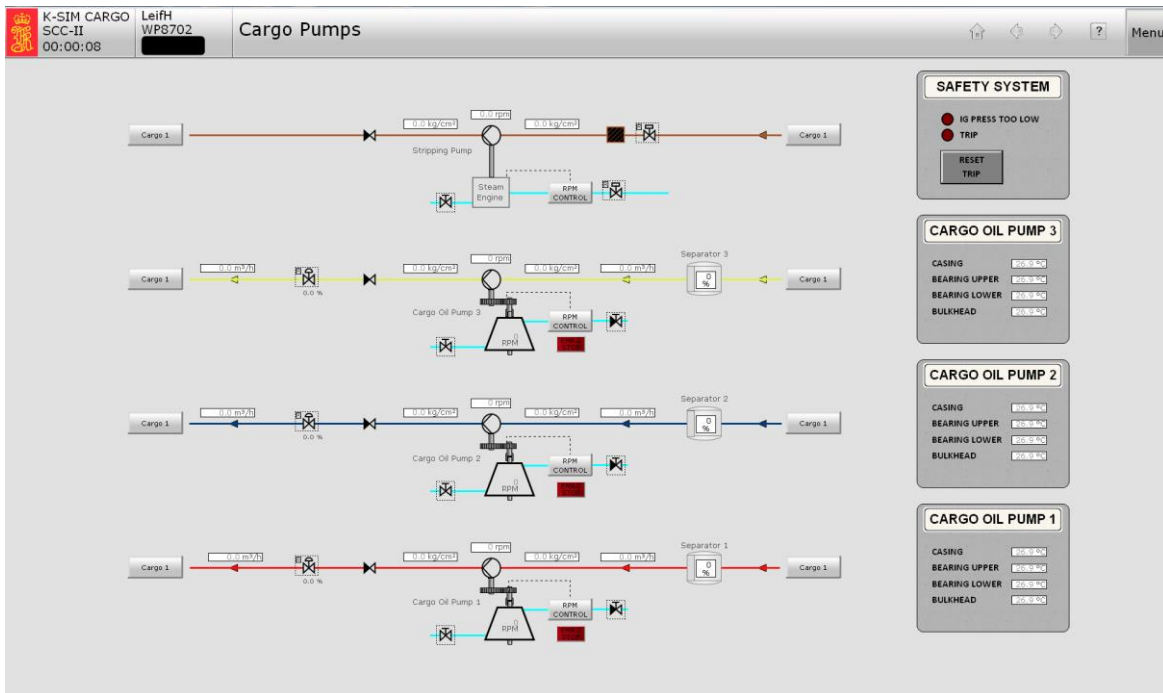
Inert Gas Panel



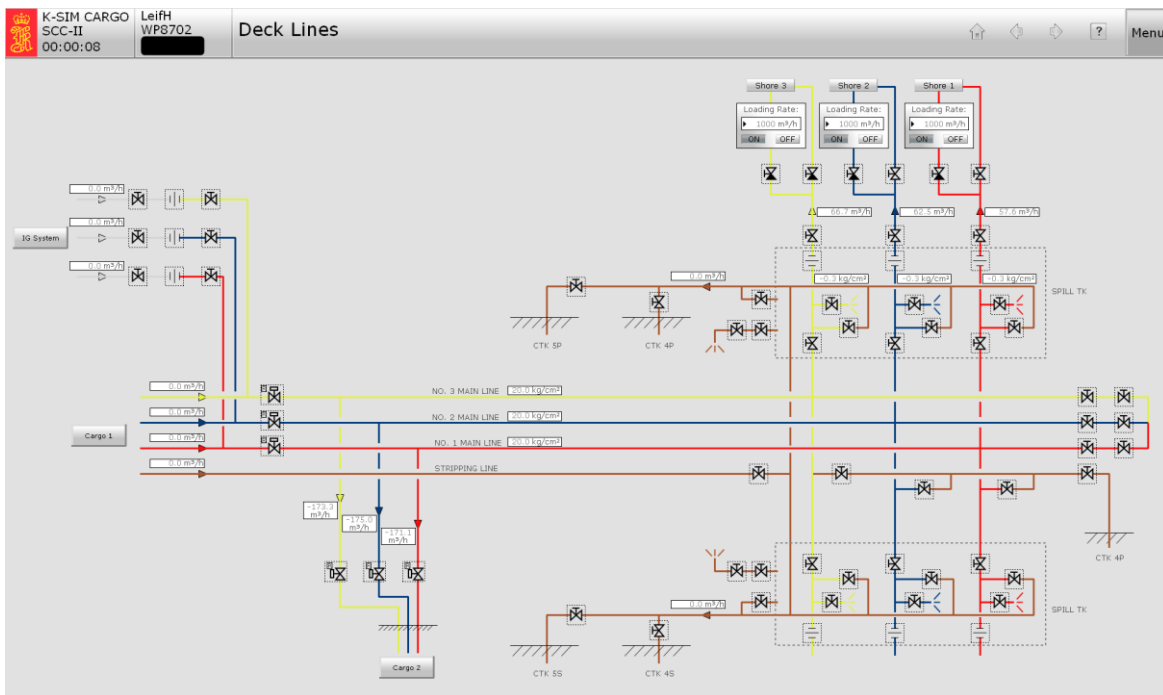
IAS Cargo System



IAS Ballast System



Process mimic Cargo Pumps



Process mimic Deck Lines

5.2 CCTV



K-SIM CARGO CCTV FOR CARGO HANDLING SIMULATORS

A part of DNV requirements for a Class A Cargo handling Simulator is to have CCTV functionality (Closed Circuit Television) on the simulated vessels manifolds and in addition to a simulated Jetty Camera.

Functionality

The CCTV Visualization is connected to the normal operating pages and when blind flanges are disconnected from the operating page, the same can be seen in the TV picture. Loading arm or cargo hose connection and disconnection operate in the same fashion.

Leakage due to operator error or a set malfunction on the coupling can also be seen on the simulated CCTV. Oil, chemical and gas leakage is visualized in the various cargo simulators.

Cameras

The CCTV system can be delivered as an integrated part of the Simulator and can be chosen from the main directory as a normal simulator page.

While in the CCTV picture mode there are three different cameras to choose from: Port Manifold, Starboard Manifold & Jetty Camera.



Loading arm connected



SCENARIOS

The operation condition page, which can be accessed from the 'F5' button, enables the scenario, including the weather condition and the 'Ship state', to be changed



Use of the Manifold Water spray system is one visual effect in the CCTV system.



Manifold water spray

When loading cold cargoes like LNG, the icing on loading arms is visible.



Cold loading arms on the LNG tanker

When the scenario is set to 'At Sea' & 'Lightering', another vessel is made visible.



Offshore cargo transfer

50

6 SOFTWARE LICENSES

6.1 K-Sim Cargo System Licences

Description	
Complete to run the quoted system with software licence and back-up copy	Included

7 DOCUMENTATION

Item	Document name	
1	Instructors manual includes: Basic system description and instructors facilities	Included
2	Users manual includes: <ul style="list-style-type: none"> • Basic system description • Description and operation of the monitoring and the remote control systems • Functional description 	Included

Note: Manuals supplied with subcontracted equipment will be supplied in the quantities received from the manufacturer.

All Kongsberg Digital documentation where applicable will be delivered in Adobe® Acrobat® PDF-format. All system manuals will be written in English.

8 PROJECT MANAGEMENT

When the contract is signed, Kongsberg Digital will assign a project manager who will be responsible for administration and day-to-day communication with the customer up until delivery and installation of the system specified in the quotation. Project meetings outside KDI's premises will be charged according to cost.

9 QUALITY ASSURANCE AND QUALITY CONTROL

Quality assurance and quality control are included.

10 INSTALLATION AND START-UP

The installation of the simulator equipment will be done by one of Kongsberg Digital's experienced installation engineers. Installation will be done remotely

11 SALES PRICE

Firm fixed quotation to: Fagskolen i Hordaland Avd. Nygård

Item	Description	Price in: NOK
1	<p>K-Sim Cargo Handling Desktop Simulator Software Licenses:</p> <ul style="list-style-type: none">• 1+14 x Licenses for CHS Model “SCC II Suezmax Crude Oil Carrier”• Remote Installation on Customers’ Existing Desktop Simulator System <p>Sales Price According to Scope of Work “NO109097A SOW CHS Desktop 1+14 SCC II Licenses”</p>	486.000.-

12 GENERAL TERMS AND CONDITIONS

12.1 Expenses Excluded in Sales Price

The sales price is exclusive of possible import duties, taxes, any withholding tax and VAT.

12.2 Payment Terms

Proposed payment terms are:

- 40% of the Contract Price shall be paid at Contact Signature.
- 30% of the Contract Price shall be paid at shipment.
- 30% of the Contract Price shall be paid no later than 30 days after taking-over.

Kongsberg is prepared to discuss alternative solutions

12.3 Time of Delivery

The equipment will be delivered to Fagskolen i Hordaland Avd. Nygård TBD months after signed contract. Remote installation can be done on short notice

12.4 Terms of Delivery

According to INCOTERMS 2010: **CIP/DAP** Fagskolen i Hordaland Avd. Nygård, Norway, inclusive customs clearance.

12.5 Validity of Quotation

This quotation is valid until: **01 May 2018**.

12.6 Equipment Warranty

Kongsberg Digital AS warrants for a period of 12 months from the date of shipment according to Kongsberg Digital’s standard terms for warranty.

12.7 Product Recycling

Please check our website:

<https://www.km.kongsberg.com/ks/web/nokbg0240.nsf/AllWeb/A631C7E1F6D89E28C1257CFB00300AD6?OpenDocument> for more information.

12.8 Other Terms and Conditions

Please refer to attached PDF-document:

609407/2 "Standard_Cond_S&I_of_SW_and_HW Logo.pdf".