

K-SPICE® LIFE-CYCLE SIMULATOR



KONGSBERG

K-Spice® is a dynamic process simulation solution designed for detailed simulation of oil and gas processes and control systems throughout the whole life cycle. The simulator combines improved features for system management, thermodynamics, and numerical solvers with flexible and intuitive graphical user interface.

KONGSBERG has been the leader in providing high fidelity dynamic simulators for process, instrumentation and control engineering for many years.

KONGSBERG's life cycle simulation concept describes how a simulator and simulations can be used throughout the development and operational phases of a project.

As the project progresses, the functionality of the simulator grows and develops in line with the requirements of the different project stages.

The level of technical information available will increase significantly from the conceptual phase through to commissioning, and the simulator will evolve accordingly, incorporating the detailed technical information in to the model.

K-Spice is designed to support all project and operational phases for a production facility.

For process design and control system philosophy check out and safety analysis working with the EPC, K-Spice® Design

ensures that issues are caught in the early stages of a project avoiding costly re-engineering and delays to startup. K-Spice® Verify uses the same high-fidelity model to analyse the DCS vendors process control and shutdown systems and to allow the operator to verify all operating procedures.

The K-Spice model can also be used as an Operator Training System, K-Spice® Train, which allows the operators to practice startup procedures in an entirely safe and controlled environment, for assessment and accreditation.

Once the production has started, it will go on continuously. The K-Spice model can be used to fine-tune the PID controllers and test out optimised control system logic to improve stability of the system and therefore increase production.

The engineering model may be used to analyse process and control modifications. Once modifications have been approved, they are tested using a check-out system. This reduces the risk of changes causing production upsets that could increase offshore installation time.

KONGSBERG is an international corporation that offers high-technology solutions to help ensure safer, more efficient operations under extreme and complex conditions. The Group is a world-wide knowledgebased organisation with a well organised performance culture.

KEY FIGURES 2015 KONGSBERG



7 688 EMPLOYEES

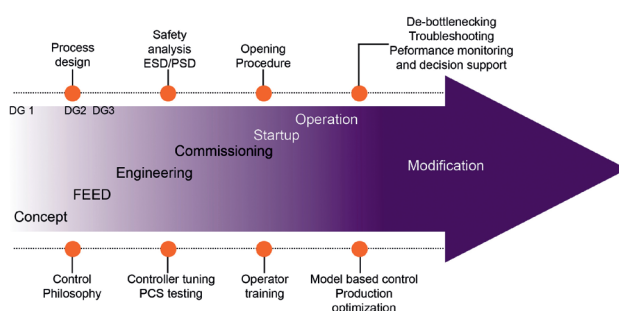
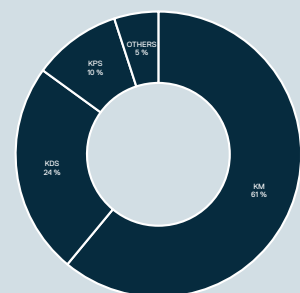


MORE THAN 25 COUNTRIES



83% OF THE REVENUES FROM OUTSIDE NORWAY

DISTRIBUTION OF REVENUES 2015



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K-SPICE® DESIGN

Design verification

Increase the understanding of process interactions and dynamics, and develop and verify process design.

- HAZOP cases
- Compressor protection studies
- Identification of bottlenecks
- Process equipment requirements
- Investigate integrity of safety systems

Control philosophy verification

Development and verification of basic control and advanced process control strategies.

- Load balancing
- Sensitivity to process disturbances
- Compressor studies
- Trips
- Startup and shutdown sequences
- Anti-surge control

Safety analysis

Test how the process will behave during a process shutdown.

- Verify that the shutdown logic protects the process
- Test the ability to reset all active shutdowns and start up the process after complete process shutdown
- Detail test of all causes and effects

K-SPICE® VERIFY

Control system verification

Pre-tune PID-controllers before startup

Tuning controllers for different rates

Evaluate use of gain scheduling

Increase plant robustness

DCS Test and validation:

- Alarm and trend system
- Control and shutdown logic
- Startup sequences
- Tuning controllers for different rates
- Evaluate use of gain scheduling
- Increase plant robustness

Operating procedures verification

- Create/test plant startup procedures
- Startup overrides
- Startup time to normal operations

K-SPICE® TRAIN

Operator training

Realistic training in a safe environment

- Process startup and familiarization
- Emergency response training
- Control system training
- Operator assessment and refresher courses

K-SPICE® MATCH

Operational support

A methodology to increase production rates and improve regularity

- Model validations against real-time measurements
- Initialization of offline Operator Training Simulator with real process conditions
- Replay of events that have happened on the plant

For more information on K-Spice®

dynamic process simulation, contact your local KONGSBERG representative or visit the website at

www.kongsberg.com/kogt.

