MEETING THE TRAINING DEMAND FOR HIGH VOLTAGE

The International Maritime Organisation (IMO) has mandated High Voltage Breaker training to improve safety in shipping, meaning that engineers and maritime officers must complete STCW based courses to retain their Certificate of Competence.

KONGSBERG’s world leading K-Sim Engine simulators are the perfect choice to meet the new training requirements in section A-III/1, A-III/2, A-III/6 and B-III/2 in the STCW Code 2010.

K-Sim® Engine HV trainer

KONGSBERG’s K-Sim Engine models with high voltage (HV) functionality are designed to meet the training requirements in the STCW Code 2010. Integrated with a real HV circuit breaker, K-Sim Engine enables safe, realistic and efficient training of electrical engineer students and crew, fully meeting the STCW requirements.

Training - operational level:
- Functional, operational and safety requirements for marine HV system
- Basic arrangement of HV systems and their protective devices
- Immediate actions to be taken under fault conditions
- Hazards associated with HV systems, incl. safety procedures related to disconnection, isolation and removal of a real circuit breaker
- Practical procedures and maintenance
- Use of trapped key system in high voltage systems

Training - Management level:
- Assignment of qualified personnel for HV maintenance and repair
- Taking remedial action necessary during faults in a HV system
- Producing a switching strategy for isolating components of a HV system
- Selecting suitable apparatus and carry our procedures for isolation and testing of HV equipment, complete with safety documentation
High Voltage Training Solution

Several K-Sim Engine simulator models are available with a simulated high voltage (HV) switchboard and interface to a real HV breaker. K-Sim Engine models with the HV feature meet new STCW requirements for practical HV training and enable electrical engineers to understand HV systems, practice and develop safety procedures in a safe training environment.

A common high voltage training solution consists of:
1 student station and 1 instructor station with a K-Sim Engine model incl. HV functionality and 1 real HV breaker.

The optimal approach to ensure realism in HV operational training is achieved through the integration of high fidelity simulators and real HV circuit breaker. K-Sim Engine models can easily be integrated with a real circuit breaker enabling more realistic training scenarios identical to on board operations. While the circuit breaker enables physical operation like isolation and earth down equipment, the simulator offers process understanding. Since the real circuit breaker is fully integrated, any operation of the circuit breaker will be reflected in the simulated electric power plant and vice versa. The instructor can generate malfunctions and assess performance during and after the exercise.

High Voltage mimics
A mimic diagram represents the HV plant which enables both operational and safety procedure training connected to isolation and earth down of equipment. The synchronising panel and all circuit breakers are available from pop-up panels. The operator must then follow a real operational procedure on the equipment in order to perform service.

Trapped Key System
Trapped key interlocks are widely used to ensure safe access to potentially live equipment in a real HV system. The main principle is as follows; any switchgear that may cause live parts in areas to be accessed must be isolated, earthed and locked without any possibility for re-connection as long as that particular area is accessible for maintenance. An example of a possible training scenario is to access a transformer or a converter due to a malfunction. The key lock system forces the users in such cases to isolate and earth down the equipment.

Integrated Automation System
All K-Sim Engine models feature an Integrated Automation System (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

When performing operations on the real HV breaker, this will reflect status and alarms in the IAS as on board an actual ship.

Photo below: Screen dump of the mimic diagram presenting the high voltage switchboard
ABB High Voltage circuit breaker

Maritime training centres providing high voltage training courses by using real high voltage switchboards and distribution systems are limited to perform hands on hardware operation based on well prepared scenarios. When using simulators during the high voltage courses in combination with a real hardware circuit breaker, more realistic operational scenarios can be performed.

Real switchboard equipment such as a high voltage circuit breaker from ABB, can be integrated with a K-Sim Engine model to perform training scenarios identical to onboard operations. By using a simulator the operation will have an impact on the entire ship since the entire process onboard is affected.

Circuit breaker type vacuum:
- Rated Voltage: 12 kV
- Rated Frequency: 60 Hz
- Rated Busbar Current: 630 A
- Rated Short Circuit Current: 16 kA
- Peak Current: 40 kA
- Local Control Voltage: 24 VDC
- Weight: 630 kg

A service trolley is included with the delivery.
K-Sim Engine Simulator models for HV training

KONGSBERG has an extensive and expanding library of K-Sim Engine simulator models with various high voltage system configurations. All KONGSBERG models with high voltage systems can be connected to a real high voltage circuit breaker.

Available KONGSBERG K-Sim Engine models for HV training:

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 LNG cruise ferry
- ERS DE42 landing ship dock

Power management models:
- PMT DE66 drill ship
- PMT DE88 semi-submersible drilling rig

"We are extremely pleased with the HV solution delivered by Kongsberg Digital. The system enables us to offer courses for Engineers who need to upgrade their certificates according to the new STCW 2010 requirements. The course we provide is customised and comprises 50 hours of theory and practice at our school, in addition to 20 hours of self-study on electricity safety prior to this. The courses have become very popular and we are running HV courses every other week now"

- Lars Hellevik, Instructor at Bergen Maritime Vocational School, Norway