3KEYMASTER™ Marine Systems

Simulation Platform

CURTISS-WRIGHT

Marine Applications

The 3KEYMASTER™ simulation environment, developed by Curtiss-Wright's Simulation Group*, has proven to be a versatile simulation tool not only for power and process plant simulation but also for marine propulsion systems modeling. 3KEYMASTER™ has been used in the development of various Ship Training simulators powered by Diesel, Gas Turbine or Steam Turbine Propulsion.

How Can 3KEYMASTER™ Enable the User?

Cost and complexity of the process being modeled have been barriers to the adoption of simulation in marine engineering. 3KEYMASTER™ changes that. Built ground-up, using true object-oriented technology with an open architecture, the software provides a fast effective modeling platform for marine systems. The software has been used not only to create training simulators but also as an embedded environment to support the design and testing of marine flow, electrical, and control systems.
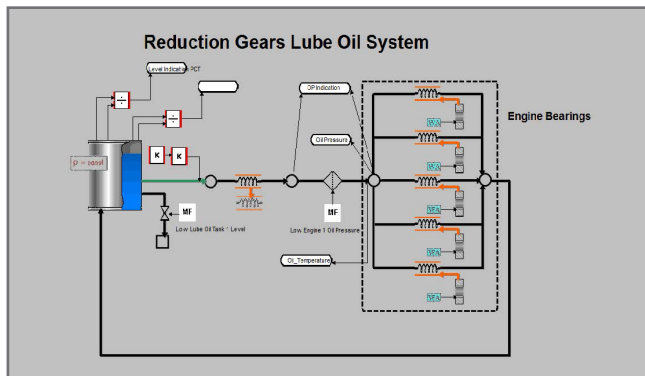
Engine Room Simulation Drawing

3KEYMASTER™ Advantages

- Ease of use—fully graphical approach, no programming knowledge required. This allows for engineers with no programing experience to develop simulation models of marine components and systems.
- Fast, efficient, and robust environment for cost-effective model construction, test, and engineering
- Comprehensive, accurate, high-fidelity modeling of systems. Knowledge of physical principles and equation solution methods are embedded in the modeling tools.
- Simulation, Logic, Relay, Single-Line Diagrams can look exactly like the customer data. This allows for easy debugging of systems and faster understanding of the modeled configurations.
- Multi-user parallel development on projects
- Ease of multithreading or parallel processing of simulation tasks
- Extendable—easy to add new modeling objects and code, or port custom code, to provide complete simulation of complex systems

*: WSC, a legacy brand of Curtiss-Wright's Simulation Group, headquartered in Frederick, MD, is a global simulation and services company. Acquired by Curtiss-Wright in 2024, WSC is recognized for the quality and efficiency of their products and flexible team-oriented approach to serving its customers.

3KEYMASTER™ Marine Systems

Simulation Platform

Use of SAE in Marine Applications

Our Simulation Group introduces Simulation Assisted Engineering (SAE) to the Shipbuilding Industry. SAE provides tools to test control systems during the development process, validating system design and interfacing, prior to build. As such, systems can be custom built to any ship type.

Curtiss-Wright's 3KEYMASTER™ Software provides powerful tools to develop high fidelity models from Propulsion Plant Systems to Shipboard Hull & Machinery Systems. Real-time process models are used to test individual and integrated systems as they are designed, to evaluate interfaces between plant and control and then to conduct operational and system limits tests. Real interface protocols, such as OPC, Profibus, Modbus, TCPIP, and UDP are used to stimulate control system testing and are available to the user including hardware in the loop testing.

After system integration and test phases, the simulation system provides a powerful Operator Training Simulator and is useful to evaluate normal and emergency operating procedures.

Use of SAE in simulator development enables the production of a high-quality and structural training simulator. Therefore, training will cover inner workings of systems and not just a common operator training. Deeper understanding translates to better training and promotes better response in real-life abnormal scenarios.

Close-up of Engine Room Operation Top Panel

Close-ui of Engine Room Operation Bottom Panel

Engine Room Trainer (ERT)

The ERT is used for individual and team training of engine control room watch keepers. The ERT supports the following types of propulsion plant training:

- Propulsion plant start-up and shut-down
- Normal underway operations
- Abnormal and casualty condition response
- Emergency procedures

The ERT simulator is used in conjunction with classroom lessons, reinforcing theory and systems knowledge obtained during lectures with performance-based skills training and practice. The ERT propulsion plant simulation is capable of being integrated with the Full Mission Bridge Trainer (FMBT) to conduct integrated watch team training.

The ERT provides a realistic training environment by replicating the Engine Control Room (ECR) layout and providing "as fitted" operator interfaces including control system panels, communications, and alarms. These interfaces will consist of equipment replications that represent the form, function, and spatial location of actual configurations fitted in the ECR. The ERT has an instructor control station for managing the simulation training, and panel control interfaces and interior communications for manual simulation and instructor role play. The ERT employs a simulation-stimulation approach, employing modeling and simulation of propulsion engine and gearing dynamics to stimulate replica onboard operator/user interfaces. The ERT is comprised of the following components:

1.) Engine room Control Station mockup room
2.) Main Diesel Engine and Gearbox Control and Monitoring Console
3.) Propulsion Plant Dynamic Simulation and associated interfaces to stimulated ECR equipment
4.) Alarm Panels

Engine Room Operation Panel