SINAVY Automation
The integrated control system for naval vessels

Marine & Shipbuilding

Answers for industry.
The integrated control system for naval vessels

Today’s naval vessels have comprehensive platform automation capabilities allowing them to achieve highest levels of vessel survivability and operational effectiveness. As an Integrated Platform Management System, SINAVY Automation provides integrated monitoring and control for all vessel systems.

Thanks to its functional variety, flexibility, and performance SINAVY Automation implements innovative solutions that meet special requirements of naval vessel automation. A uniquely scalable, distributed architecture and powerful engineering tools allow for cost-effective operation of naval vessels over the entire life cycle – from design and engineering, installation, and commissioning to operation, maintenance, and modernization.
Safety, security, survivability
High-tech automation solutions provide integrated monitoring and control for all vessel systems. SINAVY Automation takes care of comprehensive system surveillance and routine tasks. Functionally variable, flexible, and high-performing, it meets even the most complex requirements of naval vessel automation. The following references illustrate the scope and versatility of SINAVY Automation solutions.

- Joint support ship class 702 (Germany)
- MEKO A-200 SAN corvettes (South Africa)
- Dolphin class submarines (Israel)
- U212 submarines (Germany, Italy)
- CI214 class submarines (Greece, Korea, Portugal)
- F125 frigates (Germany)

Effectively meeting even the most complex needs
SINAVY Automation controls and monitors all vessel systems, including diesel engines, gas turbines, gear levels, clutches, water jet pumps, exhaust systems and fuel cells. It also handles auxiliary modules, such as fuel supply and distribution, ventilation, and fire alarm systems. Moreover, it takes care of time-consuming routine tasks thus minimizing the need for a large number of crew members. A uniform, comprehensive human machine interface (HMI) concept allows easy operation, processing, monitoring and display of processes, keeping the operator always in the loop. SINAVY Automation uses worldwide available type-tested “commercial-off-the-shelf” (COTS) components, engineering tools, and libraries. For a high reliability of all vessel systems it is designed for condition-based corrective and predictive maintenance. Standardized procedural processes with national and foreign shipyards enable a rapid dispatch of maintenance and repair measures.

Our life cycle management, SINAVY LCM, ensures comprehensive, worldwide after-sales service support for the entire life span.

SINAVY Automation is an open system allowing integration of third party components via various interfaces. It offers a variety of expansion possibilities, including battle damage control, cruise-range calculation, central battery and pier monitoring. On top of this, SINAVY Automation comes with advancements over the whole life cycle.
Clever Solutions for optimum performance

System architecture
SINAVY Automation is a distributed control system including the following features:
- Consoles with operator stations (OS) and data servers: providing the human machine interface (HMI)
- Local processing units (LPUs) with S7
- Process control units (PCUs): for control purposes and central process data acquisition
- ET200 field units: for decentered process data acquisition
- Fail-safe data buses: for connectivity
- Open system: allows embedding of automation components of other automation suppliers via various interfaces

Human Machine Interface (HMI)
The SINAVY Automation HMI offers a quick and comprehensive overview of all processes on board under all operating conditions. The status of the measuring points and the actual parameters of all processes and subsystems are prepared in an easy to survey, ergonomically designed graphical format on the operator consoles. If necessary, HMI security mechanisms can intervene. In this way, faulty operation and unauthorized or unwanted simultaneous access can be effectively prevented.
Computer-based engineering
SINAVY Automation supports efficient and cost-effective engineering employing a database system for measuring points and logistic data (e.g. spare parts). This computer-based engineering system provides electronically generated engineering documents and manuals as well as partly generated software for automation and simulation. It thereby ensures consistency between system and software requirements, the implemented automation solution, and documentation.
A submarine is a highly complex system comprising a variety of subsystems. Among other things, the trim, regulation, pressure, and ventilation systems must be controlled and monitored. To simplify operation and further support the operator, all systems are controlled and monitored using one central system. It is reassuring to know that for the realization of such a comprehensive automation project all life cycle phases, from planning to system start-up and beyond, are in the hands of a single company with years of specialized experience.

**SINAVY EMCS – our solution in detail**
Siemens offers a comprehensive services package, ranging from professional consultation for navy and shipyards, system engineering, design, manufacturing, and delivery to system start-up, at-sea testing, and after-sales service. With our life cycle management (SINAVY LCM), we ensure that the system always remains up-to-date with the latest technological advancements over the long term. The proven SINAVY EMCS automation solution combines the most diverse subsystems installed aboard a submarine to form a smoothly functioning entity.

**Comfortable and highly available**
Processes are handled in a decentralized manner by the control system with the help of self-sufficient local processing units (LPU). With its redundant data bus, the system offers the highest degree of operational reliability and fault tolerance. All components are standardized industrial serially produced COTS elements.

**Optional expansion possibilities for even more functionalities**
Featuring a variety of optional expansion possibilities, SINAVY EMCS can be flexibly tailored to meet the specific needs of the respective type of submarine. Among others, these features include:

- Central battery monitoring
- Cruise-range calculation
- Central pier monitoring
- Training (SINAVY OBTS / LBTS – onboard / land based training system).
Maintaining mission capability even in the event of an emergency

If greater damage in a specific area occurs on board the vessel, the decentralized, modular, and redundant system ensures that vital vessel functions remain operable. The operating stations are independent PCs that continuously match the processing data supplied in parallel with one another. In the event of an operating station failure, process monitoring and control are handled by the other operating stations without loss of data. Operating stations and process control units are connected with each other through a redundant communications bus. Each of the bus strands is capable of handling the entire communication by itself. If one strand fails, the other bus assumes its tasks without interruption. The SINAVY IPMS software was specifically adapted for DOD-STD and V-Model. All parts are COTS components, reinforced to withstand severe surrounding conditions (e.g. shocks, vibration, EMV, etc.). The automation systems consist of components from the Siemens SIMATIC® S7 family, whose spare parts are readily available on short-term notice worldwide.

SINAVY IPMS – Our solution in detail

SINAVY IPMS, the integrated platform management System for naval surface vessels, relieves the crew of routine tasks and simultaneously offers a high level of availability and operational reliability. SINAVY IPMS controls and monitors all power elements of the vessel, from the diesel motor to the gas turbine, gears, clutches, the electric propulsion, water jet pumps, and the exhaust system. The power management system ensures ample supply and distribution of electrical energy in all situations. The IPMS controls and monitors ancillary modules of the vessel such as supply and distribution of fuel, as well as ventilation and fire alarm systems.
With every technological advance, machinery and processes become more complex, requiring automation systems even for routine tasks. Therefore, periodic onshore and offshore training supports crews in maintaining highest levels of security and efficiency by maintaining a comprehensive understanding of real-life situations and matching them with their representation in the automation systems.

SINAVY OBTS/LBTS training systems provide hands-on automation systems training for naval vessel crews, realistically simulating physical processes and system behavior with mathematical models and the same automation software and HMI the crew uses on board. For even more realistic training, the onboard operator stations may be used for the onboard training system.

**SINAVY OBTS — your efficient On Board Training System**
Physically separated from the actual vessel operation process, the crew can be trained on the automation system and familiarized with its control functions. For even more realism, SINAVY OBTS can quickly switch between training mode and actual operations that can be practiced with the original user interface.

**LBTS — the effective Land-Based Training System**
With LBTS, permanent naval academy training facilities onshore can be configured with the same automation/simulation software and set up with training center PCs. Thereby, real onboard functions can be reproduced to prepare future vessel crews for automation tasks.

**Always close to the real thing**
For realistic training in various operational situations, onboard process control software such as SIMATIC® S7 is emulated on a PC (SoftPLC), while SIMIT® simulates the individual subsystems and electronic components using mathematical models.

For the propulsion system, the entire drive chain is simulated, while the electrical system comprises the complete main network. Other vessel systems, such as the fuel transfer system, fuel consumption system, fresh water system, and sea water fire fighting system, are also integrated.

With special instructor functions, training sessions can be recorded for later analysis. In addition, the instructor can precisely define and manipulate process states, simulate system failures, and create entire training programs. Using the remote control, the instructor may also monitor the trainees’ actions, and, if necessary, intervene to correct them.

**Three good reasons for SINAVY OBTS/LBTS:**
- Training of personnel in harbor and during high operations
- Training system is constantly available to train realistic situations, and assists in lowering training costs
- Extremely lifelike simulation of processes and system behavior, capable of being put directly into practice
SINAVY BDCS
Battle Damage Control System

Modern naval vessels need automated functions for early damage recognition and the coordination of damage control actions. SINAVY BDCS provides a real-time, complete, and up-to-date picture of the damage situation and allows for quick initiation of appropriate countermeasures. The result is a fast and effective response to any damage caused in dangerous situations, e.g. fire, water inrush, NBC contamination, injured personnel, etc. In the event of damage an alarm is set off and the actual damage point is displayed in isometric 3-D deck plans.

For the coordination of countermeasures kill cards provide actions that have to be followed to “kill” the damage situation. The state of damage control is displayed with selectable plot symbols. All corresponding actions are reported in a damage control log.
The advantages of SINAVY automation at a glance
Reliability –
The components of the system are proven for applications under rugged environmental conditions

Survivability –
A single failure in the system will not interrupt the control and monitoring function

Redundancy –
Vital monitoring and control functions remain operating when the system is exposed to adverse conditions

Modularity –
Hardware and software are modular by design for scalability, best maintainability, and operational flexibility

Standardization –
HW, SW, and system architecture are standardized to permit maximal interchangeability and minimal life cycle costs

Flexibility –
The system can be easily expanded and reconfigured to accommodate operational updates

Availability –
SINAVY automation consists basically of commercial off-the-shelf (COTS) components from the Siemens SIMATIC family. Therefore it is easy to obtain spare parts quickly, across the globe.

Maintainability –
Modular design and pluggable units allow effective engineering, commissioning, and service
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