AVAT

THE ENERGY ENGINEERING COMPANY

E²CON-M

The LNG & DF engine control system for marine applications

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LNG ENGINE CONTROL NEEDS RELIABLE SOLUTIONS AND EXPERT KNOW-HOW

The development of new engine control systems is our daily business. In doing so, we support our clients with practical experience in all the phases of their project for as long as it takes to reach it's individual goals. Using our experience with over 10,000 customer-specific engine controllers in worldwide operation, both land-based and on vessel as well as in certifying systems for type approvals, we are confident that we will also find the optimum solution for your requirements.

HIGH PERFORMANCE PARTNER

We are a trusted partner to the gas engine industry since more than 25 years. Our extensive know-how in cylinder pressure-based engine control systems makes us a reliable engineering provider for the marine industry.

- Technology leader in control systems for large gas & dual fuel engines
- Large experience gained from automation projects with a total exceeding 15,000 MW installed electric power
- Smart solutions for the automation of the process and control level providing the decentralized and sustainable energy generation and supply

Our experienced team of engineers and technicians are constantly at your disposal to support your projects:

- Electrical engineering
- Production of switch cabinets
- Training for users and developers
- Qualified service hotline
- Fast spare parts shipping

HIGH PERFORMANCE AND OPTIMIZED EFFICIENCY FOR LNG AND DUAL FUEL ENGINES

To meet strict emission limits, shipping industry is turning to gaseous fuels. For the best control of engines in marine propulsion and onboard power generation we support our clients with a full line of vertically integrated control and automation technology solutions including hardware, software and, importantly, expert consulting.

Optimized output and reliability under fluctuating or uncertain gas quality is the essence of gas engine control. It can only happen if the control system is precisely adapted to the engine and application. With E²CON-M you will quickly get the controller you need for marine gas or dual fuel engines. A modular system of proven elements, E²CON-M is highly adaptable. In close cooperation with the client, we can rapidly develop a customized control system for every marine medium-speed engine. The result: maximum performance, efficiency and reliability even under high load and rough conditions.

ADVANTAGES AND FUNCTIONS

ADVANTAGES

- A control system for both the engine and the auxiliaries
- Rapid engine run-up to operating speed
- Compact system layout
- Powerful built-in diagnostic tools
- Approved control hardware components
- Flexibly expandable and adaptable at all times
- Spare parts availability over many years
- Proven technologies from the large engine field
- High fuel efficiency at optimum emission levels
- Support for engine type approval process

FUNCTIONS

- Fuel-sharing mode
- Diesel-gas switchover even at high load operation
- System fulfills requirements for multi engine power generation
- Cylinder pressure based engine control and monitoring
- Balancing strategies based on identified combustion parameters
- Integrated auxiliary control
- Control and monitoring of fuel supply
- Redundant standard data interface to vessel control
- One powerful remote service tool for direct access to the engine
- Acquisition and processing of relevant KPIs

MARINE TYPE APPROVALS

Our company's quality management and development processes are subject to external audits on a regular basis. Thus the E²CON-M components are type-approved by major marine classification societies.

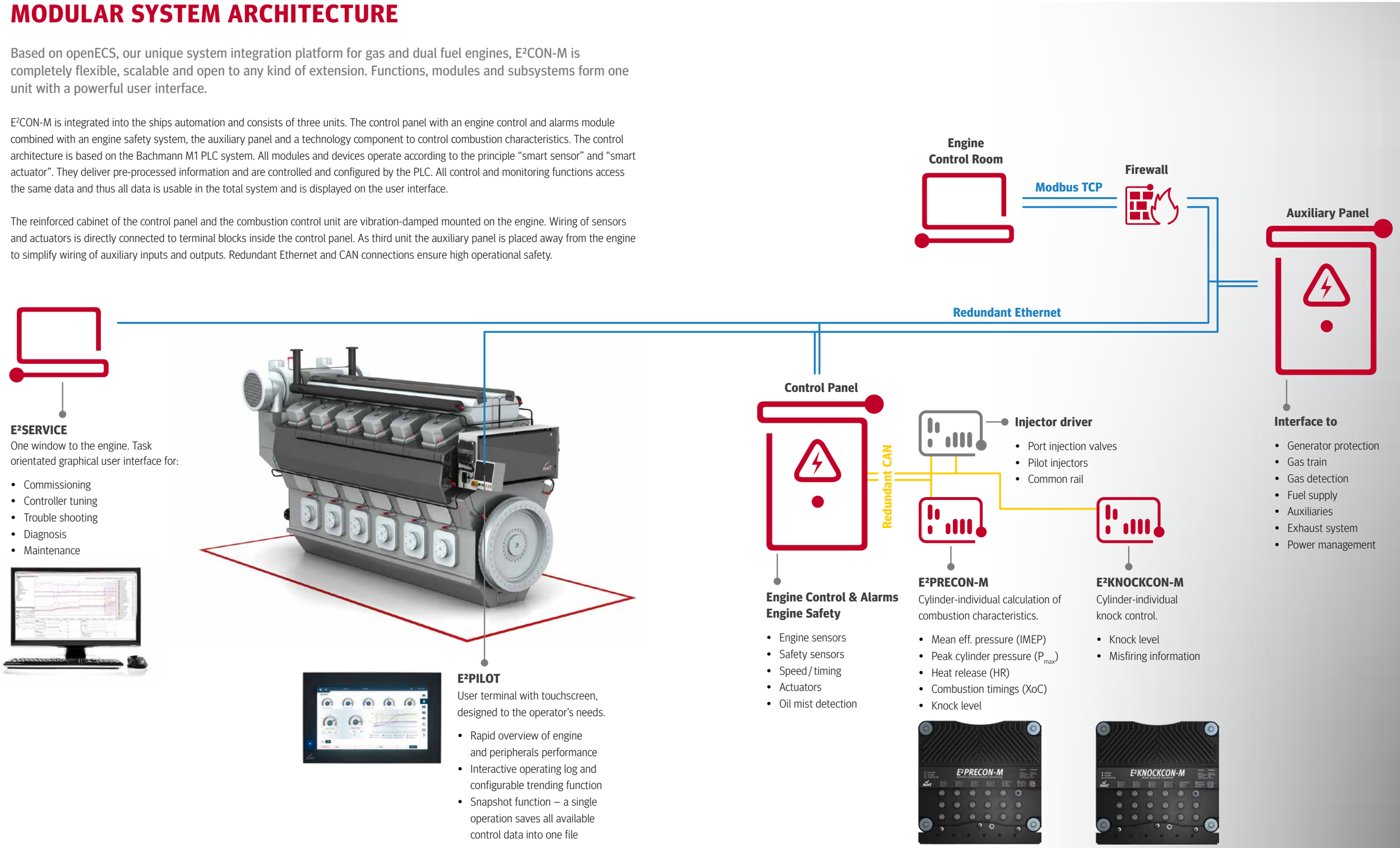
With our engine know-how and experience based on years of working and developing together with major engine builders, we are able to fully support our clients in the process of engine type approval and accompany their project from the drawing board to its sea trials.

MODULAR SYSTEM ARCHITECTURE

Based on openECS, our unique system integration platform for gas and dual fuel engines, E²CON-M is completely flexible, scalable and open to any kind of extension. Functions, modules and subsystems form one unit with a powerful user interface.

E²CON-M is integrated into the ships automation and consists of three units. The control panel with an engine control and alarms module combined with an engine safety system, the auxiliary panel and a technology component to control combustion characteristics. The control architecture is based on the Bachmann M1 PLC system. All modules and devices operate according to the principle “smart sensor” and “smart actuator”. They deliver pre-processed information and are controlled and configured by the PLC. All control and monitoring functions access the same data and thus all data is usable in the total system and is displayed on the user interface.

The reinforced cabinet of the control panel and the combustion control unit are vibration-damped mounted on the engine. Wiring of sensors and actuators is directly connected to terminal blocks inside the control panel. As third unit the auxiliary panel is placed away from the engine to simplify wiring of auxiliary inputs and outputs. Redundant Ethernet and CAN connections ensure high operational safety.



NEXT LEVEL COMBUSTION CONTROL: E²PRECON-M & E²KNOCKCON-M

The control of modern gas and dual fuel engines requires precise and dependable combustion data for each individual cylinder in order to run the engine at high efficiency close to its load limit while at the same time protecting it from overload.

Advancend combustion management is essential for the safe operation of modern high performance gas engines, which are very sensitive to fluctuating combustion properties of their fuel gas. To master misfire, knocking and emissions, engine builders need to control the combustion itself. Our technology modules for measuring cylinder pressure and structure-borne sound extract various combustion parameters from complex sensor signals and transfer them to the engine control system.

E²PRECON-M processes data from up to 12 cylinder pressure sensors and provides real-time key combustion characteristics for monitoring and closed-loop control such as indicated power, peak pressure, heat release, precise combustion timings and even NOx estimations in real time for each combustion and every cylinder individually.

E²KNOCKCON-M is an anti-knock and misfire controller also for up to 12 cylinders which computes knock levels and ignition timings for each engine work cycle. Using sophisticated digital signal processing algorithms the knock information is reliably filtered from the customary engine noises even under challenging acoustic conditions.

Both modules convince with an extremely robust design developed for the use in rough conditions and can be mounted directly on the engine or nearby. If needed two devices can be installed to control up to 24 cylinders. Marine type approvals ABS, BV, DNV GL and LR make the package complete.

THE openECS PRINCIPLE

openECS, our flexible engine controller for gas and dual fuel engines, is a unique system platform which is open for all types of expansion. Functions, modules and subsystems harmonize with a high performance user interface to form a single unit.

COMPLETE.
With openECS you create a solution that integrates all devices at and around your engine.

FLEXIBLE.
The modular design makes your Engine Control System future-proof to meet new requirements.

RELIABLE.
Long-term availability and competent support ensure safe operation in the engine's life cycle.

E²SERVICE – MANAGING BIG DATA WITH ONE WINDOW TO THE ENGINE

Engine operation in test beds or in productive applications like power stations or vessel create huge volumes of data showing performance results of the engine. Engineers require a tool to handle this data for configuration purpose and performance optimization. Our service software E²SERVICE provides visualization functionality and enables continuous remote access to all openECS based engine control systems from any location.

E²SERVICE is the perfect tool for engineers being responsible for all the challenges during engine development, test bed operation, commissioning, maintenance, troubleshooting or simply in daily operation. The visualization functionality of E²SERVICE provides a clear structure to organize Big Data supporting different kind of user requirements. Development engineers and analyst experts obtain fundamental data including a highest level of details during all engine operations. Service engineers are able to work focused on parametrization or configuration of openECS during commissioning or to get a fast overview for solutions in case of troubleshooting to minimize engine downtime.

E²SERVICE is the only service tool supporting total access to the system including the technology modules E²PRECON and E²KNOCKCON. Even status and performance of third party components like ignition systems or GAV drivers can be handled through E²SERVICE.

OPERATION HIGHLIGHTS

- One compact overview for the genset status with option for manual operation
- Reasonable grouped list of parameters for an easy access
- Electronic operation log as event journal containing all events, messages, alarms or faults time stamp based including handling for acknowledging
- Well-arranged display of all measured values including recording of the values
- Graphical display of data history or trending
- Snapshot to store complete "live" state information for e.g. offline examination
- Combined views of parameters, characteristics and maps
- Parameter set comparison and restoring
- Signal or actuators check by manual test or activation
- Search and filter function for a quick selection
- Export of stored data in an open file format

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