



Fishery Research Vessel "Solea"

for Federal Office of Agriculture and Food



**SAM
Electronics**

an  communications company

For the "Solea" SAM Electronics was responsible for the following systems:

- Diesel-electric drive system
- Electrical power generation and distribution
- Power management system

The 42-meter fishery research vessel "Solea" was delivered 2004 by the German shipyard Fr. Fassmer as newbuilding No. 1940 to the German Federal Office of Agriculture and Food. It participates in international surveys co-ordinated by the ICES to evaluate the condition of the stock of fishes, to find out the admissible booty quantities and to investigate possible alterations

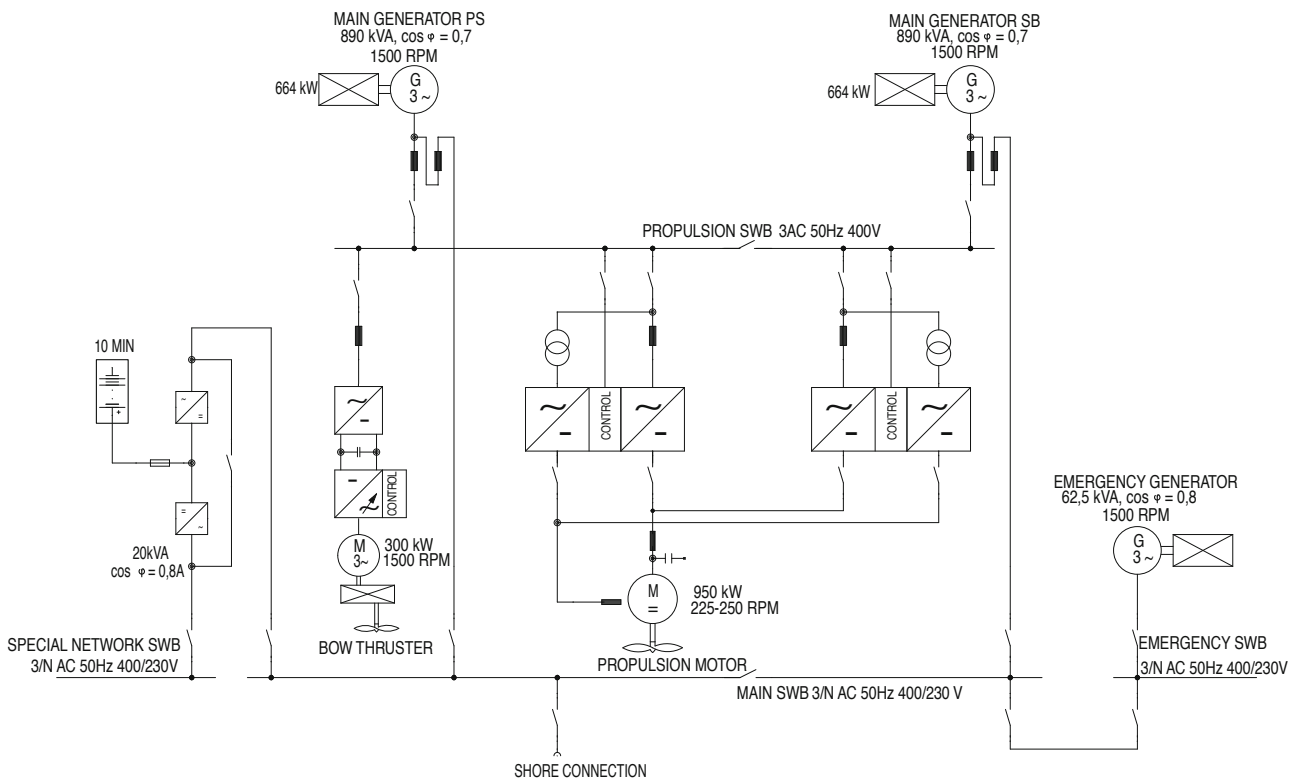
in the ecosystems. The vessel is equipped with advanced research and laboratory equipment and instrumentation. The ship is designed to operate mainly in the North and Baltic Sea, in the British and Norwegian Sea.

For this ship the newest rules and recommendations according to ICES (i.e. Co-operative Research Report No. 209 „Underwater Noise of Research Vessel") were required for the first time.

Substantially to comply with the demanded acoustic level are the following properties:

- Very low noise propulsion drives with DC propulsion motors elastically mounted onto ship's foundation with enlarged yoke and additional low-pass filter connected in the motor supply
- Drive system with only one cavitation free propeller

Further high requirements have been requested to the redundancy of the propulsion system in case of a failure. For high redundancy two converters supply one motor. In case one converter fails, it is possible to operate the propulsion system with one converter at half load only.



Power Generation and Distribution

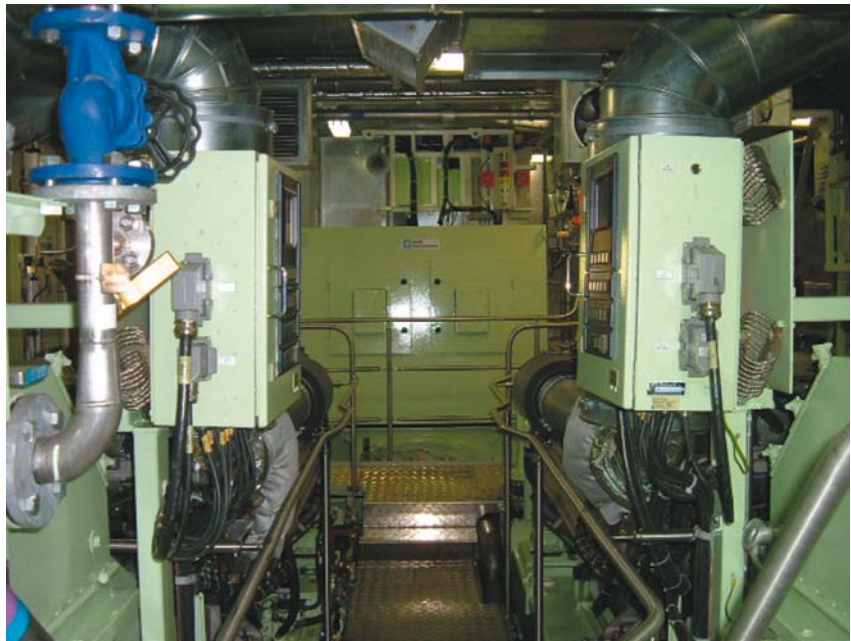
Primary the distribution system consists of the propulsion switchboard 400 V, a main switchboard 400/230 V, a special network switchboard 400/230 V and the emergency switchboard 400V/230 V.

Two identical diesel generators, each with an output of 890 KVA at 1500 rpm, supply the propulsion system and the switchboards. This solution allows cost-effective operation with low load.

The associated alternators with a total power of 1780 KVA (excluding the emergency generator) and the 400 V propulsion switchboard are delivered by SAM Electronics.

To reduce the harmonic distortion in the mains, the vessel is equipped with two duplex reactors connected in series to the main alternators.

The commutation drops in the sinus wave form of the mains supply voltage, caused by the propulsion converters, are compensated by the in antiparallel connected windings of the duplex reactors.



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Low Noise Propulsion System

The main propeller is driven by a DC-Motor with an output of 950 KW. This output can be achieved over the speed range from 225-250 rpm.

To ensure a low acoustic level the propulsion motor is elastically mounted onto the ship's foundation with enlarged iron yoke as well as it is elastically coupled with the main propulsion shaft. Due to the water cooled arrangement with a totally closed machine and thanks to the reduced fan speed during low load operation the airborne noise is further reduced.

Furthermore, the propulsion motor is equipped with two low noise sleeve bearings. During low speeds, the sleeve bearings are supplied by two extremely low noise hydrostatic pressure pumps with stand-by operation. The low pass filter connected into the supply of the armature circuit reduces the DC current ripple which results furthermore in a reduction of the structure borne noise.

The propulsion system consists of two identical converter units which supply the propulsion motor in single or in parallel operation. Each converter unit is equipped with it's own armature/exciter converter and it's own control electronic.

The armature converter is a fully controlled rectifier. The exciter circuit consists of an excitation transformer and an anti parallel controlled exciter converter, to reverse the motor's speed direction.

Thanks to the high redundancy with two converters for the armature circuit and two converters for the excitation circuit as well as with two control systems the propulsion drive can be operated in case one unit fails.

The first switched on control system is the master control with two in parallel operated armature converters and one of the excitation converters. In case one armature converter fails, operation with the half of the propulsion power is still available. In case one control system fails, the slave control takes over automatically.

For manoeuvring and station keeping the vessel is equipped with a 300 KW bow thruster drive in PWM converter technology. The braking resistors guarantee a safe operation in all operational states of the vessel.



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Power Management System

The vessel is equipped with the microprocessor operating power management system "Geapas", supplied by SAM Electronics, which monitors the operation of the generators including the generator breakers.

Design

Each generator unit is equipped with an independently operating GMM 10 module and with the diesel control- and monitoring system. The

superordinated GMM 10 module and the diesel control- and monitoring system are hardwired to enable the internal data exchange. A LCD tableau, connected at the GMM 10 serves as redundancy handling- and display equipment for the diesel control- and monitoring system.

The GMM 10 takes over the following main tasks:

- The connection of the generators with the 400V propulsion switchboard after the successful synchronization
- Distribution of the resistive load through variation of the diesel generator speed
- Starting the second diesel generator in case the diesel control system at the first operating generator detects a malfunction
- Stopping the diesel generator on demand in the case that the produced generator power is sufficient
- Generator protection