GE Power Conversion

JSS for the Royal Netherlands Navy
Built by Damen Schelde Naval Shipbuilding

GE’s Power Conversion business has been chosen by the Royal Netherlands Navy and Damen Schelde Naval Shipbuilding to equip a Joint Support Ship (JSS) with integrated electric power and propulsion systems. Power Conversion’s electric package also includes an Energy Management System and thruster electrical systems.

In December 2009, the Netherlands’ Defence Materiel Organisation (DMO) and Damen Schelde Naval Shipbuilding signed a contract for the supply of a Joint Support Ship (JSS). The ship to be built at Damen shipyards for the Royal Netherlands Navy will be delivered in July 2014.

A multi-functional platform
The JSS fulfills the operational requirements of the Royal Netherlands Navy for a robust multi-functional platform specifically designed for maritime support, strategic sea lift and sea-based missions in open ocean as well as in littoral waters. The JSS measures 205 metres in length and 30 metres in breadth and the ship’s speed is approx. 18 knots.

The vessel will accommodate up to 300 crew. It will be outfitted with signature reduction measures, ballistic protection, blast resistant constructions and redundant and shock resistant systems.

An Integrated Vessel Energy Plant (IVEP)
Power Conversion’s wide expertise in naval applications and in innovative propulsion systems enabled it to offer Damen Schelde Naval Shipbuilding and the Royal Netherlands Navy a high performance IVEP solution. Additionally Damen and the Dutch Navy will benefit from all the “single source vendor” advantages: pro-activity, customized solutions, optimization of equipment, user-friendly interfaces, time and cost savings and global responsibility.

Diesel electric propulsion plant
The diesel electric propulsion plant consists of two main electric motors of 8,900 kW each, two shaft lines with fixed pitch propellers, two bow thrusters and one stern thruster.

Electrical power is generated by means of five diesel generator sets of approx. 25MW in total, four distribution transformers, two 6.6kV switchboards and four uninterruptible power supplies.

Integrated Electric Power and Propulsion systems offer:
- High efficiency
- Low noise and vibration levels
- Operating flexibility
- Increased availability
- Low maintenance time and costs
- Energy Management System for efficient use of power

A propulsion remote control system and an Energy Management System (EMS) are also supplied by Power Conversion. The EMS features two main functions:
- Control and supervision of the electric distribution system through a user friendly interface
- Control of the electric ship load and management of the number of diesel generators in operation for optimization of the efficiency

Induction propulsion motors
Main propulsion electric motors are High Torque Density (HTD) induction motors. Their simplicity and robustness (squirrel cage rotor) offer a high level of reliability and availability. They are fed by PWM MV7000 converters.

Consequently, maintenance time and costs are reduced. Furthermore, induction motors have reduced acoustic noise and vibration levels that meet with ship requirements.
An integrated electric package including:

**Power Generation**
- 5 Generators totaling 24,900kW
- 2 Switchboards, 6,600V
- 4 Distribution transformers, each 2,500kVA
- 4 Uninterruptible power supplies

**Main Electric Propulsion**
- 2 Slow-speed induction motors, each 8,900kW
- 4 Propulsion transformers, each 5,400kVA
- 4 PWM MV7000 converters
- Remote propulsion control system

**Thrusters**
- 3 Induction motors (2x 1,250kW, 1x 750kW)
- 2 Transformers
- 2 PWM MV3000 converters

**Energy Management System**

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**PWM** MV7000 converters

Thanks to the high-performance presspack Insulated Gate Bipolar Transistors (IGBT), MV7000 converters' efficiency and availability are enhanced. In addition, the IGBT technology makes the converters easier to control and leads to a very compact design with fewer components and a consequent increase in overall system availability.

**A global high efficiency**

The Induction motor/ MV7000 converter association offers a high efficiency due to the low level of current harmonics, which results in the following advantages:

- Reduced motor losses
- Reduced AC supply harmonic level
- Power factor optimization, close to 1 over the whole speed range (> 0.96).

Consequently, the motor efficiency is high, and no harmonic filters are necessary to be compliant with the maximum Total Harmonic Distortion (THD) allowed by the classification societies. In addition, the size of the generators is reduced (power factor: 0.9).

*PWM: Pulse Width Modulation*