The Development Trend of Green Ship Building Technology

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1. Definition of Green Ship Building Technology

The object of green shipbuilding is to minimize the offal and harmful emissions during design, manufacturing, service and laying up in order to reduce the pollution to air, water and soil, save resources and improve economical and social benefits.

The scope of green shipbuilding includes “green ship” and “green shipyard”.

Green ship mainly depends on green design. Ships should be designed to enable them give the minimal effect on the environment during manufacturing and service. **The keys to green design are 3R**：Reduce the consumption of materials and energy and the pollution to environment in ship manufacturing and service. Recycle the parts and accessories in ship maintenance. Reuse the majority of materials after ship laying up.

Green shipyard shall ensure the high efficiency of materials and energy in shipbuilding, reduce the harmful Emissions and smoothen the process of integrated hull construction, outfitting and painting.

Generally, the key to green shipbuilding is green design.

2. Situation and Development Trend of Green Ship Building Technology

Shipbuilding industry is high energy consumption, high material consumption and high pollution industry. Now human's living environment is deteriorated and resource is rare, which will threat the living and development of human being. The measure to be taken to boost the sustainable development of economy is improving production efficiency and saving resource, labor and all kinds of capitals by high and new technology and modern management. In fact, green manufacturing has affected and led the development of manufacturing technology.

Besides international ship construction conventions, rules and regulations, green ship design shall comply to suggestions or requirements on environment protection of ship classification societies and some special areas.

The consciouseness and measure of green environment protection to be taken to reduce the pollution to environment in ship manufacturing, service and breaking up.

2.1 Selection of marine equipment and optimization of marine systems

Selection of marine equipment should focus on low energy consumption, low pollution and high efficiency. In evaluation of technical index of ships, a strong emphasis should be laid on the rationality of load factor of main engine, generator, boiler and air condition system, etc. and effective control of harmful emissions, vibration and noise.

For example, choosing vaporized natural gas as fuel of diesel engine can save 35 percent of fuel cost and reduce harmful emission, it is largely better than common diesel oil in environment protection.

Another example, electric propulsion system brings about revolutionary changes to ship design, construction, service and maintenance. Compared with conventional propulsion system, the ships with electric propulsion system have following advantages.

1) Handling facility, good maneuvering characteristics.

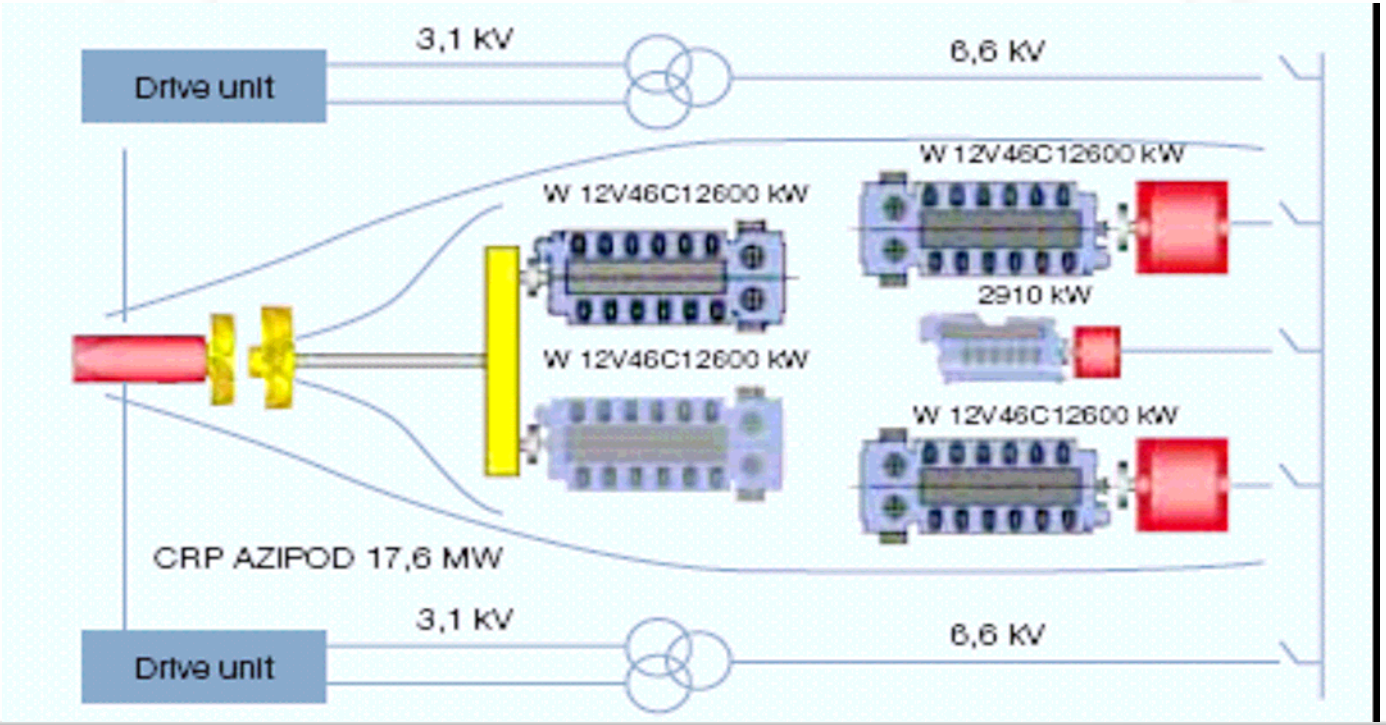
2) Low vibration and noise level.

3) High reliability. Several paralleling main generators supply power with high redundancy and improve the reliability of power supply.

4) Small volume, light weight and flexible arrangement. The ships with electric propulsion system are equipped with middle-high speed diesel generator set of small volume and light weight, cancel gear box and long shafting, etc, general arrangement is flexible and convenient and easy to enlarge loading capacity.

5) High efficiency. Quantity of diesel generators can be automatically controlled by electric power managing system according to the load to ensure the optimal load condition of the diesel generators. It improves the efficiency of generator set greatly and saves the energy.

6) Reducing maintenance. Middle-high speed generator set of the same model needs less maintenance and maintenance cost.



Although construction investment on ships with electric propulsion system is more than ships with conventional diesel generators, based on the above-mentioned benefits and low ship operating expense, ships with electric propulsion system have been widely recognized and have been prioritly selected.

The optimization of marine system design should lay stress on saving materials, increasing work efficiency and decreasing cost. For example:

- the optimization of hull lines will increase ship speed, save energy and improve economic efficiency.
- the optimization of hull structure will decrease the specification of steel and the light weight of vessel, increase the deadweight and improve economic efficiency.

- the optimization of piping system design will decrease the length of pipes and quantity of pipe bends.
- the optimization of electric system design will decrease the length of cables, decrease the quantity of equipment and increase the quantity of section pre-fabrication.

- the module design or unit design will carry out diffusion production and parallel working of intermediate products and increase pre-outfitting ratio, assembly ability and work efficiency.
- As long as we emphasize the concept of green ship design, there will be many methods to be applied to optimize design.

2.2 Selection of Materials

The Selection of green materials will be important to green shipbuilding. In the selection of materials, emphasis should be laid on the following.

1) Innocuous, inoffensive and environment materials.

2) Materials convenient for reclaiming and materials which can be recycled.

3) To decrease the quantity of variety and specification of materials to improve the utilization ratio of materials.

4) To decrease the weight of materials to increase the ship loading capacity.

2.3 Improvement of Building Technique

1) Innovation and application of high efficient welding technology will increase work efficiency, save energy and slow down pollution.

2) The integration of hull construction with outfitting and painting and innovation and application of ship painting technology will increase work efficiency, save energy, decrease waste, slow down pollution and carry out integrated hull construction, outfitting and painting.

3) Innovation and wide application of module and unit technology will realize extended manufacturing and parallel working of interim products to improve work efficiency .

4) Application of super block lifting technique of integrated accommodation, engine room, bow, stern and pump room, etc. will realize extended manufacturing and parallel working of interim products to improve work efficiency and save energy.

5) Application of hull accuracy control technology, including no-tolerance lifting of blocks, expanding no-tolerance laying-off, increasing the accuracy of block manufacturing, effectively controlling the deviation of hull principle dimensions will improve work efficiency, save energy and decrease pollution and waste.

6) Application of secondary steel nesting technology to carry out optimized design, elaborate nesting and to improve the secondary utilization ratio of steel will save steel materials and decrease waste.

3. Summarization

Green ship will not only be protective to builders and operators during design, building, operating and dismantling of the ship, but also be protective to world environment and resource. For ecological equilibrium and survival and happiness of people we should attach importance to green manufacturing and devote ourselves into green shipbuilding.

THANK YOU!