

Original Research Article

Analysis on the Application of New Energy in Ships

Yang Hu*

Zhongxinli Energy Co., Ltd. E-mail: huyang@163.com

Abstract: With the continuous development of China's sustainable development, new energy has become the internal driving force for the transformation and upgrading of various industries and the creation of green economic benefits. It is widely used in industrial manufacturing, housing construction, transportation and other fields. The application of new energy in ships can not only reduce the pollution rate of ship transportation, but also promote the scientific development of ship design and manufacturing. The value of applying new energy in ships can be seen. This paper analyzes the application strategy of new energy in ships, in order to promote the shipbuilding industry to keep pace with the times.

Keywords: New Energy; Ships; Application

New Energy mainly refers to unconventional energy, which is opposite to traditional energy concept, and needs to be developed and utilized based on new technologies, such as ocean energy, wind energy, geothermal energy, biomass energy, solar energy, nuclear fusion energy, etc., so as to make more energy choices and reduce the utilization of non-renewable resources such as oil and coal, and then apply new energy to solve energy crisis and control environmental pollution. China's shipbuilding industry is relatively developed in Shanghai, Wu-chang, Dalian, Guangzhou and other places, mainly engaged in ship design, construction, renovation, testing and production of supporting facilities. In order to cope with the development risks of China's shipbuilding industry and relieve the pressure of international market development, it is necessary to increase the utilization of new energy under the background of international industrial transfer, so as to make China's shipbuilding industry more competitive. Based on this, in order to promote the sound development of shipbuilding industry, it is particularly important to explore the application value, key

points, current situation and strategies of new energy industry in shipbuilding.

1. The application value of new energy in ships

1.1 To promote the sustainable development of the shipbuilding industry

With the development of human beings and the rapid growth of global economy, traditional energy sources such as coal and oil are rapidly consumed, and fossil fuels, which are non-renewable energy sources, are gradually exhausted. At the same time, a large number of pollutants and greenhouse gases are produced in the process of using fossil fuels, causing increasingly serious and irreversible pollution to the environment. In the past, ships regarded diesel oil and gasoline as power energy, and the degradation rate of oil pollution was slow, which had a negative impact on the ecological environment and was contrary to the sustainable development decision. Based on this, it is necessary to actively apply new ener-

gy in ships, make the ship operation mechanism cleaner and more efficient, and promote the scientific development of the ship industry. The scheme of “changing oil into natural gas” can be implemented, and natural gas can be regarded as the driving energy, so as to reduce the pollution probability of shipping to water bodies. However, natural gas is relatively poor in cleanliness, high in cost, and poor in safety and stability. Therefore, “oil to electricity” has become one of the most widely implemented schemes at present. On the basis of rich power resources, the pollution hazards of electrical components gradually appear, and the pollution caused by battery leakage to water bodies is no less than that caused by fuel oil. It is necessary to continuously explore the application of new energy in ships and achieve the purpose of efficient use of clean energy on the basis of summing up the experience of sustainable development of the shipbuilding industry.

1.2 Applying new technologies to empower China’s shipbuilding industry

The application of new energy needs to rely on new technologies, such as solar photovoltaic power generation technology and remote sensing technology. With the blessing of high and new technologies, China’s shipbuilding industry will become more competitive and lay a foundation for the industry to develop towards internationalization. For example, liquid air thermal power technology regards liquid nitrogen, dry ice and liquid air as green fuels to absorb the heat in the environment, continuously heats up and expands under the action of heat, obtains high pressure and normal temperature gas and drives ships, and uses clean energy to simulate oil combustion power operation system, so that ships can achieve zero emission, cleanness, greenness and environmental protection in the shipping process, and then uses science and technology to empower China’s shipbuilding industry.

2. The application of new energy in ships

2.1 Make full use of existing new energy sources

In order to make China’s shipbuilding industry develop in a sustainable direction, it is necessary to broaden the utilization ideas of clean energy, and utilize solar

energy, wind energy, tidal energy, nuclear energy, fuel cells and other resources in ship power system, power system, living system and other systems. By making full use of the existing new energy, it is necessary to explore more possibilities of new energy application in ships, so as to make ships have more sustainable development forms and achieve the goal of optimizing the allocation of new energy.

2.2 Solve the problem of new energy application through reasonable design

Design is the carrier of new energy application, and a stable, efficient, safe and reasonable design scheme can ensure the full utilization of new energy. Since the oil crisis, the application design of new energy in ships has never stopped. In addition, the concept of sustainable development runs through the whole process of exploring objective things, so it is necessary to link technology, resources, ships and other elements through design, and then solve the problem of new energy utilization. Taking the application of wind energy in ships as an example, it is necessary to take the lead in designing the driving structure diagram of wind power generation to ensure the reasonable composition of wind power generator, transformer and output terminal connection equipment, and digital control design to ensure the safety and stability of the wind energy driving system, and supervise the parameters such as current, voltage and rated customs, and solve the problem of wind energy utilization during ship navigation through automatic tracking, real-time regulation and data integration, and then improve the application quality of new energy through scientific design.

3. Application status of new energy in ships

“Oil-to-electricity” is one of the application trends of new energy in ships. This paper analyzes the application status of “oil-to-electricity” from the perspectives of investment, equipment and technology, aiming at summarizing the application experience of new energy and promoting the development of the ship industry in the direction of green environmental protection, energy saving and high efficiency.

3.1 The recycling of used batteries

With the support of new technologies, lithium

ion batteries, which are frequently used in ships, have made breakthrough research progress, and the promotion of government subsidies has laid a foundation for the application of new energy in the ship industry. On the basis of applying new batteries, old batteries such as lead-acid need to be recycled. Although lithium-ion batteries have a long service life, they are usually used for 4-10 years, and they also need to be recycled. Once the recycling effect of used batteries is poor, negative phenomena such as leakage of sewage sources will directly occur. Therefore, it is necessary to do a good job in battery recycling.

3.2 The use of cost issues

In April 2018, Norway's Kangshibo and Wilson Group will jointly establish the first unmanned shipping company. The new company regards all-electric power as the navigation energy of "unmanned ships", which is expected to save 90% of the cost, mainly due to the application of all-electric power ships. On the basis of batteries, advanced technologies such as cameras, sensors, radars and positioning systems are also applied to enable ships to dock by themselves, and shipping efficiency is improved. In addition, the control of labor costs and energy costs make the cost of all-electric driving ships. At present, the development of all-electric power is in the initial stage. Although the market prospect is good, the problems such as lack of research experience, small production scale of new energy batteries and weak technical support exist objectively, which makes the cost of "oil to electricity" still high and affects the application effect of "oil to electricity".

3.3 The battery occupies a large space

The space of ships is limited, so the application of battery pack to drive ships needs to occupy a large space, which reduces the cargo capacity of ships and affects the shipping efficiency of ships to a certain extent. A small number of multiple shipping forms objectively increase the shipping cost, which is contrary to the original intention of new energy application.

3.4 There are problems in the matching of ship tonnage and electric power

When ships are driven by power system, the problem of power matching should be considered to avoid the negative impact of ship power shortage. However, some

ships have poor compatibility and matching degree of all-electric propulsion power, which is also affected by ship power quality, electrical equipment, line laying and other factors. The matching effect between power and ship tonnage is uneven, which reduces the effectiveness of "oil to electricity".

4. The application strategy of new energy in ships

The application of "oil to electricity" in ships has the following advantages: (1) convenient control, high degree of automation, fast start-up acceleration, and improved ship maneuverability, maneuverability, safety and stability; (2) The application of high-speed irreversible heat engine can reduce the weight of marine power plant, enhance the power of power system and make the engine room layout more flexible; (3) Electric propulsion is applied to reduce the power of auxiliary generators, or even cancel it, which can further optimize the layout of engine rooms; (4) Disconnect the motor under fault to ensure the safety and stability of shipping; (5) The mechanical characteristics of motors are selected to suit different shipping conditions and improve the economy of ships.

4.1 To solve the problem of old battery recycling

According to the Standard Conditions for Lithium-ion Battery Industry (2015), a battery pack production project is set up according to the shipping demand of ships, and the recycling of used batteries is included in the regulatory scope on the basis of process technology, resource allocation, safety management and government supervision, so as to standardize the recycling process of used batteries, ensure the safe recycling and reuse of used batteries, and improve the effectiveness of new energy application in ships.

4.2 To solve the problem of using costs

Guided by the application of new energy in ships, the electric energy industry will develop towards integration, such as establishing industrial parks, creating standardized and efficient industrial chains, coordinating technology, equipment and design, designing less mechanical drive systems, improving power density, and reducing device costs under the blessing of new power electronics technology and permanent magnet motors.

4.3 To solve the problem of space occupation

By analyzing the shipping advantages of “oil-to-electricity” ships, it can be seen that the auxiliary generator and other configuration structures can be excluded on the basis of power system optimization, so as to save the ship space. At the same time, the electric propulsion system can be enriched according to the ship structure, and the application efficiency of squirrel-cage induction motor, synchronous motor and DC motor can be improved with the support of digital control technology and power electronics technology. The space occupation problem can be solved by device design, and the traditional shafting can be replaced by cables to improve the cabin layout. Lithium-ion battery is light in weight and small in size, and its density is about 6 times that of lead-acid battery. In addition, it does not contain harmful substances such as cadmium, mercury, lead, etc., which is green and environmentally friendly, and then makes the new energy application safer.

4.4 To solve the problem of matching ship and electric power

Vigorously develop the ship’s all-power integrated propulsion system, and ensure the coordination, stability, safety and efficiency of each system based on functional modules through the multi-functional design of propulsion, dragging, substation, distribution, energy storage and monitoring, and then solve the matching problem between power and ship. About 30% of developed countries use all-power integrated propulsion system, which provides constant torque under forward and reverse rotation regulation, making its working character-

istics more stable and power matching effect better. In addition, digital control technology is deployed in time to improve the comprehensive utilization rate of power resources.

5. Conclusion

To sum up, in order to make China’s shipbuilding industry develop scientifically, it is necessary to base on sustainable development, establish awareness of new energy application and development, do a good job in the application planning of new energy in ships, improve the application system of new energy in ships, promote the application of new energy in ships to keep pace with the times through scientific management, optimize the allocation of new energy in China, and enhance the comprehensive competitiveness of shipbuilding industry.

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