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Research on Key Technologies of Intelligent Protection for Marine Power System

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Abstract: in people's daily life, ships have become an important means of transportation. At present, China's shipbuilding industry has been rapid development, the number of ships has increased year by year, at the same time, the volume of ships has also become larger and larger, people have put forward more stringent requirements for the safety of ship power system operation. For the ship, the power system is the key. Only by ensuring the safety of the power system can the navigation requirements of the ship be effectively met. In view of this, this paper briefly describes the ship power system, and analyzes the disadvantages of the traditional methods in protecting the operation of the ship power system. On this basis, the key technologies applied in the intelligent protection of the ship power system are deeply studied.

1. Introduction

In recent years, China has made great efforts to improve the shipbuilding industry. In this process, the structure of ship power system has become more and more diversified. Considering that the power system as an important guarantee equipment for the supply of electric power resources, it has an important impact on the normal operation of ships. Once the power system has security risks, it is difficult to effectively ensure the safe navigation of ships. However, it is difficult to ensure that the ship's travel requirements are met by using traditional methods to protect the ship's power system. Therefore, it is necessary to realize the intelligent protection of the ship's power system through the application of intelligent protection technology, so as to make the ship's operation more stable and reliable.

2. Brief Introduction of Marine Electric Power System

For the marine power system, it is mainly composed of power supply, power grid, load and power distribution equipment. Through the joint operation of these components, the normal operation of various functions such as power supply, distribution and transmission can be ensured. Among them, for the power supply, it can provide electric energy for the operation of the whole ship. Generally, the generator set or battery pack is used as the power supply. At present, most of the marine generators are diesel generators or steam generators. Some larger ships are also using hybrid generators as power supply devices. Through the application of the power distribution device, we can realize the power distribution and the task of the control command. In this process, we should

design the corresponding program to divide the specific types of different electrical equipment, so as to rationalize the use of electricity. For the power grid, it is constructed by using cables to connect various electrical equipment, which can be used as a medium to transmit power resources. For the load structure, it is equivalent to a kind of intermediate equipment in the process of power transmission. The function of the equipment is to ensure the safety of power transmission. Because there are a lot of goods involved in the process of maritime transportation, and the freight is relatively low, many enterprises often use the mode of sea transportation to achieve the purpose of import and export. Ship is an important means of transportation to realize maritime transportation. The efficient operation of ship power system is related to the safety and stability of marine transportation. In the ship operation system, the power system is an important part of the ship, and also directly determines the safety of the ship operation. Therefore, for ships, its internal power system is equivalent to a small and independent power grid, which can be used to supplement power energy in time when the ship is sailing on the sea. Generally speaking, a ship only needs to be equipped with one power station, but this will limit the capacity of its power grid. If the high-power load is started, the excessive current will impact the power grid, and the voltage in the power grid will fluctuate violently. Therefore, when the ship power system is running, it is necessary to optimize and adjust the transmission frequency of the power grid so that the ship can operate in the power grid In the navigation process, the power resources can be used more safely and reliably.

3. Disadvantages of Traditional Methods in Ship Power System Protection

In the process of ship operation, power system plays an important role. As the power system after a long time of use, it is inevitable to encounter failures, which will inevitably cause adverse effects on the ship's power supply. Therefore, it is necessary to ensure the good protection of the ship's power system. In the traditional protection methods, three-stage current protection is often adopted according to the time principle. Although the method is relatively simple and reliable, it can also quickly check the fault. However, in the application of three-stage current protection, it is necessary to ensure that the adjacent two-stage switches can perform selective protection action. However, due to the existence of a variety of objective factors, when the power system is running, the protection switch is often affected when performing the protection action, which leads to power failure. Especially for the ship power system, short circuit fault often occurs, in order to ensure that the normal area is protected to prevent interference. In the traditional method, the current protection should be applied according to the time principle to play the same role as the three section current protection. The only difference is that the protection section delay principle should be followed in the switch protection process to prevent the fault from causing adverse effects to other areas. In recent years, the complexity of China's ship power system structure is increasing, but the protection methods still use the traditional protection mode, which will undoubtedly have adverse effects on the operation of the ship power system. Even if the traditional protection methods are optimized, the expected protection effect can not be achieved. Moreover, when the protection lags behind or the degree of protection is not comprehensive, it will cause the problem of refusing to move, and will affect the safety of the whole ship operation. Therefore, it is necessary to introduce and apply more advanced equipment and technology to ensure the reliable and stable operation of marine power system.

4. Research on Key Technologies Involved in Intelligent Protection of Marine Power System

(1) Condition identification technology

Computer technology and network technology are the important basis for realizing the intelligent

protection of ship power system. The monitoring of ship state needs the application of network topology analysis to ensure that the ship will not affect the power network detection under various working conditions. After the detection of ship state, new power network topology data will be generated. At present, network topology analysis has been widely used in the power system. After years of development and optimization, the application scope of network topology analysis is becoming larger and larger, and it has achieved good application effect in ship power system. Based on topology data, it can greatly improve the protection ability of intelligent technology for marine power system.

(2) Power flow calculation technology

In recent years, the power flow calculation technology is often used in our country to grasp the power distribution in the ship power system in real time. At the same time, we can also understand the specific variable values of different state variables in the specific section of the ship power system in a certain period of time. Through the corresponding calculation results, we can analyze whether these state variables will give to the ship power system in a certain period of time The intelligent protection of the system has adverse effects. Of course, as an important algorithm, power flow calculation technology itself is not perfect, and it is difficult to converge in the application process. However, considering the similarity between ship power system and land power system, it can be used for reference to the practical experience accumulated by the land power system in the application of this technology. For example, when the forward calculation method is applied, the loop impedance method can also be applied, or the Newton method can be improved. As for the forward calculation method, it has its unique application advantages and disadvantages. For example, the forward calculation method can be used for simple and fast programming, but it lacks enough ability to process the mesh. In the process of applying power flow calculation technology to ship power system, each algorithm has its advantages and disadvantages. However, in general, the advantages of these algorithms are more obvious. Therefore, when selecting the specific algorithm, we need to combine the actual situation to determine, or combine a variety of algorithms to ensure the calculation accuracy and accuracy after a series of optimization combinations Calculation efficiency.

(3) Fault diagnosis technology

In the intelligent protection of marine power system, it is necessary to ensure that the power system can make accurate and rapid diagnosis in case of fault, so as to prevent the phenomenon of protection action refusing to operate or misoperation. At the same time, it also helps to deal with the fault quickly, minimize the adverse impact of the fault on the system, and ensure that the corresponding equipment is effectively protected. At present, the modern signal processing technology has been applied to the ship power system. The application effect can be effectively improved by combining the technology with artificial intelligence theory. However, in the process of technology selection, the focus of fault should be determined.

epilogue

In a word, with the continuous advancement of global economic integration, China's economic and cultural exchanges with other countries have become increasingly close in recent years, and the domestic economy has also been greatly increased. In this process, the ship undoubtedly plays a huge role. Therefore, it is necessary to strengthen the ship construction to further improve the function and safety of the ship power system. By means of intelligent technology, the ship power system can be protected intelligently, and then the ship power system can operate reliably and stably Safe navigation and escort.

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