

Key technology study on submarine composite cable with long length, three cores and high voltage

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ABSTRACT

There are many differences between high voltage, long length, three cores, submarine composite cable and low/medium submarine cable on manufacturing technology, inspection, etc. This article focuses on the continuous extrusion technology, assembly of the optic fiber core and power cores, performance tests, etc. for long length, high voltage submarine cable.

KEYWORDS

Long length, three cores, high voltage, technology, performance test

0 INTRODUCTION

Long length, high voltage submarine cable is widely used at the high-capacity supply net work between land and island, group supply network among oil exploration platforms, wind power generation transferring to the mainland.

With the development of maritime countries of the world and the islands industry and tourist industry, the medium voltage submarine line can not meet the fast growth requirement of power demand. Marine resource development is going fast under the implementation of Chinese ocean development strategy. Especially the offshore wind power exploration, it is an important strategy of the new resource for China and offshore countries around the world.

Submarine cable, related facilities and route is becoming increasingly with the development of marine economy, the route cost is higher and higher. Chinese ocean management department has realized the serious of the problem. So many economical strategies comes out to save the application area of the ocean and promote the coming forth ocean industry as a long term consideration. Three cores, high voltage submarine cable has the big capability for the power transferring and also has the advantage on the saving resource of route, lower electromagnetic loss and voltage drop, lower cost for the submarine cable fabrication, installation and maintenance[1]. High voltage submarine cables have been used in four offshore wind power projects in China since 2013. Three cores were applied for three of the above projects.

The first offshore wind power of China Southern power grid- Zhuhai Guishan offshore wind power demonstration project was launched at March of 2013. The design of 110kV submarine composite cable is based on two circuits, three cores, which was used to transfer the power to the mainland. The inside optic fiber unit is applied for the information communication, equipment centralized control, operation status on line monitoring. Each circuit length is 21km, there is no factory joint required. This

article focuses on the key technology study of long length submarine composite cable used in this project.

1 KEY TECHNOLOGY RESEARCH

1.1 Main information of the product

Specification/ model: CU/XLPE/Lead/SWA/OFC 64/110kV 3x500mm²+33B1

Product structure drawing: Please refer to fig 1.

Length of single segment: 20km

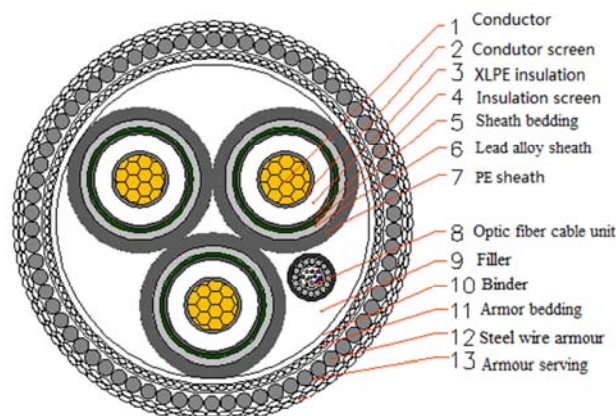


Fig1: Structure drawing

1.2 Long length submarine cable insulation manufacturing technology

Normally, the working time of the triple layers (conductor shield, insulation and insulation shield) of high voltage production line will be not more than 7 days. The manufacturing length is about 15km, which can not meet the requirement of 20km continuous length without factory joints. The following actions shall be taken to ensure the continuous length without factory joint:

- More quantity of insulation extrusion production line shall be adopted ($\Phi 200$ type extrusion machine will be adopted for the major insulation). The rotating speed of bolts will be controlled within 15rpm/min and also the temperature of the cooling water shall be controlled in the range 95 ~ 100 °C. Then the insulation extrusion temperature will be reduced, the melting temperature of the insulation material will be controlled within 130 °C and the melting temperature of screen material will be controlled within 120 °C.
- Super clean high voltage insulation material will be adopted and proper insulation filter screen (270~300) will be choosed. The extrusion pressure and melting temperature can be reduced by some other ways