

Dynamic Cable Installation for Fukushima Floating Offshore Wind Farm Demonstration Project

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Furukawa Electric Company and VISCAS Corporation have proceeded with a Fukushima FORWARD Project (FF project) as one of the commissioning manufacturers of the Ministry of Economy, Trade and Industry. This paper reports the development condition of the power transmission system, mainly the development of a high voltage dynamic cable, which is considered as an essential technology.

The FF project consists of a 1st stage (2011-2013) and a 2nd stage (2014-2015). Figure 1 illustrates the transmission and substation system.

A behavior of dynamic cables subjected to under-water rolling caused by the steadily wave movement is different from that of the static submarine cables. Therefore, a development point is the improvement of a fatigue withstands property. For a practical application of riser cables, a target is to achieve the similar endurance life of a floating body or of a wind turbine.

As the dynamic cable, a fixed wave condition and a floating body's rolling condition are needed for the riser cable design at first for external conditions. A static behavior analysis, a dynamic behavior analysis and a fatigue analysis are in turn conducted with combinations of the various parameters and the shapes for a riser cable under above conditions. The analysis and feedbacks are reiterated and finally the most suitable submersible shape design and its detailed riser cable design are defined. It is essential for a conceptual construction of the submarine cable to meet the specification in accordance with the electrical equipment technical standards and for its electrical and mechanical characteristics to satisfy JEC-3408, CIGRE TB 490 and CIGRE Electra No.171. Based on the previous findings, the riser cable construction is defined as shown in figure 2. The cable has double layers of strand armor wires twisted in opposite directions in order to prevent cable torsion.

The transmission system was installed in order of submarine cable, riser cable and submarine joint. The 66kV riser cable was installed from the substation to the jointing point with submarine cable. After installing the riser cable, the submarine joint was constructed on the vessel with the submarine cable which had been installed.

The 1st stage of the FF project was successfully completed in 2013 and it is already under operation.

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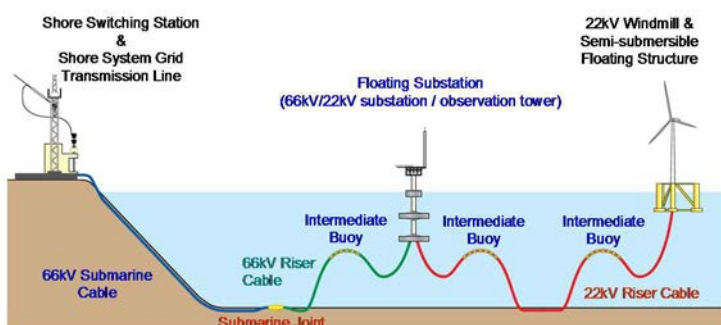


Fig. 1: Transmission and substation system in FF project

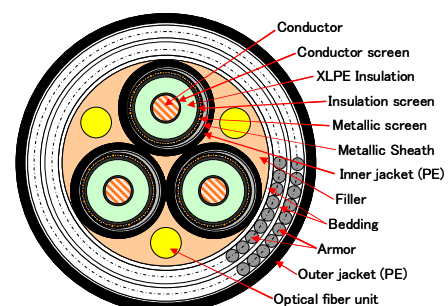


Fig. 2: Structure of 66kV riser cable