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A testing platform for subsea power cable deployment

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ABSTRACT

The failure of subsea cables has been predominantly attributed to third party activities and cable field joints. Field joints may be unavoidable due to joining of insufficient factory-made cable lengths, cable repair, or when the cable installation process has to be abandoned due to rough weather or other unplanned events. Failures within the jointing location reveal that current quality testing of these joints may be inadequate. The failure mode in these joints is mainly a result of seawater ingress at the field joint. Current design practices for subsea cable field joints recommend offshore simulations/trials to demonstrate the long term performance of the joint under the expected mechanical loads during cable installation to demonstrate whether the planned field joining practice is satisfactory. Nevertheless, offshore simulations are costly, and therefore a set of standardized onshore testing schemes would be advantageous alternative. This paper presents an onshore testing scheme for subsea power cable deployment. The proposed testing arrangement can be employed to verify the design of the offshore field joint and to prove the functionality of the field joint under the installation loads.

1. Introduction

Pervious work published in the literatures [1–4], has highlighted that jointing operations are complex and involve valuable vessel time. The jointing operations to be undertaken offshore require good planning, highly qualified personnel and an installation vessel equipped with proper equipment for handling and deployment. Jointing operations typically last for several days. This is depending on the subsea joint design as well as the type of the joint. Cable repair may not be possible during rough seas or windy conditions. It is well recognized in the offshore industry that it may be difficult to find favorable weather conditions of sufficient duration. It is necessary to carry out the joining operation in good weather conditions to guarantee the integrity of the joint and to prevent fatigue failure of the hanging cable sections. Ref. [5] proposes that cable joints as well as terminations should be subjected to a testing scheme as per industry standards.

The main contribution of this paper is the introduction of an onshore testing platform for Omega deployment which can be used to test the joint under the expected installation loads. The onshore simulation can be used to mimic the corresponding mechanical forces and handling of the lifting equipment for the "Omega-laying" procedures.

The proposed testing arrangement can be used to replace the sea simulations/trails to determine if the proposed field joining procedure is acceptable. The test could be implemented in conjunction with the typical mechanical tests listed in [6].

Ref. [1] presented a testing platform for the in-line offshore field joint (In-line joint is illustrated by Figs. 1 and 2) which can replace the sea trials undertaken offshore, whereas this paper proposes a testing scheme applicable only for the Omega offshore field joints. The Omega offshore field joint refers to a joint that will be deployed on the seabed in a "U" configuration, in an over length loop (Omega joint is illustrated by Figs. 3 and 4). It is also defined as an Omega joint because the joint mimics the symbol Omega from the Greek alphabet "Ω".

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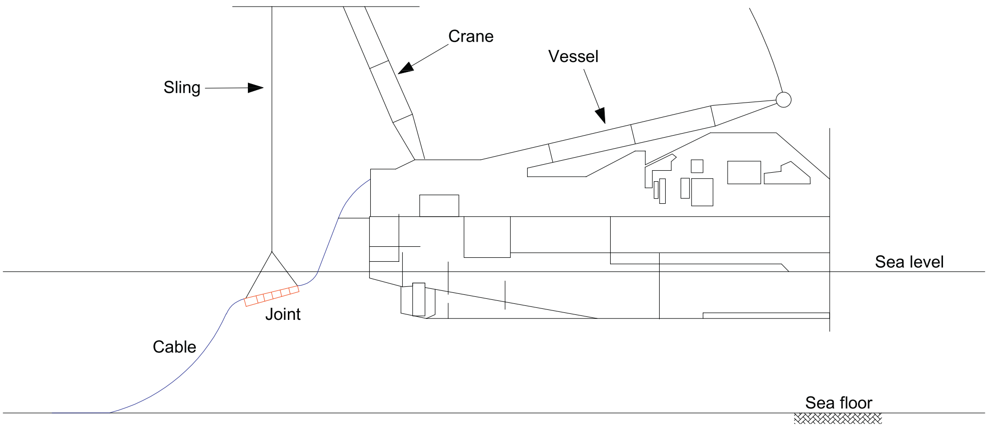

Fig. 1. In-line offshore field joint deployment.

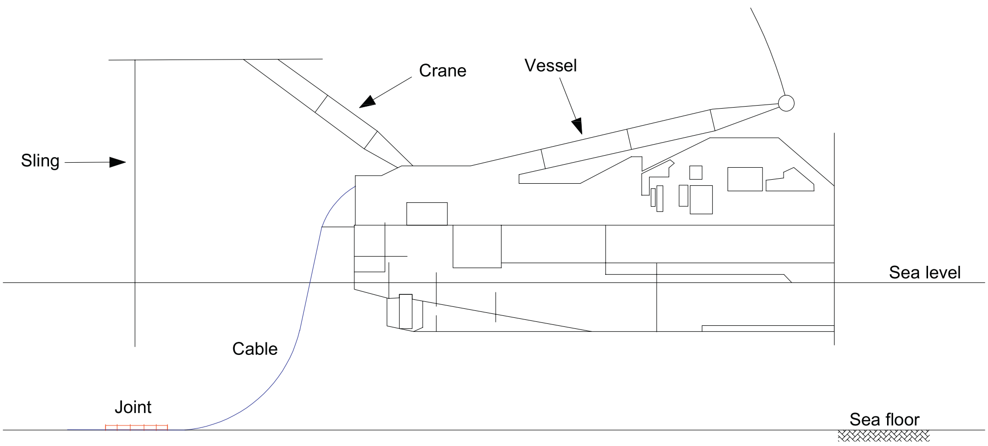

Fig. 2. In-line offshore field joint-final position.

The testing scheme presented in this paper should be undertaken to verify the design of the offshore field joint. Moreover, the proposed testing scheme increases the level of confidence in the design of the offshore field joint and proves the functionality of the field joint under the anticipated installation loads.

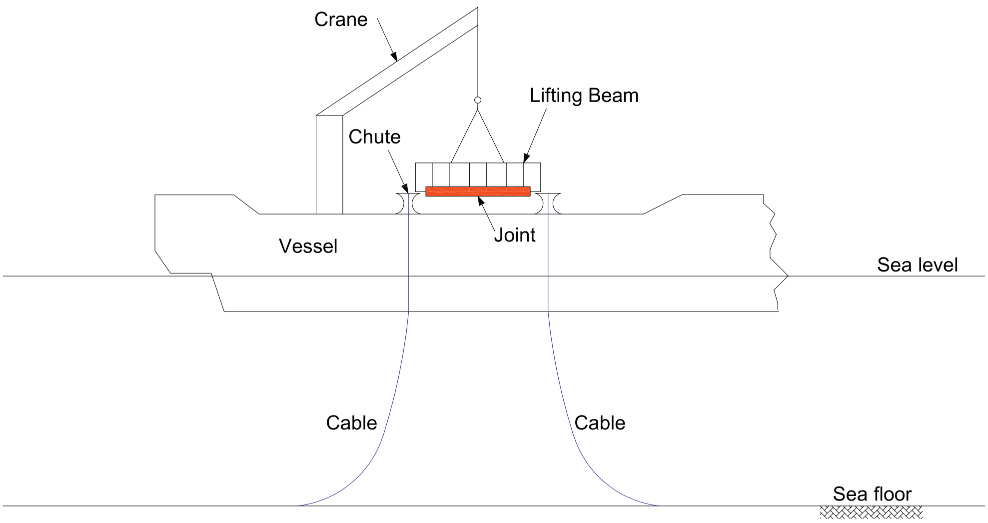

Fig. 3. Omega offshore field joint deployment.