Retrofit “Tuck-in” Riser with Pivoting Trunnion System

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ABSTRACT

Newly built shallow water platforms are fabricated and installed with risers on the inside of the jacket structure to protect them from external impacts. However, it is often necessary to retrofit new risers, either for unanticipated project extensions or to replace existing risers that are no longer fit for purpose. Placing these retrofit risers on the inside of an existing jacket is challenging and so retrofit risers tend to be installed on the outside and require alternative methods of protection (typically a large protection frame).

This paper presents the concept of the tuck-in retrofit riser, as a protection alternative. This consists of a riser installed as a single piece, where the bottom part is on the outside of the jacket and the top part that is potentially exposed to impacts on the inside.

The key aspects to consider the feasibility of using this type of riser on a particular application and in particular its constructability are presented in this paper, together with a discussion on the key design decisions. These generic considerations are complemented with the presentation of a case study with four tuck-in retrofit risers recently and successfully installed for TotalEnergies in the Middle East. Some of the lessons learnt from this case study are also presented.

KEY WORDS: riser; retrofit; tuck-in; offshore installation.

INTRODUCTION

Rigid risers on new platforms are installed inside the jacket to provide protection against external impacts. This is achieved by pre-attaching the risers onto the inside of the jacket before the installation campaign.

In some cases, however, new risers need to be added (or retrofit) onto existing platforms. This can be as a result of the need for an unanticipated riser or to replace an existing riser that is no longer fit for purpose.

In the case of risers to be retrofitted into existing platforms, the following options are available to ensure the protection of the riser from impacts:

- The new riser could still be placed on the inside of the jacket. This, however, requires installation of the riser in several pieces (to allow locating them inside the jacket) that need to be connected once in place. Since the introduction of intermediate flanges in risers is generally not desirable (and not allowed in the TotalEnergies referential), this implies the realization of one or more hyperbaric welds, which may not be possible and should be avoided in any case.

- The new riser could be placed on the outside of the jacket and be protected by a protection frame.

In some cases a protection frame may already be in place and a decision needs to be made on whether the frame is removed and reinstated after the new riser has been installed or an installation sequence is developed to allow installation as a single piece behind the existing protection frame without frame removal. If a new protection frame is to be introduced, a verification that the existing jacket can support this new item is required (weight and additional hydrodynamic loading). As alluded in the previous paragraph, introduction of a new protection frame will also impact the installation of future retrofit risers onto this structure.

- The new riser could be installed as part of a caisson, provided it was demonstrated that the protection provided by the caisson was equivalent to that provided by a protection frame.

- An alternative to the options above is a riser with the top section inside the jacket and the bottom section outside the jacket, with a geometrical transition made with two bends between the two parts. This configuration is referred to as a ‘tuck-in riser’ in this paper. This option can be implemented for cases without a protection frame and for cases with a protection frame where there is a drive to avoid removing and reinstating the frame. An example of a tuck-in riser on a jacket with a protection frame is illustrated in Figure 1.

Although tuck-in risers have been previously installed in the industry, no published records have been identified by authors and this configuration and its associated installation methods remain ‘unconventional’.

The objectives of this paper are to present the tuck-in riser solution and its design and installation criteria and to discuss its advantages, disadvantages, the considerations to determine when it can be implemented and any measures that may need to be considered to ensure a safe installation. The paper also presents the example of a tuck-in replacement riser recently installed for TotalEnergies in the Middle East, including the relevant technical details and key return from experience.