Investigation on Scheme of Penglai 19-3 Phase II Jumper Hoses and Cables Installation

Bin Yan, Lai Yan, Jinfang Jiang and Xuecheng Gong
Offshore Oil Engineering Co., Ltd.
Tanggu, Tian Jin, China

ABSTRACT
The installation method of jumpers and cables connection between Soft hard arm single point mooring system and Floating Production, Storage and Offloading System (FPSO) includes pre-installation, barge carrier installation and floating crane vessel installation. This paper discusses and compares the three installation methods of jumpers and cables connection from technical feasibility, cost management, operational risk and motivating vessel resources combining with the giant world-class 300,000 ton FPSO jumpers and cables connection project, and hope to provide a useful reference and experience for future installation of jumpers and cables.

KEY WORDS: FPSO; SPM; offshore operation method; jumper hoses and cables; soft hard arm single point mooring system.

INTRODUCTION
Pressures on installation, field operation, and health and safety concerns are encouraging quicker and easier methods of jumper hoses and cables connection between soft hard arm single point mooring system single point tower and FPSO (Floating Production, Storage and Offloading System) that reduce the cost and complexity of offshore operation. This paper advances three reasonable installation schemes of flexible jumpers hoses and cables connection, which includes pre-installation, barge carrier installation and floating crane vessel installation(Jiang,2006; Jiang,2008;Wang et al.,2008;Zhao et al.,2008), and discusses and compares the three installation schemes combining with giant world-class 300,000 ton FPSO jumpers and cables connection project. The FPSO has been put into use in Penglai 19-3 phase II Oilfield in China's Bohai Bay in March 2009, and engages 14 great span high altitude jumper hoses and cables which reached 50 m span.

FPSO and SPM (single point mooring system) are adopted more and more in the development of offshore oil and gas field, especially the soft hard arm single point mooring system becomes the main choice in shallow sea such as China's Bohai Bay. At present, there are 7 FPSO utilizing soft hard arm single point mooring systems which have been serving in China's Bohai Bay, and COOEC (Offshore Oil Engineering CO., LTD) has broached three installation methods of jumper hoses and cables connection and each method has been successfully put into practice. Especially, pre-installation method has been successfully applied to jumper hoses and cables connection of the giant FPSO named Hai Yang Shi You 117, which is China’s largest FPSO and can load or off-load 190,000 barrels of crude oil a day. 14 flexible jumper hoses and 4 flexible cables are used, and the heaviest of which is 24.7 ton 78 m long and the longest one is 106 m, and all altitude is 42.4 m. It is a new record about weight, length and altitude in China even in the world.

This paper will present the three installation schemes combining with the giant world-class 300,000 ton FPSO jumpers and cables connection project with particular reference to the more efficient installation of jumpers and cables.

Background
The huge FPSO, named Hai Yang Shi You 117(HYSY 117), which was designed and built by Shanghai Waigaoqiao Shipbuilding Co. Ltd and upper modules were assembled and installed in Singapore by SOME, is applied to Penglai 19-3 phase II oilfield which is approximately 27 m depth in China Bohai Bay, and can load or off-load 190,000 barrels of crude oil a day, which is the largest FPSO in China. The vessel is 323 m long and 63 m wide, and measures 71 m from its keel to the top of its smoke stack. There are 14 flexible jumper hoses and 4 flexible cables installed between SPM single point tower and the giant FPSO including 4 pieces of 16 inch production hoses, 4 pieces of middle and low voltage power cables 106 m long, as shown in the Table 1.

HYSY117 adopts soft yoke mooring system, and begin to jumper hoses and cables connection when FPSO hook up with YOKE. When the FPSO draft is 14 m, the distance from the highest point of jumper hose installation platform to the sea level is 42.4 m and from the lowest point is 13.7 m and from FPSO bow to single point tower is 51 m, as shown in Fig.1.