Liuhua 19-5 Gas Field Development: A Successful Subsea Tie Back Solution

Jiayou Mao, Jianjun Yang
Deepwater Engineering&Construction Center
CNOOC China Ltd. Shenzhen
Shenzhen, China

Jing Gong
College of Mechanical and Transportation Engineering
China University of Petroleum at Beijing
Beijing, China

ABSTRACT

Liuhua 19-5 gas field is a two subsea well head marginal field. The development is through subsea tie back technology. The field is located 240km to the south east of Hong Kong with 200m water depth. During the execution of the project, several challenges were met such as delayed delivery of long lead items resulted in re-alignment of most offshore installation activities. The topside modification to the existing platform also encounters problems, such as safety issues, late stage project scope changes. Quality issues for some local products stretched the pre-commissioning time, cracks on the slug catcher vessel after heat treatment etc. Various measures were taken to solve those difficulties. The project achieved its target startup date with overall effective control on schedule, cost, safety and quality. There are also four China first use technology been successfully implemented.

KEY WORDS: Subsea tie back; pipe in pipe; flow assurance; virtual metering; slug catcher.

INTRODUCTION

Liuhua 19-5 gas field development is located in South China Sea in water depth of 185m. The development plan is to use subsea wells heads tie back to the existing PY30-1 gas field central platform 11km to the south-west. The main scope including two subsea well head production system, one 11.4km long rigid flow line, one 11.4km composite electric-hydraulic control umbilical, one subsea pipeline end manifold, 5 pipeline expansion spools and two rigid jumpers, topside modification and installation of additional processing equipment on the existing platform (Fig.1). Sanctioned in June of 2011 with a target field startup end of 2013, the project is a schedule driven project. Start bidding process for long lead items right after project sanction established a good start. However unforesseeable delays of subsea production system happened at the later stage of the project which resulted in re-alignment of most offshore installation activities to accommodate this change (Yue, Liu and Mao, 2013). The topside modification to the existing platform also encountered problems, such as safety issues, late stage project scope changes. Quality issues for some local products stretched the pre-commissioning time, cracks on the slug catcher vessel after heat treatment etc. Various measures were taken to solve those difficulties.

Fig. 1  Liuhua19-5 gas field layout schematic

NON TECHNICAL CHALLENGES

Delay of the Christmas Tree And Other Critical Items

As mentioned at the beginning of this paper, the project is a schedule driven one. The basic design freeze date is Feb. 2012. First gas achieved Dec. 2013 with 22 months duration. At the early stage with the tree delivery estimated at beginning of June, 2013, umbilical delivery in Aug.-Sept. 2013. The offshore installation schedule was originally arranged in sequence as following: wells drilling to be finished before June of 2013 followed by tree installation and well completion by the drilling rig before mid. of July, 2013. After that the drill rig is demobilized and construction vessel enters in field to perform pipe line laying, umbilical laying and subsea manifold, pipe spool and jumpers and fly leads installation. At Jan. of 2013, the tree vendor informed a 2 months delay may happen. This physically created a 1.5 month gap between well drilling and completion and made it inevitable to have two times mob and de-mob of the rig. Moreover, this will push the other installation activities late into winter monsoon season with rough seas. With the earlier than schedule delivery of the umbilical, also for better allocate the main offshore installation...