Design and Operation Considerations for Large Jacket Installations in South China Sea

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ABSTRACT

This paper presents an overview of the design and operation considerations based on our recent experiences of six large jackets installed in the northern waters of South China Sea. Latest progress of large jacket installation technology is also reviewed here. This paper provides installation design guidelines to enable large jackets to be launched and installed as rapidly as possible co-incident with safe practice for future offshore projects.

KEY WORDS: Jacket launch; upending; on-bottom stability; T-Shaped launch barge.

NOMENCLATURE

CPP = Central Processing Platform
COG = Center Of Gravity
HMPE = High Modulus Polyethylene
HYSY = Hai Yang Shi You
LW3-1 = Liwan 3-1
Te = Tonne, or Metric Ton

INTRODUCTION

Since May 2006 there have been six large jackets ranging from 11,000Te to 32,000Te successfully installed in the northern waters of South China Sea. Fig. 1 shows a successful launch of 31,375Te mega jacket by the world's second largest T-Shaped launch barge in South China Sea on August 30, 2012. Large jacket installations should take into consideration a variety of design and operation factors including jacket launch, upending scheme, on-bottom stability, pile upending system, pile driveability, gripper design, grouting design, flooding system, launch barge positioning spread, jacket wet tow riggings, jacket lifting/upending riggings, tiedown removal sequence, anti-prelaunch device, breakout push jacks, jacket leveling tool, pile handling tool, and other installation operation issues.

Jacket launch analyses shall include determination of an optimal initial launch condition and a launch sensitivity study with variation of jacket weight, COG shift, friction coefficients, damaged compartments, etc., thus ensuring the integrity of both jacket and launch barge. Three different jacket upending schemes have been adopted in installations of the abovementioned six jackets. Large size of foundation piles, as massive as ø108"(2743mm)×158m ×754Te skirt piles, are successfully installed which may cause challenges in design of pile upending rigging system and pile installation method. Large jacket on-bottom stability and its pile driveability shall be carefully evaluated. Large bollard-pull positioning tugs and HMPE wet tow riggings shall be required to maintain the position and orientation of large launch barges as well as launched mega jackets. Large capacity of flooding system, skirt pile grippers, inflatable grout packers, grouting spread, leveling tool, etc., are also required for large jacket installation.

This paper presents an overview of the design and operation considerations based on our recent experiences of six large jackets installed in the northern waters of South China Sea. Latest progress of large jacket installation technology is also summarized here. Both jacket and barge trajectory motions have been successfully monitored and measured in two jacket installations. The challenging underwater dynamic pile monitoring technique has been successfully applied to the LW3-1 mega jacket. Latest development of marine operation codes and standards for the jacket installation design are reviewed in this paper. Lessons learned from the offshore operations are also addressed here.