Shallow Water Subsea Pig Launcher Concepts and Their Application in Deepwater Field Developments

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ABSTRACT

This paper examines the benefits of using a shallow water pig launcher/receiver in the development of a deep water field in remote areas where a large deep water pipelay vessel is cost prohibitive to mobilize. The use of a shallow water pig launcher/receiver enables the laying of multiple small diameter lines in the deep water section and a large diameter line in the shallow water with a manifold at the interface point such that export lines and production flowlines can be laid with the same deep water lay vessel. A vertical and horizontal launcher/receiver are evaluated and their design challenges and regular pigging methodologies are also addressed. The study concludes that the vertical subsea pig launcher/receiver is a practical solution.

KEY WORDS: Subsea; pig launcher; pigging; pipeline; manifold

INTRODUCTION

The application of subsea pig launchers/receivers is limited in offshore field development but is gaining momentum in deep-water fields where a single flowline is installed between the host facility and the well. For example, Serrano (Gulf of Mexico) and ETAP (North Sea) are two projects where this concept was successfully utilized. However, this paper examines the concept of subsea pigging on the configuration of an export pipeline from a host floating facility in deepwater to the onshore receiving facility. This concept was developed and is directly applicable to remote locations in Australia, India and South East Asia where a deepwater field development requires mobilization of deepwater pipelay vessels from Gulf of Mexico or from West Africa.

An early commitment is often required to secure pipelay vessels to ensure on-time project delivery. However, this is generally not possible, particularly if the contracting process is tedious and excessive time is needed to complete it. In addition, usually more than one vessel is used to install the export pipelines and the infield production flowlines. Vessels capable of laying large diameter export pipelines are not as plentiful and have a higher day rate than mid-size deep-water pipelay vessels suitable for laying smaller flowlines.

Therefore, remote projects would endeavor to mobilize only one deep-water pipelay vessel to lay export pipeline as well as infield production flowlines reducing the mobilization cost. This is accomplished by substituting the large diameter export pipeline with multiple small diameter pipelines (as determined by hydraulic analysis) such that both export pipelines and flowlines are laid by the same vessel in deepwater.

For the purposes of this concept, the size of the shallow section of the export pipeline is kept unchanged as it can be laid easily by a conventional shallow water pipelay vessel or barge. At the interface of shallow and deep-water sections, a manifold is installed to connect both sections. The multiple lines from the host facility in deep water to the manifold will be pigged round trip from host to host facility. However, pigging of the single shallow water section will either be pigged from onshore to manifold or vice versa requiring a subsea launcher or a subsea receiver which could be either diver or ROV assisted. This paper describes two types of pig launchers/receivers currently used in the industry and considered for use in the study field.

DESIGN AND REQUIREMENTS

The study field is remotely located and will produce gas and liquid condensate from a multiple well subsea production system to a floating platform in a water depth exceeding 3,000 ft. The floating platform will offload condensate to a shuttle tanker and export gas using three (3) 12-inch ANSI 900# flowlines. These flowlines run approximately 20 miles from the floating platform to a manifold at a water depth of 300 ft. The manifold will combine the three (3) 12-inch lines and connect them to a single 28-inch ANSI 900# flowline that will continue to the shore; as shown in the Figure 1.