



OTC 18524

## Deepwater Tieback SCR: Unique Design Challenges and Solutions

Ruxin Song and Paul Stanton, Technip USA

Copyright 2007, Offshore Technology Conference

This paper was prepared for presentation at the 2007 Offshore Technology Conference held in Houston, Texas, 30 April – 3 May 2007.

This paper was selected for presentation by the OTC Program Committee following review of information contained in an abstract submitted by the author(s). Contents of the paper, as presented, have not been reviewed by the Offshore Technology Conference and are subject to correction by the author(s). The material, as presented, does not necessarily reflect any position of the Offshore Technology Conference or its officers. Electronic reproduction, distribution, or storage of any part of this paper for commercial purposes without the written consent of the Offshore Technology Conference is prohibited. Permission to reproduce in print is restricted to an abstract of not more than 300 words; illustrations may not be copied. The abstract must contain conspicuous acknowledgement of where and by whom the paper was presented.

### Abstract

A steel catenary riser (SCR) is often the preferred option for subsea tie-back to an existing deepwater platform due to its conceptual simplicity, ease of construction and installation, and simple interface with the flowline. Unlike new field development, which provides more room for the design of new SCR, the engineering design of a tie-back SCR has unique challenges and requires special solutions. This is mainly because initial preliminary SCR design during design of the floating production system lacks project specific information for the tie-back. In addition, the early SCR design draws much less attention compared to the detail design.

Based on deepwater tie-back SCR engineering experience, key tie-back SCR design challenges are summarized from the engineering execution perspective. These challenges include potential concept changes, platform stringent weight budget limits, existing riser porch strength limits, SCR top arrangement, thermal performance requirement, subsea layout, riser interference, SCR and flowline interface design, SCR fatigue design, and installation. They call for design optimizations and even innovative ideas. The engineering analysis and design to handle the challenges are discussed together with solutions. The lessons learned from recent tie-back SCR engineering projects are outlined. These lessons should have significant relevance to future tie-back SCR projects.

To demonstrate the challenges and solutions, an example is given based on a recent deepwater Spar tie-back SCR project with solution to challenge design that makes the design reliable and robust.

### Introduction

In recent years, exploration and production activities have

increased dramatically in deepwater nearly doubling the water depth compared to the activities a couple of years ago. The offshore industry is building systems today for production from even deeper water, progressively using new technology and significantly extending existing technologies. The targeted water depths for oil and gas developments in areas such as Gulf of Mexico (GoM), West of Africa (WoA), Brazil and North Sea are increasing every year.

Regardless of the floater concept adopted for offshore field development, there is always a need of risers. Risers are some of the more complex aspects of deepwater developments. It became evident that riser system plays bigger and bigger role as part of the offshore infrastructures. There are different ways to group deepwater risers. The most widely used and field proven deepwater riser concepts include SCRs, hybrid risers with a single line or bundled multi-lines, flexible risers with different configurations, and top tension risers (TTR) as shown in Figure 1.

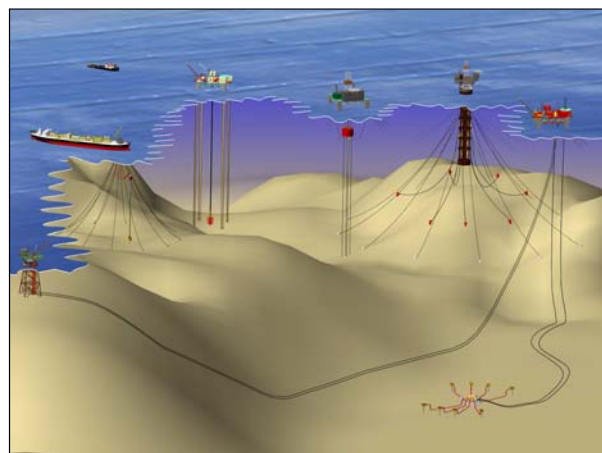


Figure 1: Illustration of Deepwater Riser Concepts

Among the riser concepts, SCRs have been enjoying a widespread acceptability for deep and ultra-deepwater oil and gas production in recent years. Up to today, more than 100 deepwater and ultra-deepwater SCRs have been installed worldwide mainly in the GoM, WoA, and offshore Brazil. The impetus for developing SCR technology is the continuing push into deep and ultra deep water, and the growing belief that SCRs offer the best technical and commercial solution. To date, the deepest SCR that has been engineered and installed is the Independence Hub Facility (IHF) at a water depth of 8000 ft, which includes a tie-back SCR. [Song, R., et al, Ref. 3].