Bottom Weighted Riser – A Novel Design for Re-location and Disconnection

Frank Lim and John McGrail
2H Offshore Engineering Ltd.
Woking, Surrey, United Kingdom

ABSTRACT
Flexible pipe risers have limitations in deep water depths and pressure/collapse ratings compared to rigid steel pipe risers. Use of steel pipe systems has therefore attracted the interest of deepwater riser designers, not least to dissociate from the monopoly of the limited few flexible pipe suppliers in the world. Examples are the steel catenary riser and freestanding hybrid riser systems.

An all-steel pipe Bottom Weighted Riser (BWR) system and its components are described in this paper. It is a novel approach ideally suited for short to medium term usage for production, injection and export of hydrocarbons in a large range of riser diameters. Its key advantage is the ability to relocate in a re-usable form, and disconnect from the production vessel in severe weather conditions.

The feasibility of the BWR is shown in terms of the operating envelopes when connected to a floating production vessel.

KEY WORDS: Deepwater; Steel Riser; Disconnection; Relocation

INTRODUCTION
The use of a generic re-locatable production riser system for use with a disconnectable Floating Production Storage and Offloading (FPSO) vessel or Floating Production Unit (FPU) in a range of shallow to medium water depths has been the topic of a number of offshore projects in the South China Sea.

Such a system is attractive when early production is desirable whilst the reservoir condition remains uncertain, in an area where typhoon is almost a predictable event.

A flexible riser system conventionally adopted for this range of water depths is deemed to be less than ideal from an economic standpoint. It is also disadvantaged by typically long delivery schedule, susceptibility to damage during retrieval and re-installation, and inadaptability to different water depths.

The Bottom Weighted Riser (BWR) concept was first mooted more than a decade ago (Huang and Hatton, 1995). It was originally intended for large diameter risers operating in deep and harsh environments. Its design and configuration are now recognised to possess features that lend itself to be a re-locatable riser system, for use with a mobile production vessel operating in a seasonally harsh environment.

The system is engineered to use proven oilfield technology, and utilise components that are readily available from a number of equipment suppliers to ensure that procurement and manufacturing schedules are kept to a minimum. The system is also designed to be readily retrievable and easily adaptable to allow it to be moved with the production vessel to a new location following the completion of a short to medium term production program and consequently be re-used on a number of fields with different water depths.

RISER SYSTEM DESCRIPTION
The generic re-locatable production system consists of a BWR used in combination with an integrated tree assembly. The system is designed as a production system suitable for a single well tie-back from a subsea well to a disconnectable floating production system (FPSO or FPU), dynamically positioned or otherwise moored such that the riser does not restrain the vessel movement. The primary application of this technology is for use with an Early Production System (EPS) which may require a single relatively small diameter production riser system for use on a short term basis without the requirement for a dedicated subsea tree.

A description of the system is given in the sub-sections below.

Connected Riser Configuration
The basic configuration of the system when in a connected configuration is shown in Fig. 1.

The system consists of two sections of rigid pipe, connected between the wellhead or production manifold and riser porch on the FPSO. At the connection points between the tree and the two pipe sections are swivel assemblies which allow the riser to articulate without overstressing the rigid pipe. These articulations allow the riser system to accommodate the vessel motions and offsets, environmental loading, and 360 degree weather vaning of the vessel.