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## Design and Installation of the Yme Submerged Loading System

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### Abstract

Talisman Energy Norge AS has awarded a contract to SBM Offshore for the re-development of the Yme field which is located in the Egersund basin in the North Sea. The re-development is based on a Mobile Offshore Production Unit (MOPUstor) with a subsea storage tank from which stabilized crude is exported via a **Submerged Loading System (SLS)**.

The SLS, which is a novel design, is a freely weathervaning loading system located directly on the seabed. The SLS consists of a subsea flowline fitted with a horizontal diverless connector at each extremity, and a gravity base with a rotating upper part linked to the export tanker through a 16" ID riser in a Steep Wave configuration. When disconnected, the riser is left on the seabed, and the end of the riser is connected to a messenger line which is terminated by surface marker buoys and a pick-up rope.

Both the riser and the flowline are comprised of 12m Trelline™ bonded hose sections. The riser (or any hose section) is replaceable by way of a vertical diverless coupling connecting the gravity base piping and the subsea central pipe swivel.

An acoustic transponder with heading sensor is fitted on the rotating part of the subsea swivel, and acoustic DP reference transponders are positioned on the seabed.

The SLS system is hawserless because it is operated with DP Class 2 tankers which can stay on station up to the maximum specified operational seastate.

The SLS was installed by SBM's *Normand Installer* in August 2008. This was the first major milestone in the MOPUstor system installation campaign. The size of the gravity base and the large number of bonded hoses (115 hoses for the flowline and 16 hoses for the riser) made it a challenging operation, not only offshore but also at the mobilization in port. The constraints onshore and offshore, the main installation steps and the methodology are described in this paper.

### Introduction

The Yme field is located approximately 100 km offshore in the Norwegian Continental Shelf. The Yme field consists of two main reservoirs, Beta and Gamma, which are approximately 12 km apart. The Yme Re-development Project will be based on a MOPUstor<sup>2,4</sup>, which is a Mobile Offshore Production Unit with a subsea storage tank. The MOPUstor will be located at the Gamma reservoir with surface completion of the Gamma wells and tie back of the subsea completed Beta wells.

The oil will be exported by means of an oil offloading flowline laying on the seabed and a weathervaning Submerged Loading System (SLS) installed in the vicinity of the MOPUstor at a distance sufficient to allow weathervaning of the shuttle tanker, as shown in Figure 1.

Export tankers will periodically connect to the SLS and will receive the oil stored in the storage tanks of the MOPUstor.

The complete system is designed to meet the environmental operational conditions specified for both the offloading and survival cases in accordance with the specifications and the Classification Society rules. The SLS system does not require mooring because it is attended by DP tankers.