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Ormen Lange Subsea Production System

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Abstract

This paper presents the concept and the technical solutions developed and applied to the Ormen Lange subsea production system. First, the key technical challenges related to the subsea system are presented. Thereafter the paper describes the extensive design, fabrication and testing processes undertaken in order to verify correct functionality and gain confidence in the applied solutions. Finally the paper summarizes achievements and key success factors for the project.

Introduction

The Ormen Lange field is located in the Norwegian Sea, approximately 100 km off the northwest coast of Norway. The field is located within a prehistoric slide area, the Storegga Slide, with water depths reaching 850 meters in the main production area.

The selected development concept for Ormen Lange comprises a subsea tieback to an onshore processing plant at Nyhamna as shown in Fig. 1.

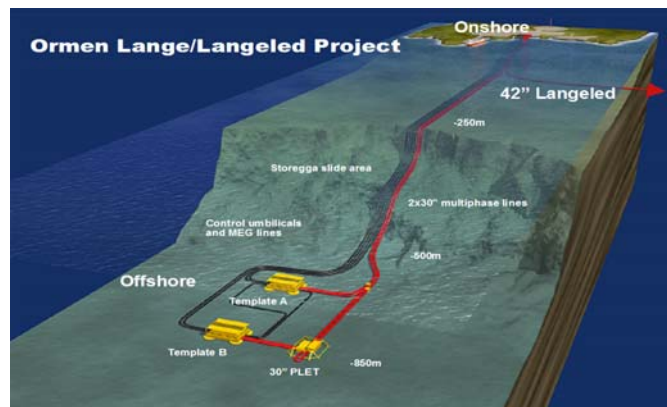


Fig. 1 Ormen Lange initial subsea development

The gas will be produced from up to 24 subsea wells. The well fluid will be transported to the Nyhamna plant via two 30" multiphase lines. After processing, the dry export gas is transported from the onshore plant through a new 42" pipeline via the Sleipner riser platform and further through a new 44" pipeline to the gas-receiving terminal in Easington, England.

Overall project schedule. The conceptual engineering of the subsea production system was initiated in 2002. The main contracts for subsea equipment supply, umbilical fabrication and template installation were awarded between the autumn of 2003 and the summer of 2004.

The main part of fabrication and testing took place during 2004/2005 with the subsea templates installed offshore in the late summer of 2005. Umbilical A and remaining subsea equipment were installed during the summer of 2006 and the first Xmas tree was installed on Template A in December 2006.

Completion of the first subsea well on Template A is scheduled for spring 2007 and subsea production start-up scheduled for autumn of 2007.

Subsea system configuration. Due to the large geographical extension of the Ormen Lange reservoir and the risk of reservoir segmentation, the subsea system design has a high degree of flexibility with four planned template locations. For this reason, a phased development scheme has been chosen. The phasing and location of the subsea wells will be timed to maintain plateau production as the field depletes.

Initial development. The initial subsea development consists of two 8-slot production templates (A & B), located approximately 4 km apart in the main production area. Each template is tied back into the two 30" multiphase pipelines to shore. The two 30" lines are interconnected via a pipeline end termination system (PLET) as shown in Fig. 2.

Two main control umbilicals link the onshore plant to the subsea production system; one is connected to template A, and the other to template B. A crossover control umbilical interconnects the two production templates, providing redundant hydraulic supply to all the subsea wells.

For prevention of hydrate formation, all wells are continuously injected with monoethylene glycol (MEG) via two 6" pipelines from the onshore plant. One line is connected to template A, and the other to template B. A 6" crossover MEG line interconnects the two production templates for added flexibility.