APPLYING THE RELIABILITY ANALYSIS CONCEPT IN ON-BOTTOM STABILITY DESIGN OF SUBMARINE PIPELINES

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ABSTRACT

This paper describes a reliability based formulation to determine submarine pipeline on-bottom stability for conventional, concrete coated pipeline system used for transmission of gas and condensate in South Pars Field of Persian Gulf. The instability is defined as a condition where the water will push the pipeline but the movement will not necessarily cause a failure. The Stability conditions are usually checked during installation and operating conditions. The submarine pipeline on-bottom stability design is carried out for different water depth and environmental conditions. Moreover the effect of embedment of the pipeline on the seabed in considered with reduced hydrodynamic coefficients as detailed in the literature [1,3,4,5]. The evaluation of reliability requires an understanding of design methodologies and what design parameters can cause and increase unreliability in a designed system. The on-bottom stability limit state formulation is based on DNV-RP-E305 recommended practice which is widely used in engineering analysis in submarine pipeline industries [2].

KEYWORDS: Subsea Pipeline – Reliability Analysis – On-bottom Stability

INTRODUCTION

This paper is concerned with the application of design standards for subsea pipelines. The subsea pipelines have been constructed for different purposes such as transformation of crude oil and gas transmission. Some countries use their own standards as guideline for design of subsea pipeline. The most popular used standard for on-bottom stability analysis is DNV design standard which will be adopted in this paper.

Pipelines installed on the seabed are subjected to hydrodynamic forces. Waves and steady currents that are characteristics of all offshore areas subject the pipeline on the seabed to drag, inertia and lift forces. For lateral stability, the pipeline resting on the seabed must resist these forces and at a minimum be at equilibrium.

Drag and inertia forces act together laterally on the pipeline, tending to move the pipeline. Lift force acting vertically tends to effectively reduce the submerged weight of the pipeline. The sliding friction between pipeline and seabed soil provide the resistance of the pipeline on the seabed. In general, the larger the submerged weight, the higher the frictional resistance. However, latter methods for

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