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Henning Devices: A New Class of VIV Suppression Apparatus for Offshore Tubulars

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Abstract

This paper introduces a new class of vortex-induced vibration (VIV) suppression apparatus, Henning devices. Test results for a number of such devices are presented and discussed. One of the main advantages of these novel devices over helical strakes and streamlined fairings is that the coverage density required to be effective is reduced from about 70 to 80% or more to approximately 20 to 25%. The drag on the tubulars with the light coverage density is therefore significantly reduced, compared to that of helical strakes. An additional advantage of Henning devices over fairings is that they are not required to rotate to be effective at reducing VIV, as evidenced by the tests. With the application of this new type of hardware, great cost savings can be expected.

Introduction

Offshore tubulars used in oil and gas exploration and production are often protected from vortex-induced vibration (VIV) with add-on hardware. Among the various types of suppression devices, helical strakes and streamlined fairings are the most common. These apparatus are effective at reducing VIV, though each has its own advantages and disadvantages [1,2]. One common feature to strakes and fairings is that a coverage density of greater than 70 to 80% is normally required to effectively mitigate VIV [3]. For example, if a suppression coverage length of 1,000 ft of the tubular is determined necessary, the required amount of suppression, in linear feet, should be at least 700 to 800 ft spaced evenly along the 1000 ft length.

Extensive VIV testing has been performed at Shell Westhollow Technology Center current tank, to explore more efficient suppression devices. As a result, a new class of VIV suppression hardware was discovered in 2006. In early 2007, a general methodology for VIV suppression was developed based upon the understanding of the test results. Additional tests, at higher Reynolds number, were subsequently conducted to further validate these novel concepts.

This paper presents and discusses some of the test results for this new class of suppression devices. First, the test facility and setup are described, followed by an introduction of various types of Henning devices. Test results for three examples (tri-bladed, square, and fixed 4-bladed devices in a range of applications) are presented next to illustrate various features. Conclusions are drawn thereafter.

The information presented in this paper should be of interest to offshore engineers and project managers involved in platform, mooring and riser design as well as project execution, as it discusses some of the latest developments in VIV suppression.