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Metocean Criteria for Jack-Ups in the Gulf of Mexico

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Abstract

Prior to the 2006 hurricane season, jack-ups had successfully operated in the Gulf of Mexico with few failures, but until recently there was not a consistent metocean criteria to which they were assessed prior to operations. The paper sets out a methodology that can be used to determine if the unit can be safely operated, and successfully evacuated prior to the arrival of a tropical revolving storm likely to cause the unit distress. The thrust of the paper is the life safety issue of ensuring the unit is evacuated in sufficient time: survival of the unmanned unit is not addressed within this paper.

The assessment storm is a partial population hurricane comprising a combination of the 50 year independent extremes that could impact the unit prior to its evacuation. Hence the magnitude of the assessment storm will depend on the speed with which the unit can and will be evacuated: if a unit is operating close to its limits, then evacuation may be required at an earlier time, and with more preplanning.

The paper also presents the results of a broad study of the extratropical storm extremes (winter storm) that can be generally used for initial assessment of jack-ups in winter months.

Key Words: MODU, Jack-up, Site Assessment, ISO 1905, Gulf of Mexico, SNAME T&RB 5-5A

Introduction

The foundation and development of the Gulf of Mexico Annex to the Society of Naval Architects and Marine Engineers (SNAME) Offshore Committee 7 (OC7) is set out in the 2006 OTC paper (1). That paper gives a clear understanding of the background to site specific assessment of jack-ups in the Gulf of Mexico, and how the requirements for a more logical foundation have progressed. One extremely important aspect of the site assessment is to determine the suitable metocean data to be used.

This paper sets out how reasonable and realistic operating conditions have been developed, and a methodology is established by which site-specific metocean data can be obtained that allow jack-ups to operate to their fullest ability throughout the hurricane season. A philosophy is established that can be used, in conjunction with a qualified meteorologist, to arrive at a suitable operating criteria that results in the unit having a lower than 2% probability of being affected by its assessment storm in the manned condition. This assessment storm would then be used in conjunction with a suitable assessment methodology to determine the unit's suitability for the site. Since it has been developed to be part of an Annex to SNAME T&RB 5-5A, that is the analysis methodology that is the prime focus, however, it does not preclude the use of the data in other analysis methods. The derived data is robust, and solidly founded in analysis and experience.

In addition to the use of the derived data for jack-up analysis, there is potential benefit to other sectors of the offshore community where there is increasing interest in developing better defined and founded criteria for all offshore operations within the Gulf of Mexico. Existing API RP 2A Section 17 metocean criteria were developed over 10 years ago, and the "Sudden Storm" definition used was based on any hurricane that developed within the Gulf of Mexico. While a reasonable approach at the time, it is now possible to compare these data to those developed through the more rigorous techniques explained within this paper.

Metocean Premise

It is current practice within the Gulf of Mexico to evacuate virtually all offshore facilities prior to the arrival of a hurricane, so most jack-ups can be considered "un-manned" in hurricane conditions. Clearly, evacuating the offshore facilities takes both planning and time, so there is a low, but not insignificant, probability that any individual unit could be affected by a hurricane prior to evacuation being effected. The magnitude of this probability will be dependent on the time required to evacuate the unit: the longer it takes to evacuate, the higher the probability that it will be affected by a hurricane before all personnel are off it.

The amount of time needed from first thought of evacuation through to completion of the evacuation will vary depending on a number of parameters, including distance from helibase, well control issues, time required to prepare the unit for storm arrival, and helicopter operations planning. However, in almost all cases it can be achieved within a 48 hour period. It can therefore be argued that the unit should be