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Transition to Risk Based MODU Codes for the Gulf of Mexico

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Abstract

There is increasing pressure from regulators and industry players for the semi-submersible Mobile Offshore Drilling Unit (MODU) site specific mooring design criteria to be risk based because of the large variability of site infrastructure. This paper describes a process for developing a sequence of approaches, starting with a simple “assume the worst case”, through an intermediate (checklist) approach, rather than, or as well as a fully incorporated risk assessment and criteria development. The paper describes the foundation for the methodologies, and establishes some clear guidelines as to how such risk based assessments should be performed. While detailed quantification is not normally necessary, rigorous analytical approaches are needed in order to demonstrate reasonable compliance. The paper establishes the foundation for the requirements.

Key Words: MODU, semi-submersible, mooring risk analysis, API RP 95F, MODU Mooring JIP.

Background

The last 10 years have seen a huge increase in the number of permanent deepwater Gulf of Mexico (GoM) facilities. These facilities not only represent billion dollar investments, but also are responsible for an increasing proportion of the total US hydrocarbon production. In addition, many will require the services of a semi-submersible MODU to drill additional tie-backs, and to work over existing wells, thereby necessitating relatively close quarters operations.

There is growing concern that any of these facilities will be damaged in a hurricane, for whatever reason, particularly given the desire for the US to increase domestic production and reduce reliance on petroleum imports. This concern has resulted in a flurry of activity in code development including a reassessment of the basic metocean design criteria: it has also raised questions of the design criteria used to moor semi-submersible MODUs in deepwater. While there was limited

damage to those facilities by the 17 semi-submersibles that suffered mooring failure during hurricanes Katrina and Rita, there is increased concern that this is a potential area for a catastrophic incident (e.g., collision of a MODU with a permanent facility). There is also the concern of damage to the deepwater pipeline infrastructure. During Katrina and Rita, some deepwater pipelines designed to carry over 100,000 barrel of oil equivalent (BOE) per day were damaged and could have resulted in significant loss of production had there not been additional unrelated facility damage, which effectively cut off production to the pipeline⁽¹⁾. It took approximately six months to repair the pipeline, although it has been estimated that the damage could have been repaired within three months had there been the immediate necessity to recommence flow⁽¹⁾.

It has been suggested by some outside the industry that a way to circumvent the possible threat caused by drifting semi-submersible MODUs would be to increase the design criteria for MODUs to those used for permanent installations. There are a number of consequences associated with this. First, and foremost, it would not be possible to upgrade the MODU fleet to meet these criteria, even if it was advisable: there are limitations on the worldwide supply of the wire, chain, and polyester needed to upgrade the fleet; and much of the fleet could not physically be upgraded to that level due to limitations in deck space, strength, and variable load capability. New moored semi-submersible MODUs can be designed to higher criteria, but there will be many years lag before these new MODUs are available for operations in the GoM. In addition, there are not sufficient offshore anchor handling vessels available to install the heavier mooring systems even if they could be bought and installed on the semis. Bigger boats can be built, but as with the MODUs, this will take time. Second, there is an important issue of personnel safety. The industry has a good safety record, but the existing anchor handling fleet is comprised of vessels of limited size. If there were a requirement for a significant increase in the number of large mooring systems to be installed, those that stretch the limitations on the vessel's equipment, there is a real likelihood that the number of offshore mooring installation accidents would increase. Handling large mooring components on the deck of a boat is difficult enough as it is without increasing the risk by stretching the capability of the equipment.

Notwithstanding the above, there may be circumstances in which an extremely high level of mooring system reliability is needed: e.g., working close to a permanent facility, in the