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Structural Design Overview of the Drillship

Yu-Chang Lim, Hae-Am Moon, Jin-Tae Kim, Jong-Koo Kim, Daewoo Shipbuilding Marine Engineering Inc.

Abstract

Daewoo Shipbuilding and Marine Engineering (DSME) was awarded the contract to build four drillships capable of drilling up to 30,000 feet in 10,000 feet water depth and scheduled for delivery by mid September 2008. The structural design of the drillships was based on the operating experience of the owner Transocean Offshore Deepwater Drilling Inc, and takes into account the new requirements of DnV OS Rules and CSA2 guidelines.

The former are based on Load and Resistance Factor (LRFD) format, which is different from the other conventional approach, Working Stress Design (WSD). Whole ship analysis was performed. The overall structural design procedures for the drillships are presented and recommendations are proposed in the paper. Other features of the structural design process including the fatigue assessment and accidental load assessments are presented.

Structural Design Basis.

According to COMPANY and Class requirements, the following design concepts for the Hull structural strength evaluation was considered.

1A1

This is the main class requirement with which all ocean going vessel should comply. The details of the requirement are specified in Ship Vessel Rule.

The main class requirements met through local scantling by 'DNV/Nauticus Hull' and hold FE analysis based on Classification Notes 31.3 Strength Analysis of Hull Structures in Tankers

OS-C102

DNV OS-C102 specifies that offshore ships are to be designed to comply with LRFD design concept as defined in OS-C101 as well as main class requirements. It is to be noted, however, that the severity of onsite environmental loadings determined whether to apply the LRFD design concept. The subject vessel was assumed to be operating in relatively harsh environment for which the LRFD was mandatory to be applied. The subsequent chapters was prepared on this assumption. The requirement specified three limit states in its details:

- ULS (Ultimate Limit State)
- FLS (Fatigue Limit State)
- ALS (Accidental Limit State)

The capacity assessment in the ULS condition included buckling and yield checks. Gross scantlings were utilized in the calculation of the buckling capacity of the hull structural elements. The strength of the hull girder was assessed based on the load conditions that result in maximum longitudinal tension and compression stresses in deck and bottom plating. The strength of the supporting structure for the topside facilities was evaluated considering relevant operational load conditions and their combinations. The local requirements for the structural members in the fore and aft ship including deck houses and accommodation were designed to comply with the technical requirements given in the Rules for Classification of Ships Pt.3 Ch.1.

The fatigue capacity was determined according to Classification Note 30.7. Evaluation of the fatigue limit state included consideration of all significant loads contributing to fatigue damage. (Site specific environmental data was used for calculation of long term stress range distribution as well as North Atlantic condition.) A load factor of 1.0 was used on all