Risk Based Structural Engineering Activities on Offshore Projects in the Shipyard as EPC

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ABSTRACT

Recently, the risk based engineering activities for offshore projects in the shipyard are gaining tremendous attention because of many catastrophic failure occurrences in past. There is a need for having a well established procedure for risk assessment in the shipyard. Results from the risk assessment will have an unexpected and direct impact on the design, the associated procurement and the construction in EPC (Engineering, Procurement and Construction) projects.

This paper introduces a sort of procedure for the risk assessment from the classification of the vulnerable areas to the consequence analysis which is established by DSME, and the actual applications to FPSO projects for ship collision, dropped objects and explosive blast.

KEY WORDS: Risk Assessment (RA), Quantitative Risk Assessment (QRA), Ship Collision, Dropped Objects, Explosion (Blast)

INTRODUCTION

Worldwide, there have been several major offshore accidents such as collision between ships and gas installations, impacts arising from dropped objects and swinging load incidents involving cranes and explosive blast from hydrocarbon leakage. In particular, in the offshore industry, an increased focus was placed on the risk-based design after the Piper Alpha accident in 1988 (see Fig.1).

The accidental loads may have results in the total loss of the offshore units and/or marine environment and hearth threats. In this reason, the owners usually request the risk-based engineering for structural integrity against the accidental loads, so that it is of high significance for the shipyard to successfully complete offshore projects.

In spite of this importance and a great many past offshore projects, a few reference papers and handbooks which are described the systematic process and/or procedure may be in existence for the shipyard. Project reports and analysis results are occasionally made to introduction, but it is difficult to share the information because of the security. In addition, the descriptions for the problems between the owner and the shipyard may be lack to understand fully during the going on project.

Therefore, the standardized assessments process/procedure are described herein for the accidental events relating to the structural safety, e.g. ship collision, dropped objects and explosive blast.

STRUCTURAL ENGINEERING ACTIVITIES

The engineering activities majorly implemented by the shipyard as EPC in offshore projects with respect to the risk-based structural design are as follows:

- Clarification of QRA in FEED phase
- Detailed RAs in detail design phase
- Structural Verification : ship collision
- Structural Verification : dropped object
- Structural Verification : explosion

The quantitative risk assessment (QRA) is mostly conducted as a risk specialist so that the shipyard needs to examine thoroughly the high risk items which affect critical design modifications for each accidental event. Especially, the clarification works for results from QRA in FEED (Front End Engineering and Design) phase are highly of importance to minimize future impacts onto steel works in the shipyard.