

Global and Local Structural Analyses by Dynamic Loading Approach for AGBAMI FPSO Hull and Topside Interface Structures

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ABSTRACT

This paper deals with evaluation of the structural adequacy by DLA (Dynamic Loading Approach) for AGBAMI FPSO (Floating, Production, Storage and Offloading) hull and topside interface structures. The subject vessel was designed for satisfaction of the ship owner's requirement and ABS criteria in sea-going and on-site condition. In this study, a large number of load cases were taken into account in the global and local FE analyses applying North Atlantic wave data in sea-going and site specific metocean data on site. All the engineering activities in DLA were successfully finished and the proposed structural design of the vessel was found to well meet the FPSO design requirements. Some important lessons-learned in relation with engineering execution by DLA are introduced in this paper. It gives useful feed-back experiences and makes the successful engineering activities on time for the future FPSO project.

KEY WORDS: Dynamic Loading Approach; AGBAMI FPSO; global and local FE analyses; sea-going and on-site condition; lessons-learned

INTRODUCTION

AGBAMI FPSO was contracted from ship owner (Star Deep Water Petroleum Limited) in the end of 2004. The vessel has been designed and fabricated in Okpo ship yard of Daewoo Shipbuilding and Marine Engineering Co., Ltd. In the middle of 2007, it will be delivered to the operation site, AGBAMI field as shown in Figure 1. AGBAMI field is located in offshore Nigeria in the central Nigeria delta approximately 113 km south-southwest of the nearest Nigerian shoreline and approximately 354 km southeast of the city of Lagos. The field lies in OPL (Offshore Prospecting Lease) 216 and 217. The water depth at the centerline of the FPSO is approximately 1433 meters. AGBAMI FPSO would be positioned toward south-southwest on site, which is 20 degree off the head (STAR, May 2003). AGBAMI FPSO Hull has the SH-DLA and SFA notation of ABS according to owner's additional request. The main particulars of the AGBAMI FPSO are as the following:

• Length Overall	320.0 m
• Length Between Perpendicular	320.0 m
• Length Scantlings	310.4 m

• Breadth Moulded	58.4 m
• Depth Moulded	32.0 m
• Design Draught	23.5 m
• Scantling Draught	24.0 m
• Block Coefficient	0.995

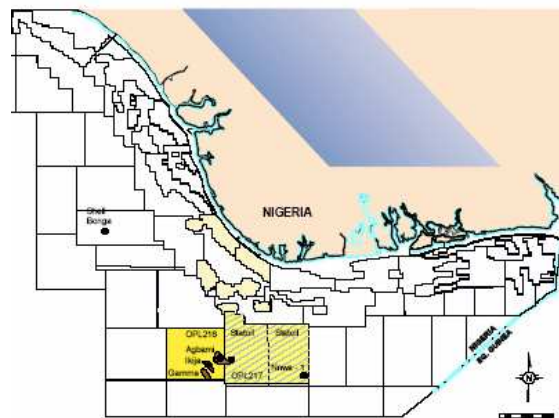


Fig. 1 AGBAMI Field Location

The DLA hull global and local structural analyses are to confirm that the hull structural design satisfies the ABS criteria for yielding and buckling strength in the sea-going and on-site condition (DSME, March 2006).

The analyses were carried out using two full ship FE model and a lot of local fine mesh FE models with the following objectives:

- Determination of stress components for yielding and buckling evaluation in all primary plating in the hull
- Selection of high stress areas for local fine mesh analysis
- Determination of global hull deflection and reaction force data

The analysis tools as shown in Table 1 were used to perform the sea keeping analysis, structural analysis and post-processing the analysis results for yielding and buckling. A number of persons were participated in the DLA hull strength evaluation because a lot of engineering activities should be carried out within a short engineering time schedule. In order to obtain a lot of F.E. models as fast as possible, model