Establishment of Offshore Process FEED (Front End Engineering Design) Method for Oil FPSO Topsides Systems

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ABSTRACT

In this paper, we describe an offshore process FEED (Front-End Engineering Design) method for oil FPSO (Floating, Production, Storage, and Offloading) topsides systems based on the concepts and procedures for FEED of general offshore plants. First, various activities of the general process FEED phase are defined and analyzed, and then the offshore process FEED method, which is suitable for application to all offshore oil and gas plants, is established. Finally, the established FEED method is applied to oil FPSO topsides systems in order to test its validity. This established process FEED method would contribute to performing successful offshore projects in the future.

KEYWORDS: FEED; Topsides systems; FPSO; Offshore oil and gas plants; Offshore projects

INTRODUCTION

As the demand of oil and gas, which are representative offshore resources, is increasing relative to other energy resources, potential new offshore fields are being explored. The installation area of offshore production plants is gradually moving toward the deep sea, and the need for multi-functional offshore plants is increasing. (Jung et al., 2006). Accordingly, the demand for Oil FPSO (Floating, Production, Storage, and Offloading), which can produce, store, and offload crude oil in the deep sea, is also increasing. Particularly, the demand of LNG FPSO projects will grow with the greater demand for natural gas. Therefore, the prospects for offshore production plants are bright in the medium and long term. (International Maritime Associates Inc., 2005)

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Contaminants such as H₂S and CO₂ may be present at levels higher than those acceptable to the gas purchaser.

Overall engineering phases of such offshore production plants consist of two engineering phases. One is the FEED (Front-End Engineering Design) phase. The other is the detailed engineering phase. Of the two engineering phases, the FEED phase is the more critical phase for determining the feasibility of the development of specific well areas.

Economic analysis on the development of specific well area is performed based on the outputs of the FEED phase. Based on the results of economic analysis, the detailed engineering phase is executed if the value of the development is big enough to perform considering many aspects of economic analysis. In other words, the FEED phase, which is the basis of the detailed engineering and the feasibility of development on the specific well areas, is the most important part of overall phases of offshore plants projects in determining the success of the projects. The final outputs of the FEED phase are the total costs, the weight, and the layout of offshore plants. The feasibility of offshore plants projects is determined by these final outputs. First, each system capacity and size of topsides systems are determined to get the final outputs such as the total costs, weight, and layout. Offshore process engineering, one of the highest priority areas in engineering, is the most important component in calculating the system capacities and sizes of topsides systems. The overall engineering for offshore topside systems includes offshore process, piping, mechanical, instrumentation, electrical and outfitting engineering. The major engineering data are derived from the activities of offshore process engineering in order to obtain the final FEED outputs. So, an effective method of performing offshore process engineering activities is needed to increase engineering efficiency. Therefore, our study establishes an optimized offshore process FEED method at the stage of FEED and presents the results of its application to oil FPSO (Floating, Production, Storage, and Offloading) in order to obtain successful FEED outputs of offshore plants in the future.

THE CONCEPT OF OFFSHORE PROCESS FEED ENGINEERING

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Figure 1 shows the offshore and onshore engineering scheme for refining petroleum products from oil and gas from the specific well areas. As mentioned above, the main function of offshore engineering is to separate light hydrocarbon components from heavy hydrocarbon components, refine each hydrocarbon components to meet the