Application of an Integrated FEED Process Engineering Solution to Generic LNG FPSO Topsides

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ABSTRACT

An Integrated FEED (Front End Engineering Design) process engineering solution proposed in our previous work is applied to the Pre-FEED process engineering phase of Generic LNG (Liquefied Natural Gas) FPSO (Floating, Production, Storage, and Offloading) topsides process systems. The concept of the selected generic LNG FPSO topsides Systems is introduced to build an integrated FEED process engineering solution. The proposed solution leads all process activities of the Pre-FEED engineering phase of generic LNG FPSO topsides systems to an automated and integrated processing. The results of the application show that the solution increases engineering efficiency considerably by reducing critical factors such as costs, length of time, and human error in the generic LNG FPSO project. Therefore, the integrated FEED process engineering solution can be useful in offshore topside engineering fields including LNG FPSO topsides FEED.

KEYWORDS: Integrated FEED process engineering solution; LNG FPSO; Pre-FEED; Automated and integrated processing; Engineering efficiency

INTRODUCTION

In recent offshore projects conducted by major oil companies, requirements have been changed considerably compared to previous projects. Firstly, the method of contract completion has changed to EPIC (Engineering, Procurement, Installation and Commissioning) from the more traditional AFC (Approved For Construction) contract type. This means has meant that the contractor must assume responsibility for all controversial points, from the engineering phase to the construction phase. So, the technical level of offshore engineers becomes more important than other factors. Secondly, the application of Engineering Management (EM) as a part of the Project Management (PM) is being requested by many oil companies because of the concept of life cycle management, connected to Enterprise Resource Planning (ERP), is widely used when contractors prepare bids for offshore projects. (Infield Co., 2005 and Mather, 2002) This in turn means that the building of engineering infrastructure is being requested when the contractor performs offshore projects. Thirdly, the globalization of contractors is being requested. Among three major requirements, our study focuses on building engineering infrastructure to prepare EM in the future. Because of the increase in offshore projects and the increase in the use of EPIC, conventional engineering methods have limited use in efficient undertakings of engineering projects. Accordingly, the introduction of an EM system, which automatically processes an enormous amount of data without human error, is necessary. EM systems can fundamentally prevent exorbitant costs and reduce unnecessary man-hours by applying systematic work execution during the FEED (Front End Engineering Design) stage, the basic and detailed stage of process engineering. (ISOPE Conference Proceeding, 2008)

This paper consists of three main sections. Firstly, our research team introduces the concept and system descriptions of the generic LNG FPSO topsides process, which is a new technology to offshore areas. Secondly, the concept of an integrated FEED process engineering solution proposed in our previous work is described. And then, we apply an integrated FEED process engineering solution to the Pre-FEED process engineering phase of generic LNG FPSO topsides process systems. We conclude from our research that applying offshore topside process FEED engineering to the proposed integrated FEED process engineering solution is mandatory in order for the oil and gas industry to move toward increased efficiency in future offshore project developments.

GENERIC LNG FPSO TOPSIDES PROCESS

Typical LNG Liquefaction Plant

A typical LNG liquefaction plant is shown in Figure 1. The plant is divided into three parts: a field specific part, a liquefaction part, and a utility part. The field specific part separates the natural gas from the condensate and stabilizes the condensate. Process design and equipment for the field specific part vary according to the conditions of the gas field. The liquefaction part treats the natural gas for the requirements of the liquefaction plant, to separate heavier hydrocarbons (LPG) and to convert the natural gas to LNG products. The utility part provides power, cooling water, nitrogen, and other necessary materials to the required specific and generic equipment.

The wellstream is introduced to the LNG liquefaction plant through a form of riser/swivel or internal/external turret connected to gas fields. The introduced gas and condensate mixtures pass first into the slug catcher to convert the slug flow to the stabilized gas/condensate flow.