New Technology Opens the Door for Deepwater Development

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Deepwater exploration has always been a great technical challenge to engineers and professionals. Not only is it due to the complicated harsh environment and great water depth, but it also requires various frontier technologies, such as directional controlled drilling, advanced remote control systems, new applications of material, sophisticated advanced analytical tools, as well as modern model testing methodology and technology. With continued innovation and development of new technologies associated with ocean activities in various disciplines, deepwater development has been accelerating in recent years.

The development of deepwater oil fields is now reaching a new stage with the dramatic increase in water depth and increasing demands for economic development of the field. The increasing water depth not only constitutes technical difficulties, but also comes with the risk of environment impacts. High pressure, high temperature, and sometimes high corrosive liquids, are often associated with deepwater drilling and production. Any mistake or technical deficiency could cause enormous financial losses and even catastrophic disaster to human beings and the environment. The recent catastrophic example caused by the semi-submersible offshore oil drilling rig Deepwater Horizon in the Gulf of Mexico proved this once again.

Due to the complexity of the deepwater environment and industry's lack of previous experience with complicated structures, offshore engineering has been one of the most challenging and technologically demanding disciplines. There are some significant developments in the industry in terms of the design of floating structures in recent years, which mainly is reflected in the following areas: 1) the gradual maturation of the industry; 2) the increasing need to quickly develop discovered oil/gas fields; 3) the substantial increase in number of deepwater floating projects; and 4) the worldwide participation of deepwater field exploration and production.

Interest in deepwater technology has gained tremendous momentum in recent years in China. The exploratiory findings of the Liwan deepwater oil and gas field in the South China Sea have accelerated the need for research and development for deepwater. Various deepwater study projects have been established and funded. Some new deepwater facilities have been built, such as the 6th generation of the deepwater drilling semi HYSY981, the heavy offshore semi transport vessel HYSY278, the heavy lifting installation vessel Lan Jing, deepwater pipe-lay barges, etc.

This presentation will provide an updated status on technology for deepwater field development, demonstrate the importance of its application through actual project examples, investigate some future technical development trends, and discuss the importance of technology advancement in China's offshore development. The focus will be on floating structures and recent developments in China's offshore industry. By reviewing some of the engineering aspects of the project, I will discuss and demonstrate the technology advances, innovations, and challenges in offshore engineering. There are more than a dozen current deepwater projects that are ongoing or have recently been installed. Several of these projects are setting new water depth records and are providing new "firsts" for the industry, such as the use of tender assisted drilling from a floater, novel installation methods, accelerated fabrication, and directly supported top tensioned risers from the floaters. Some of the technical advances from these recent projects will be

highlighted. The speaker's view of technical challenges facing deepwater forwarding will be discussed. This will cover water depth limitations, new material applications, installation methods, riser development, and operational issues. An overview of technologies that will enable deepwater projects to be extended into new frontiers, such as the South China Sea, will be presented.

KEY WORDS: deepwater exploration, field development, frontier technology, floating structure, China Offshore.