Status of Methane Hydrates Production R&D and Enhanced Recovery Technologies

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ABSTRACT

Huge amount of methane hydrates worldwide exist at offshore and onshore areas, particularly in reservoirs of marine sediments. Because the development of methane hydrates is of great interest for future energy of natural gas, a lot of R&D projects have been undertaken to achieve the whole system including geological survey, exploration, production and enhanced recovery technologies. Japanese program MH21 has promoted the own R&D, focused on the production of methane hydrates from offshore areas. In this talk, research and development related to gas hydrates production are summarized to reveal the status and updated technologies of its exploitation. Recent predominant R&D cases of gas hydrates enhanced recovery are also introduced for advanced energy utilization and sustainable development of gas hydrate resources.

KEYWORDS: Methane hydrate, Gas hydrates, Enhanced recovery, MH21, Production method

INTRODUCTION

Methane hydrate (MH) is one of the potential resources of natural gas in the near future, because it exists in marine sediments or in permafrost regions worldwide. Some extraction methods of gas hydrates from the reservoir has been proposed, such as depressurization, thermal stimulation and inhibitor injection. These are all based on the in-situ dissociation process of gas hydrates that is transformed into methane gas and water. Therefore, it is very important to understand the behavior in hydrate reservoir, especially in developing the production method for gas hydrates, and when considering the environmental impacts due to the development. The national project of methane hydrate development in Japan (MH21) started in 2001. In the project operated by MH21 research consortium, we have been carried out a lot of experimental and computational R&D on modeling and production method for methane hydrates (MH21 research Consortium, 2004). This talk reports a progress of MH21 national project. To obtain fundamental data for hydrate-bearing sands in marine sediments, we have tested artificial samples and core samples from ocean survey. Thermal, mechanical and geo-chemical properties are analyzed and compiled as a database. The dissociation behaviors of hydrate samples have been observed in various kinds of conditions and production methods. The original simulator for MH production is developing for evaluating various kinds of production methods and the efficient way of extraction in practical conditions. A lot of data and parameters have been obtained to make the following computational modules needed for the simulator, such as the permeability module, the dissociation rate estimation module, and the consolidation module. MH21 national project has three phases for the complete target of commercial production. In the first phase we focus on fundamental properties of hydrate-bearing sand layers and simulator development based on laboratory experiments and simulations. On-shore and off-shore production tests are undergoing. The feasibility and cost performance would be considered in the second phase, and the practical production might be designed in the third phase.

MH21 RESEARCH AND DEVELOPMENT

In the research consortium MH21, there are three major groups, resources evaluation and exploration, production methods and modeling, and environmental assessment (Narita, 2003). The research and development of production and methods and modeling for MH was focused in the first Phase. Fig.1 illustrates the outline of MH21 project in Japan (Homepage of MH21 Research Consortium, 2010).