

Development of a monitoring system for the JOGMEC/NRCan/Aurora Mallik Gas  
Hydrate Production Test Program

International Conference on Gas Hydrates,  
July 6-11, Vancouver, B.C., Canada

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Abstract:

Design and construction of long term gas hydrate production facilities will require the assessment of in situ formation response to production at a field scale. Key parameters such as temperature and pressure are useful to determine phase conditions, other such as formation resistivity, formation acoustic properties and fluid mobility are useful to determine gas hydrate saturation, permeability and porosity. An ability to continuously monitor the response of these parameters during the course of a production test would indicate how the dissociation front moves and yield valuable information for engineering design and verification of reservoir simulators. Such a monitoring system has been designed, developed and introduced as part of the Japan Oil, Gas and Metals National Corporation and Natural Resources Canada gas hydrate production testing program carried out in the winter of 2007 in the Mackenzie Delta, Canada.

To allow investigation of formation response some distance away from the well bore, and to enable continuous monitoring during production testing regardless of wellsite operations, the system was designed to be installed outside the well casing of a production and observation well. Optical fiber cables, combined with the Distributed Temperature Sensing system, were utilized for the downhole temperature measurement. A cross-well monitoring system was designed with deployment of resistivity and acoustic arrays. To evaluate the fluid mobility, streaming potential measurement method was also attempted. A number of pressure sensors were also planned to be installed in the vicinity of the production zones. While the deployment of some sensors and the acquisition of some data sets were limited due to operational problems encountered during the field program, considerable experience has been gained during all phases of the 2007

research program. Some of the results such as the downhole temperature profile and the formation electrical potential change during testing were acquired and will be discussed.