Wire-line Logging Analysis of the JOGMEC/NRCan/Aurora Mallik Gas Hydrate Production Test

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In order to evaluate the productivity of methane hydrate (MH) by the depressurization method, Japan Oil, Gas and Metals National Corporation and Natural Resource of Canada carried out a full scale production test in the Mallik field, Mackenzie Delta, Canada in April, 2007. An extensive wire-line logging program was conducted to evaluate reservoir properties, to determine production/water injection intervals, to evaluate cement bonding, and to interpret MH dissociation behavior throughout the production.

New open hole wire-line logging tools such as MR Scanner, Rt Scanner, Sonic Scanner and ECS (Elemental Capture Spectroscopy) were deployed to obtain precise data on the occurrence of MH, lithology, MH pore saturation, porosity and permeability. Perforation intervals of the production and water injection zones were selected using a multidisciplinary approach. Based on the results of geological interpretation and open hole logging analysis, we picked candidate test intervals considering lithology, MH pore saturation, initial effective permeability and absolute permeability. Reservoir layer models were constructed to allow for quick reservoir numerical simulations for several perforation scenarios. Using the results of well log analysis, reservoir numerical simulation, and consideration of operational constraints, a MH bearing formation from 1093 to 1105mKB was selected for 2007 testing and three zones (1224-1230, 1238-1256, 1270-1274mKB) were selected for injection of produced water.

Three kinds of cased-hole logging, RST (Reservoir Saturation Tool), APS (Accelerator Porosity Sonde), and Sonic Scanner were carried out to evaluate physical property change of MH bearing formation before/after production test. Preliminary evaluation of RST-sigma suggested that MH bearing formation in the above perforation interval was almost selectively dissociated (sand produced) for lateral direction. Further detail analysis using Sonic Scanner data, which has deeper depth of investigation than RST, and integration with sanding data would bring us useful information on MH dissociation front and dissociation behavior.