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Logging data from gas hydrate production well

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For the 2nd onshore production test of gas hydrate at Mallik 2L-38, lots of pre-studies had been done in order to ensure the identification of the gas hydrate by logging measurements with various principles. The logging data at gas hydrate interval where is interbedded sand and shale at Mallik (Dallimore and Collett, 1997) can be consistent with the behavior of the ones at Japanese deep sea field. Since this resemblance of lithology will not be affected by the condition as permafrost at Mallik, the behavior of log data at gas hydrate interval will help to optimize the logging program and to predict the measurements for Japanese gas hydrate projects.

Gas hydrate bearing formation is usually represented as higher resistivity and velocity interval (e.g. Sager et al., 2000), and there are not so much reports about the other conventional logs. But these conventional logs can be also used for the interpretation of gas hydrate. For example, gas hydrate in pore spaces makes the neutron porosity be overestimated than the one of formation filled with water. On the other hand, nuclear magnetic resonance porosity regards the volume of gas hydrate as matrix. Therefore the separation of two porosity curves can show the range of gas hydrate distribution. Although it is not so difficult to find the gas hydrate interval in the ideal condition as above, the other conventional logs like gamma-ray density are also essential because we have to consider about the effects of clay and so on, practically.

To use the logging results for research, it is necessary to understand the uncertainties of data. Logging data is affected by the movement of acquisition device, deviation, borehole size, drilling mud and its invasion, lithology, relative dips, formation fluid type and salinity, temperature, pressure and everything. Loggings are based on various acquisition principles, and are affected by the environmental factors caused by acquisition principles. In the other word, the environmental factors caused by acquisition principles enable to measure the arbitrary information. Therefore the lack of environmental corrections and principle specific processing will be the critical issues of data quality. After all processing, we can start to interpret the tool and parameter limitations. If there are still some gaps between the measurements of laboratory and the ones of field, the quality of logging and cores, the limitation of acquisition principles, the limitation of processing and the resolution of measurements should be considered.

Thank to the cooperation of MH21 consortium, this study was carried out. The logging data were acquired in 2nd onshore production test of gas hydrate at Mallik 2L-38 carried out mainly by the Minister of Natural Resources Canada and Japan Oil, Gas and Metals National Corporation (JOGMEC) in 2007 and 2008 winter. And the processed results obtained under ”Additional petrophysical analysis for 2nd onshore production test” committed by JOGMEC were partially referred.

Reference:

Dallimore, S. R. and Collett, T. S. (1997). ”Gas hydrates associated with deep permafrost in the Mackenzie delta, N. W. T., Canada: Regional overview.” Proceedings of the Seventh International Conference on Permafrost, 201-206.

Sager, W. W., Kennicutt II, M. C. and Gas Hydrate Science Team (2000). ”Proposal to the Ocean Drilling Program for Drilling Gas Hydrate in the Gulf of Mexico” Proceedings of the 2000 Offshore Technology Conference, Houston, 1-4 May 2000, paper 12111.

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