

The second offshore production test of methane hydrate in the eastern Nankai trough

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Following the first attempt in 2013 and to obtain the knowledge about long-term behavior of the gas production from gas hydrate deposit below seafloor, the MH21 consortium conducted the second offshore production test of methane hydrate in the vicinity of Daini Atsumi Knoll of the eastern Nankai trough area. Based on lessons of learnt from the 2013 operation, some improvements of the sand control, the down-hole artificial lift system, and the riser system were made to realize extended-term and stable flow.

An exploration well (AT1-UD) and two monitoring holes (AT1-MT2/MT3) as well as shallow section of two producer holes were drilled in 2016, and geophysical logging data were taken in the holes. In the term from April to June of 2017, deeper section of the producer holes was drilled, sand control devices were set in the holes, and twelve and twenty four days of flow was realized in each producer holes.

Sand production problems in the first hole (AT1-P3) and strong water flow than expectation in the second hole (AT1-P2) prevented the planned degree of depressurization (from the original 13 MPa to target 3 MPa), but almost stable flow was established. However, the expected temporal gas flow rate increase predicted by numerical simulations was not observed in neither well.

During the flow, temperature and pressure data were obtained in both monitoring and production horeholes that derived the information about gas/liquid production profiles in the producers and gas hydrate dissociation behaviors around the monitoring holes. Furthermore, previously obtained seismic and log data could give perspectives about the heterogeneity of the gas hydrate occurrence in the reservoir.

From the information above, there should be certain causes in a location near or far from producer hole that prevent effective expansion or stabilization of the depressurized region. Creation of positive skin due to plugging of sand control devices, reduction of apparent permeability around wellbore, non-linear flow behavior, and heterogeneity of formation properties might obstructed the model-predicted imaginary production behavior.

Through analyses of obtained data and comparison between actual data and numerical model results, a cause of the discrepancy between model predicted and actual gas/water production behaviors will be revealed, and measures to stabilize and enhance productivity should be developed.

Keywords: gas hydrate, reservoir model, flow test