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Qualitative interpretation of CO2/CH4 Gas Exchange Field Trial in Alaska

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”Depressurization method” is now considered as the central method for producing methane from methane hydrate under ocean bottom and permafrost. It has, however, not known whether the depressurization method alone is able to ensure cost-effectiveness in development. CO_2/CH_4 gas exchange, where a methane molecule is exchanged in situ with a CO_2 molecule within a methane hydrate structure and is released for production, is a candidate to complement the depressurization method in commercial production.

The first-ever field trial of a methane hydrate production by gas exchange was executed in the North Slope of Alaska. JOGMEC participated with ConocoPhillips and the U.S. Department of Energy in carrying out this project. The objectives of this trial were to evaluate the viability of CO_2/CH_4 gas exchange as a production technique and to understand the implications of the process at a field scale. Ignik Sikumi #1 was drilled vertically to a depth of 791.6 m. A mixture of CO_2 (23%) and N_2 (77%) was injected through the perforated section of 10 m thickness. The downhole pressure was lowered during production at initially above and then below the dissociation pressure of native methane hydrate. (Schoderbek *et al*., 2012)

The planned volume of mixture gas was successfully injected into the formation without any loss of injectivity. An increased temperature at the sand face measured by fiber-optic DTS during injection implies exothermic CO_2 hydrate formation. Methane produced above the hydrate stability pressure at first of production phase. This indicates produced methane generated not by depressurization, but by gas exchange.

Schoderbek, David, Kenneth Lloyd Martin, James Howard, Suntichai Silpngarmlert, and Keith Hester, 2012, North Slope Hydrate Fieldtrial: CO_2/CH_4 exchange. OTC-23725.

Keywords: methane hydrate, gas exchange, carbon dioxide, permafrost, Alaska