

Recent Research in the Field of Gas Hydrate

By Robert Lankston and Arthur Johnson

Old Business

The special publication that arose from the 2004 Hedberg Conference is nearly complete. The most recent delay was caused by a decision of the AAPG to issue the publication on CD with extended abstracts on paper. This required seeking extended abstracts from each of the authors. That process is now complete, and final formatting is in progress. The editors of this special publication are Art Johnson, co-chair of the EMD Gas Hydrate Committee, Tim Collett, Ray Boswell, and Camelia Knapp.

Annual Meetings

The 2008 AAPG annual meeting includes a gas hydrate short course, poster and oral sessions, and the annual meeting of the gas hydrate committee. At the committee meeting, the committee chairs will recruit additional committee members.

Initial plans have begun for gas hydrate sessions at the 2009 AAPG annual meeting. Session chairs are currently being approached.

State of the Gas Hydrate Industry

Research in the broad field of gas hydrate continues steadily. The US Department of Energy (DOE) National Energy Technology Laboratory (NETL) has, perhaps, the broadest spectrum of hydrate studies of those programs sponsored by national governments. The US program includes research aspects that relate to climate impacts of hydrate dissociation, sea floor and facilities safety, as well as energy resource.

The NETL is supporting three, high visibility resource-focused programs. The first one of these is a consortium of agencies, universities, and various petroleum industry contractors coordinated by BP Alaska to map and test gas hydrate occurrences on the North Slope of Alaska. In early 2007, the program drilled a stratigraphic test to a depth of approximately 1000 m and cored two sands predicted to be hydrate-bearing in pre-drill analyses of seismic and log data. Pre-drill predictions of sand thicknesses and hydrate concentration were fairly accurate. MDT sampling was conducted, and gas from hydrate dissociation under simple pressure drawdown was collected.

Post-drill work continues to refine the methodologies for seismically predicting hydrate concentration and to analyze the core from the two hydrate-bearing sands. The two sands totaled about 30 m thickness and had hydrate concentrations in the pore space of about 65%.

The consortium conducted a workshop in March 2008 to define a strategy for developing a production testing facility in the Eileen gas hydrate trend of the North Slope. The conceptual target for beginning work at the test facility would be sometime in 2009.

The second of the high profile NETL programs is a joint industry project (JIP) coordinated by Chevron. This program began with a focus of sea floor facilities safety and safely drilling through hydrate-prone sections in the deep water Gulf of Mexico. Since the successful 2005 drilling program of the JIP, the focus of the project has evolved to include a greater focus on energy resource considerations. The planned 2008 program will conduct drilling with LWD logging. No coring is planned for 2008.

Since its inception, the JIP has included a large effort to quantify hydrate concentrations from seismic data. The 2005 drilling program tested the pre-drill predictions in generally fine grained sediments. The 2008 drilling will test seismic predictions in sandy sections, including locations in the Alaminos Canyon Area where a hydrate-bearing sand was previously logged during the drilling of a conventional prospect.

The BP Alaska and the Chevron consortia have a look forward focus in that they are conducting traditional seismic and well log analyses and designing drilling programs. The third NETL supported program is being conducted in the vicinity of Barrow, Alaska, and involves a detailed analysis of historical gas production from three fields. Production from these fields may have included a component of gas from hydrate dissociation from layers above the producing gas horizons. Results of this analysis should be available in late 2008.

In late February 2008, the US Department of Interior (DOI) Minerals Management Service (MMS) released a report on its Monte Carlo-based assessment of the volume of the gas hydrate resource in the Gulf of Mexico. The report estimates a mean or expected value of over 21,000 Tcf of gas in place as hydrate with approximately one third of that volume in sandy sections. This study is probably the most comprehensive to date because the MMS has access to all of the seismic data that have been recorded in the Gulf of Mexico. The MMS estimate was limited to biogenically-sourced hydrate. A follow-up study has been proposed that would include thermogenically-sourced hydrate, a potentially large addition to the in-place estimate given the presence of extensive migration and venting of natural gas in the Gulf of Mexico. Underway are assessments of the gas hydrate resource in the Atlantic, Pacific, and Alaskan OCS.

Gas hydrate mapping, drilling, and production testing programs are underway in several countries, particularly those with little or no access to conventional hydrocarbon resources within their boundaries. India, Japan, and Korea are notable examples. China has also begun a hydrate program. With China having access to considerable conventional resources, the China motivation in researching gas hydrate would seem to stem from a growing need for hydrocarbon resources in general.

Japan is engaged in a two-year program of testing at the Mallik site on the Mackenzie Delta of northern Canada. In the winter season of 2006-07, wells from the 2002 international program at Mallik, during which gas was produced through depressurization, were re-entered and prepared for another phase of production testing. The production testing is to be completed during the 2007-08 season. The Japanese project and the US project on the North Slope have similar economic philosophies, i.e., testing the relatively shallow hydrate-bearing horizons in the Arctic is generally less expensive than comparable operations in deep water.

In 2006, India sponsored a major drilling program to sample inferred gas hydrate occurrences in its territorial waters off of both its west and east coasts. The program demonstrated the viability of relatively rapid drilling with LWD logging, and that success in being leveraged by the Chevron JIP for the 2008 drilling cruise. Two DVD's of the data from the 2006 India program were released in March 2008 and can be obtained through the chief scientist of the program, Timothy Collett of the US Geological Survey.

Most of the resource-related research programs that are funded by national governments have targets around 2015-16 to demonstrate the viability of gas hydrate as an energy resource or to actually have production facilities on-stream.