

PTTC Focused Technology Workshop

“Structurally Controlled Hydrothermally Altered Carbonate Reservoirs”

October 11, 2006; Buffalo, NY

Workshop Summary

This workshop was the latest in what has become an annual cooperative event between PTTC and the Eastern Section of AAPG whereby PTTC organizes and hosts a post-meeting workshop. This year offering was preceded by similar cooperative workshops in Pittsburgh (2003), Columbus (2004) and Morgantown (2005). In addition, for the second consecutive year we cooperated with AAPG headquarters in Tulsa to underwrite a pre-meeting workshop offered by AAPG at low cost.

This carbonate workshop was organized and taught by two recognized experts, Graham Davies, of Graham Davies Geological Consultants, and Taury Smith, from the New York State Museum Institute and a key member of the Appalachian Oil and Natural Gas Research Consortium's Trenton-Black River research team.

The instructors integrated a series of exercises with lectures, and included discussion periods as well to keep all participants more involved throughout the day. The opening section was a discussion of hydrothermal (thermobaric) dolomite and a description of saddle dolomite, burial-temperature histories, thermal anomalies, rock fabrics, aquifers and top seals. A geochemistry exercise followed this lecture and preceded the morning break.

The second section was a lecture, followed by another exercise, on the structural connection to hydrothermal dolomite. This section included examples of the different types of faults associated with HTD and the location of the dolomite body relative to the fault, basically on the downthrown, not the upthrown, side of the fault, regardless of the style of fault. Examples were given from the Trenton-Black River fields in Albion-Scipio, southwestern Ontario and New York, as well as other dolomite fields in western Canada.

The third section of the workshop was a discussion of the association between hydrothermal dolomite and leached limestone host rock. The common tie between HTD and leached limestone appears to be episodic fluid flow along faults, with leaching by cooling, Mg-depleted fluids after HT dolomitization. Examples were shown from the Devonian Slave Point and Ladyfern in British Columbia as well as Venezuela and the Middle East.

The next section was on other controls and factors, beginning with facies control on geometry, then sandstone aquifers and HTD, and top shale seals and aquitards. This

section was followed by a section on rock fabric response to stress and pressure transients, which included a lot on rock mechanics and fabric evidence.

In the afternoon, discussion of the reservoir characteristics of HTD began in earnest. Examples of various HTD facies were shown, followed by a section on porosity-permeability plots for different oil and gas fields, and ending with the role of fracturing. This was followed by a section on timing and tectonic setting, during which the timing of emplacement, tectonic connections and implications, associated volcanism, the source of Mg, and exploration strategies were presented.

At the end of the workshop, Taury Smith presented an overview of the Trenton-Black River play in the Appalachian basin. He began with the geologic setting, structural setting for reservoir development, and hydrothermal dolomitization and alteration, then included a summary of three New York cores that he had studied followed by reservoir characterization, and closed with a discussion of the production history of the play. He concluded that HTD reservoirs occur around transtensional and extensional faults that probably are reactivated basement faults; TBR dolomitization most likely took place during the Late Ordovician when the host rocks were only buried a few hundred meters; drilling prospects with basement-rooted faults that die out in the Trenton or overlying Utica Shale may have the best chance of being dolomitized and containing hydrocarbons; fields with faults that moved during the Ordovician and were activated later could still have hydrocarbons, but also could have been breached; many fields appear to line up on failed extensional and strike-slip faults that moved during a Late Precambrian rifting episode and Grenville Orogeny related faults; and intersections of ancient faults trends also seem to be common sites of HTD. He predicted that there are lots of fields waiting to be found.

Evaluation Forms

Thirty one of the 52 attendees submitted an evaluation form. In contrast to most of our previous workshops, most of these attendees heard about the workshop through our e-mail blast to SPE Chapters and AAPG-affiliated geological societies, or saw the notice on the website for the Eastern Section AAPG meeting. The group that responded was quite diverse, with 15 operators, 5 service company and consultants, 3 educational employees and 8 government employees.

More than 80% of the respondees gave PTTC a 4 or a 5 (out of 5) for providing a program that met their expectations, for recruiting speakers and contracting for a facility, and for organizing the workshop.

Numerous comments were included on the evaluation forms, some negative, but mostly positive. Many said that the workshop was very good, great, excellent or well done, with excellent presentations; it was very economical to attend; and that it worked well because of the high quality and knowledgeable instructors. One commented on the

general format of the entire meeting, in that there was a great variation in the types of education offered, with field trips, papers, cores on display, and workshops like this one.

Other comments were slightly critical. One felt that there were too many interruptions and stories being told. One said that the instructors should have provided a reference list for all cited material because this is the only way that “we” can evaluate whether they are presenting valid interpretations. Actually, many references were given, and when none was, the work was original to the speakers.

Another comment was that the speakers were fine, but PTTC was not organized, and another said that there were problems with the registration but the problems were handled very quickly and very well by Mark Hoffman. In our defense, the local organizing committee handled all workshop registrations and they had a package deal as an option. The vendor they hired from the University of Buffalo failed to add the package registrants to the list of individual registrants, so our pre-workshop headcount was approximately 35, whereas 55 actually had pre-registered and paid. This was out of our control, but we took the blame. As a consequence, we arrived with only 40 notebooks, and Mark did a good job in finding a local print shop that produced another 20 on site within 2 hours of the start of the workshop.

Fifteen persons indicated that they have attended a previous PTTC workshop, and 9 were willing to share technology on fracture mechanics; geochemistry; tar sand experience; sedimentology; well site geology; multi-state Trenton-Black River stratigraphy; biostratigraphy; and chronostratigraphy.

Only a few topics were suggested for future workshops, including: more courses on trends and plays in the basin; seismic mapping/recognition; tar sands in the eastern US/Kentucky; carbon sequestration; coal bed methane; unconventional gas; source rocks; and source/reservoir interaction.

Attendance List

As stated above, 55 persons pre-registered, but only 52 attended. In some cases, people got confused, as three workshops were being presented in adjacent rooms, and some people were in the wrong room but stayed there.