

PTTC Focused Technology Workshop
Workshop Report

“Understanding the Trenton-Black River Reservoir”

June 7, 2004, Washington, PA

Coordinator’s Assessment of the Workshop

Workshops on the Trenton-Black River play continue to be very popular with operators in the Appalachian basin, and other parts of the U.S. and Canada. The most recent workshop in a series of Trenton-Black River workshops, held in Washington, PA on June 7 was no exception, as more than 60 were in attendance. Speakers were recruited by Lee Avary (WVGS) and PAG member Rick Goings who could address the two main workshops goals: to learn more about the Trenton-Black River reservoirs from those who are active in the play; and to learn more about other plays in rocks of the same age in different parts of the eastern U.S. and Canada. In my opinion, the workshop speakers achieved both of these goals.

The morning session was dedicated to three talks that brought participants up to date on Ordovician carbonate plays in western Newfoundland, eastern Tennessee and the Michigan basin. During the afternoon, five speakers took a closer look at the Trenton and Black River reservoirs in the Appalachian basin play, and at some new tools that are gaining wider acceptance to characterize and visualize the reservoir.

Christopher Pike and Paul Patey from Ptarmigan Resources in Nova Scotia, discussed an emerging play in a Cambro-Ordovician carbonate platform offshore from western Newfoundland. They stated that they were eager to attend the workshop to learn more about the Trenton-Black River play in our area, and to tell workshop registrants about a potential carbonate platform play in their part of the world. Ptarmigan has identified four prospects in what they call the North Platform play, and two prospects in their North Allochthon play. Using a standard industry risk analysis technique, they estimated oil resources in these areas to be in excess of 500 million barrels and gas resources in excess of 975 Bcf. Ptarmigan, a company described by Patey as having “the same talent as a major, but just a little short on cash,” is seeking partners for these very expensive wells.

Dr. Gary Bible from Miller Petroleum in Huntsville, TN, reviewed the Trenton-Stones River play in eastern Tennessee. Dr. Bible stated that the status of this strongly oil-prone play is approximately equivalent to the Trenton-Black River play in New York five years ago. He described two techniques that his company has used with success, one to solve an operational problem, and the other to stimulate the reservoir. Wells in Morgan County typically produce a waxy crude, yielding an operational problem that has been solved by allowing produced drip gas or naphtha purchased from a refinery to drip down the annulus to prevent paraffin buildup. The other technique developed by his company

is to run an acoustic noise log to determine gas entry into the well bore, and then hit that zone with acid. This completion technique has resulted in flows of 5000 barrels per day.

Dr. Bible also discussed Miller Petroleum's interest in the Eastern Overthrust area and in the Swan Creek field. Dr. Bible stated that they have not seen massive dolomite bodies in their wells, but they have seen fine vugular porosity lined with dolomite crystals. Usually the section drilled by the second drill rod below the first occurrence of fine, vugular porosity yields oil.

Dr. William Harrison, who directs PTTC activities in the Michigan Basin presented a comprehensive overview of Trenton-Black River oil and gas reservoirs in his area. To illustrate what he was saying, Dr. Harrison laid out 160 feet of Black River core in the meeting room, and brought posters that summarized the research of two graduate students who had worked on the core.

Although these fields are developed in dolomite reservoirs encased in otherwise tight limestone, fractures at various scales are the key to field locations and production from the fields. Most of the nearly 20 named fields are small, relative to the Albion-Scipio trend, but collectively they have produced 140MM barrels of oil and 260 Bcf of gas. Dr. Harrison went on to discuss structural models for several key fields and showed production histories from those fields, before describing the reservoir rock by showing a series of core photos. The core intervals chosen illustrated the types and diversity of fractures observed, the type of fracture filling, the extent of dolomitization and the original fabrics and depositional environments.

Elliott Wiltse and John Hubbard from Schlumberger Oilfield Services in Charleston, WV were the first two speakers in the reservoir characterization portion of the workshop. Wiltse discussed the advantages of running a Formation MicroImager (FMI) tool in Trenton-Black River wells, whereas Hubbard discussed an alternative tool, the DSI Dipole Shear Sonic Imager. In general, the FMI tool is more expensive to run than the DSI Dipole tool, and for both tools, approximately 60% of the cost is to run the tool and 40% is for interpretation.

John Repetski presented the results of a Trenton-Black River thermal maturation mapping and modeling study conducted by four geologists at the U.S. Geological Survey. The study involved a stratigraphic analysis, including conodont zonation, and the determination of the maturation of samples (conodont alteration index) collected from these formations throughout the study area. The thermal maturation values were then compared to the locations of major structural features and provinces and oil and gas fields that produce from Ordovician and Silurian rocks, and to maps of vitrinite reflectance values.

Dave Harris, a geologist at the Kentucky Geological Survey, discussed the results of petrographic and geochemical studies of outcrop samples in Kentucky, and plans to take cores and shoot seismic to determine the subsurface extent of these tectonic

dolomites. The final results of this study, funded by the U.S. Department of Energy, NYSERDA and Triana, will be available in October 2004.

Taury Smith, a geologist with the New York State Museum Institute, presented a paper on hydrothermal alteration of carbonate reservoirs that posed the question: How common is this? His answer seemed to be, quite common and very important.

How big is the impact of hydrothermal alteration on these two limestone formations? “Without fault-controlled hydrothermal alteration, there would be no Trenton-Black River play in New York,” Smith stated emphatically. He also cautioned that whereas this mechanism can enhance a reservoir, in other cases fault-derived mineral cements are precipitated in what otherwise would have been a good reservoir rock.

In summary, Smith offered this exploration model. First, look for appropriate tectonic settings: basement-rooted intra-platform wrench faults and fault intersections, fault-controlled margins, and the first carbonates deposited on newly rifted/heavily faulted continental basement. Second, look for evidence of fault movement soon after deposition: much of the alteration takes place in the first kilometer of burial, so faults with minor vertical offset at the time of alteration may be in the best locations. Third, breccias may be either karst or hydraulic, so look for saddle dolomite-cemented breccias. These are probably hydraulic in origin. And finally, look for petrographic evidence of hydrothermal alteration in cores and cuttings. With this final statement, Smith supported what Bill Harrison had stated earlier in the workshop: there is no substitute for looking at the rocks.

Attendee List

A list of attendees is attached.

Evaluation Forms

Individual evaluation forms will be mailed separately, but a summary is attached. On a scale of 1 to 5, with 5 being the highest rating, the majority of attendees rated the three performance criteria as 4 out of 5: the program met their expectations, the speakers and facilities were acceptable and the program was well-organized. The most common complaint was that some speakers showed slides that they did not provide us for the notebook, and we printed the slides too small in the notebook.

Of the 39 respondents who had attended at least one previous PTTC workshop, 17 said they had used new technologies gained through their workshop attendance, and 11 offered to share technology innovations or best practices. Of those who offered to share, most of the technology appeared to be related to the Trenton-Black River play.

Suggestions for future workshops included seismic, especially as applied to the Trenton-Black River; other plays, including Upper Devonian sandstones and the Oriskany, the deeper Beekmantown play and new areas of exploration; and updates on current activity.