WELLBORN, ROBERT, Burton/Hawks, Inc., Casper, WY

Air Drilling for Gas Sands—Marianne Field, Sweetwater County, Wyoming

Marianne field is on the northeast flank of the Rock Springs uplift in Sweetwater County, Wyoming, just south of the town of Superior. The field is located where regional east dip averages 300 ft/mi (57 m/km). Numerous east-northeast-trending normal faults are present across the field with displacements ranging from 20 to 400 ft (6 to 120 m). Updip stratigraphic pinch-outs are responsible for gas accumulations in two separate Second Frontier sandstones with entrapment apparently not related to faulting. There are similar traps in various thin sandstone stringers in the Third Frontier and Muddy sandstones. In addition, a combination stratigraphic-fault trap for hydrocarbons appears to have been found in the Dakota and Lakota sandstones in one well; these horizons were abandoned for mechanical reasons before conclusive testing could be completed.

All but one of the wells at Marianne field have been drilled either partially or completely with air. Consequently the potential to produce from various pay zones in nearly every well was determined prior to running production casing. This information generally cannot e obtained through drill stem testing in this area due to the formation damage from the drilling mud on the Cretaceous sandstone reservoirs. If an air-drilled gas reservoir was damaged later by drilling mud or cement, the potential was already known and it could be "brought back" through fracturing.

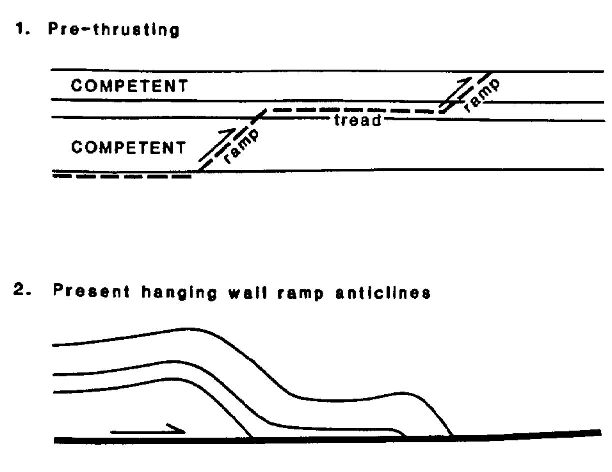
The field consists of 6 gas wells and 5 dry holes.

WEST, JUDY L., The Anschutz Corp., Denver, CO

Style of Deformation in Productive Fairway of Absaroka Plate: Southwest Wyoming and North-Central Utah

Deformation of the Absaroka plate is characterized by two subparallel trends which result from ramp anticlines. Each thick competent unit in the stratigraphic section (Paleozoic carbonates, Thaynes Formation and Nugget/Twin Creek formations) forms hanging-wall ramp anticlines and productive structures. The western trend (anticline) is associated with truncation of the Paleozoic section against the Absaroka thrust, and the eastern trend (en echelon anticlines) with truncation of the Triassic/Lower Jurassic section.

Variations in the style of folding are different on the two trends. This variation results from the vastly different mechanical properties of their stratigraphic sections; 4,500 ft (1,370 m) of nearly continuous, competent Paleozoic carbonate and quartzite produce a single ramp anticline 50 mi (80 km) long. Imbricate faults at the base of this anticline (western trend) cause oscillations of closure along strike and minor strike offsets.



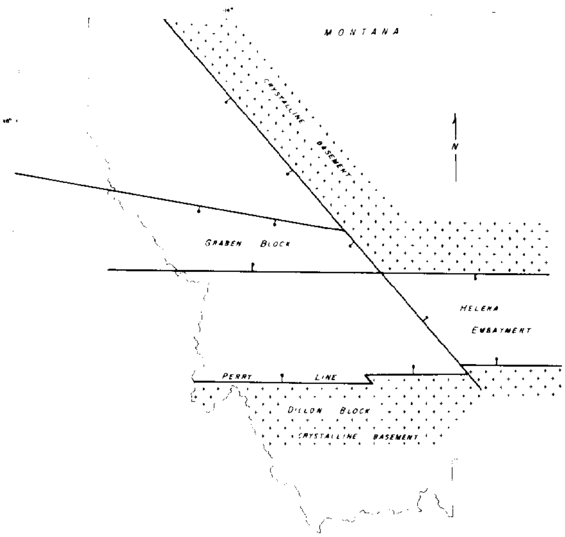
The eastern trend is dominated by folding rather than internal faulting. The Mesozoic section, which immediately overlies the thrust in the eastern trend, consists of alternating competent and incompetent units, each ranging from 750 to 2,500 ft (230 to 760 m) thick. Two competent mechanical units which form the ramp anticlines are the Thaynes Formation and the Nugget Sandstone/Twein Creek Limestone unit. Ramp anticlines develop from a single ramp through both competent units (producing one anticline) as well as stair-stepped ramps separated by a tread or "glide plane" in the incompetent unit between the Thaynes and Nugget formations (producing two anticlines). Additional folding may also result, apparently from simple compression which produces three anticlines stacked en echelon in the transport direction. These genetically related, stacked en echelon folds along an elongate zone of deformation are termed herein "imbricate folds" and are not associated with imbricate faulting.

Fold length along the eastern Mesozoic trend ranges from 1 to 6 mi (2 to 10 km). In contrast, oscillations in the 50-mi (80-km) long western anticline range from 5 to 15 mi (8 to 24 km). A clear relationship becomes apparent between both length and style of ramp anticlines and the thickness of the stratigraphic section traversed by the ramp.

WINSTON, DON, Univ. Montana, Missoula, MT

Middle Proterozoic Belt Basin Syndepositional Faults and Their Influence on Phanerozoic Thrusting and Extension

During the middle Proterozoic, continental crust of the Belt region was cut by nearly east-west and northwest-striking faults that produced a mosaic of large basement blocks. Blocks that subsided formed the Belt basin and were surrounded mostly by uplifted blocks. The Dillon block bounded the basin on the south along the Perry line, and, together with blocks to the south and west, furnished most of the sediment that filled the basin. Great alluvial aprons sloped basinward from the uplifted blocks down to extensive flats that bordered the Belt intracratonic "sea." Sediments were deposited in the deeper parts of the sea by underflows and interflows. The graben blocks, including the Helena embayment and the diagonal block to the northwest, received the thickest sediments.



Cretaceous to Paleocene compression thrust the Belt rocks and Phanerozoic cover rocks eastward and northeastward, forming first a western, and then an eastern thrust belt. Thrusts on the blocks formed long sheets that deflected and tore along the block boundaries, where depth to basement and tectonic transport distances changed. Where thrusts crossed northwest-trending basement faults, they ramped locally.

Eocene extension produced fault patterns that change from block to block. Differential extension formed right-lateral strike-slip faults across block boundaries.

Proterozoic faults that cut the continental crust, not only formed the framework of the Belt basin, but affected patterns of later compression and extension.