WHITNEY CANYON-CARTER CREEK GAS FIELD, SOUTHWEST WYOMING

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ABSTRACT

Whitney Canyon-Carter Creek field is a large multi-pay gas field, located in southwestern Wyoming. Its principal production, when a gas plant is completed, will be sour gas from several Paleozoic reservoirs. The structure, an elongated, faulted anticline, was mapped by the seismograph. The discovery well was completed early in 1977. The structure overlies a ramp of Cretaceous siltstones and shales on the Absaroka thrust plane. Involved in the structure are Cretaceous and Jurassic siltstones, shales and salt, Triassic limestones and shales, and Paleozoic carbonates, with lesser sandstones and shales. Mississippian Mission Canyon intercrystalline dolomite contains the most important hydrocarbon reservoirs in the field. Fracturing of limestone and dolomite may provide the most important porosity and permeability of the other reservoirs. Several thrust faults, with displacements ranging from a few feet to several hundred feet, have been encountered in drilling development wells, and a large thrust fault of several thousand feet displacement may mark the eastern edge of the field.

Thirty-two wells, ranging in depth from 9,462 feet to over 18,400 feet, have been completed in the field. Wells have encountered several hundred feet of productive interval and some tests have recovered gas at rates of up to 34 million cubic feet per day (MMCFPD). Gas from the Triassic Thaynes limestone is sweet and gas from lower formations contains from 2 to 20 percent hydrogen sulfide. Hydrocarbons have not been recovered from either the Jurassic Twin Creek or Nugget formations, which are principal producers in other fields of the province.

INTRODUCTION

The Whitney Canyon-Carter Creek field (shortened to Whitney-Carter field in this report) is a large multi-pay gas field. It is located in the southwest corner of Wyoming, 12 miles north of the city of Evanston (Fig. 1). Its principal production will be sour gas from several Paleozoic carbonate reservoirs. Upon completion of two large gas desulfurization plants in 1982, it is anticipated that the field will produce 400 million cubic feet of sweet gas, 10,000 barrels of condensate and 2,200 metric tons of sulfur per day. Whitney-Carter field was discovered in 1977 and is the first to produce wet gas from Paleozoic reservoirs in the Wyoming-Utah-Idaho thrust belt. Natural gas appears to be trapped in all zones of porous rock below the top of the Triassic Thaynes limestone. The trap is an elongated, faulted anticline.

REGIONAL GEOLOGIC SETTING

The Wyoming-Utah-Idaho thrust belt embraces an area of 15,000 square miles extending from Jackson, Wyoming on the north, 180 miles south to the Uinta Mountains of Utah, and from Tip Top-La Barge, Wyoming on the east, 80 miles west to west of Bear Lake in northeast Utah and southeast Idaho. To the petroleum geologist, it is an area of major north-south trending faults, thrust from the west with stacking displacements totaling possibly 60 miles. Folding, associated with and generally parallel to the strike of the faults, has provided traps for many of the oil and gas fields of the province.

It is generally believed that: 1) basement rocks are not involved in the thrusting, as contrasted with many oil and gas producing structures to the east, 2) fault planes are approximately parallel and duplicate the sedimentary package, 3) faults tend to parallel the bedding in incompetent beds and cut obliquely upwards in more competent beds, 4) thrusting was episodic during the Cretaceous and early Tertiary, cutting up-section to the east (in the direction of transport), and 5) oldest faults are the shallowest and lie to the west.

Major faults have been named, and although there are some variations in names and in the manner in which they have been projected and recognized, it is generally accepted that the oldest fault is the Paris-Willard thrust which lies just west of Bear Lake (Fig. 1). The next thrust to the east is the Crawford, then the Absaroka, followed by the Hogsback (Darby-LaBarge in the north) as the youngest. A number of other thrusts have been mapped and named and some of these will some day probably be regarded as “major” depending on the amount of displacement and economic importance.

The hanging wall of the thrusts is generally called a “plate” because of its overall shape. For example, the Whitney-Carter field, as well as most of the other thrust belt fields of the province, lies on the Absaroka plate.

Mesozoic and Paleozoic rocks are exposed in north-south ridges in the northern half of the area providing insight into the character of the folding and faulting to the south. In some of the valleys between the ridges, Eocene Wasatch continental sediments were deposited to considerable depths, probably concurrent with the faulting and structural growth. The net result was that normal faulting formed grabens partially filled with low-velocity Tertiary sediments.

Structure of field

The Whitney-Carter structure is a narrow, north-south trending, faulted anticline, about 14 miles long and 2 miles wide. It is bounded on the east flank by the Tunp thrust fault with 4,500 feet of vertical displacement (Fig. 2).