of 20 to 50 atm, the eastern Devonian shales are a viable source of synthetic liquid or gaseous fuels. Experimental work, in equipment capable of processing up to 1 ton/hour of shale, has confirmed the technical and economic feasibility of above-ground hydroretorting of oil shales. Work done to date on nearly 500 samples from 12 states indicates that the HYTORT process can give organic carbon recoveries from 2 to 2.5 times those of conventional retorting of the Devonian shales, so that the HYTORT process yields 25 to 30 gal/ton on syncrude at many localities, compared with 10 to 15 gal/ton using Fischer Assay retort methods.

Criteria for inclusion of shale in estimates of recoverable resources for the HYTORT process are (1) organic carbon of at least 10% by weight, (2) overburden of less than 200 ft (59 m), (3) volumetric stripping ratios of less than 2.5 to 1, and (4) stratigraphic thickness of 10 ft (3 m) or more.

Resource estimates include: Kentucky (Ohio, New Albany, and Sunbury Shale), 190 billion bbl; Ohio (Ohio and Sunbury Shale), 140 billion bbl; Tennessee (Chattanooga Shale), 44 billion bbl; Indiana (New Albany Shale), 40 billion bbl; Michigan (Antrim Shale), 5 billion bbl; and Alabama (Chattanooga Shale), 4 billion bbl. Recoverable resources have not been identified in West Virginia, Georgia, Oklahoma, Illinois, Arkansas, or Missouri outcrops. Co-production of uranium and metals is a possibility in the areas favorable for syncrude production.

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Absence of Connate Water in Michigan Reefs Attributed to Anhydrite

Dehydrated gas stored in depleted reef reservoirs behaves uniquely in that the gas comes out essentially as dry as when injected. This observation leads to the conclusion that the major part of the reservoir does not contain connate water. However, the base of the reservoir, usually of low porosity, is filled with brine.

Reef rocks contain anhydrite. A study of anhydrite occurrence leads to the relation of gypsum to anhydrite. A review is made of the controversial views held as to this relation in the earth. One concludes anhydrite in the earth must react with liquid water to form gypsum. Further, it is believed the anhydrite conversion to gypsum forms the seal to project salt layers.

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St. Louis and Salem Stratigraphy and Oil Production, Owensville North Consolidated and Mt. Carmel Consolidated Fields, Gibson County, Indiana

Recent oil discoveries in the St. Louis and Salem Limestones of Middle Mississippian age, on the eastern flank of the Illinois basin in Indiana, have been significant enough to stimulate exploration. Most previous oil exploration in the area was confined to depths shallower than the St. Louis and the Salem.

Along with the oil discoveries came problems of stratigraphic identity in Gibson County and adjoining counties. The problems were resolved by a study in which the Salem Limestone and associated rocks were traced from the outcrop area into the subsurface, where geophysical logs and drill cuttings were used for correlation. Within the St. Louis a geophysical log marker—the X marker—and the Sisson Member were introduced as new names.

Two adjoining fields in Gibson County, Owensville North Consolidated and Mt. Carmel Consolidated, were studied in detail in an attempt to determine the conditions for oil entrapment in the St. Louis and Salem reservoirs. Production in both fields abut one another, and therefore the reservoirs are treated as one unit. Production is from the St. Louis (Sisson Member) and the Salem. The Salem reservoir is about 180 ft (55 m) below the St. Louis reservoir, and both produce from porous zones in a calcarenite facies composed of microfossils, fossil fragments, and oolites. Porosity studies of the reservoirs show that the lower limit of producible porosity is 6%, and most oil wells have at least 5 ft (1.5 m) of net porosity greater than 6%. Maximum porosity recorded in the St. Louis was 15%, and in the Salem 21%. Density logs were used for porosity determinations. Salem wells had higher initial production than St. Louis wells. Entrapment is influenced by both stratigraphic and structural conditions.

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Geology and Mining of Tennessee Coal

The coal deposits of Tennessee occur in Pennsylvanian strata on the Cumberland Plateau. The southern half of the plateau contains Lower Pennsylvanian strata which are thick, massive sandstones and thin shales. The northern half consists of Lower and Middle Pennsylvanian strata. Relatively thick shales and thin sandstones comprise the Middle Pennsylvanian section. Most of Tennessee's present coal production comes from the northern Cumberland Plateau.

The first recorded production of coal in Tennessee was in 1814. Significant production did not begin until the expansion of the railroads which occurred around 1850. Except for a lapse in production because of the War Between the States, production increased steadily until 1900. Although production has fluctuated, Tennessee has produced approximately 9 million tons per year since that time.

Today there are over 300 operating mines in Tennessee. Of these, about 60% are surface mines. The average production of surface mines in Tennessee is about 6,500 tons per month. Underground mines average about 4,500 tons per month. All of the coal produced in Tennessee is bituminous and is used largely in steam-powered electric plants.

There are several experimental uses of coal being studied in Tennessee. These include synthetic fuel plants, magneto-hydro-dynamics plants, atmospheric fluidized-bed combustion plants, and coal gasification plants. The development of any of these processes could significantly affect coal production in Tennessee.

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