

**KANSAS GEOLOGICAL SURVEY
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POSSIBILITIES OF KANSAS MINERALS FOR INDUSTRIAL USE

by

John C. Frye

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The possibilities of Kansas minerals for industrial uses are indeed many and varied. Kansas ranks fifth among the states ~~of the nation~~ in petroleum production, fifth in natural gas, fifth in zinc mining, third in the value of salt produced, and is the leading producer of volcanic ash or "silica." Kansas, for the past 13 years, has constantly been among the top 10 mineral-producing states of this country. The impressive war record of the Kansas mineral industries shows an exceedingly rapid expansion. Since 1939, the value of our total output has increased by more than 80 percent, to bring us to an annual production of more than 220 million dollars worth of mineral materials. This percentage increase is larger than that shown by the United States as a whole during the same period and has been greatly influenced by the rapid increase in the production of oil, which for the first time in Kansas attained an annual output of 100 million barrels in 1943.

Just a few days ago I read with much interest an article entitled "The War and our Vanishing Resources" written by Harold L. Ickes, Secretary of the Interior.* Mr. Ickes defends his conclusion that the United States has passed from the category of a "have" nation to a "have not," and gives some figures for the life expectancy at normal production rates of some of our important mineral substances. As several of the minerals listed by him as having a relatively short production future are prominent in the list of Kansas minerals, it suggests that, in some cases at least, possible future industrial uses of mineral raw materials will be controlled by the adequacy of the supply.

In this respect, it is important that the Kansas mineral economy be a diversified one, in spite of the dominance of the fuel minerals in the value of our total output. Even in the fuel minerals we are diversified. We produce within

* December, 1945, issue of American Magazine.

the state sizable quantities of the three important fuels -- oil, natural gas, and coal -- and the Geological Survey is now investigating the reserves and quality of certain deposits of low grade oil shale. Such deposits are not to be regarded as of immediate commercial importance, but they add to the total reserves of fuel within the state for possible future needs.

Diversification is further illustrated by a glance at the mineral production figures. In 1943, we produced nearly 189 million dollars worth of fuel minerals; our mines yielded more than $13\frac{1}{2}$ million dollars worth of metallic ores; manufactured cement was valued at more than 8 million dollars; more than 4 million dollars worth of salt was mined and processed; and we produced more than 6 million dollars worth of other substances including volcanic ash, sand and gravel, gypsum, stone, and clay products.

Furthermore, our mineral deposits are diversified in geographic location. A glance at the map of the mineral resources of Kansas shows that no large section of the state is completely devoid of mineral deposits. Oil or gas are now produced in 71 of our 105 counties, and active exploration is under way in 20 others. Stone of various types occurs in more than half of the counties, and very few are without deposits of sand and gravel. Extensive reserves of salt, gypsum, and light-firing clay occur in central Kansas; coal is mined in the eastern and southeastern parts of the state, and zinc and lead are mined in the extreme southeastern corner.

In a very real sense all mineral substances produced from the rocks of the state may be considered industrial minerals. The fuel minerals -- the dominant cash crop from below the Kansas grass roots -- have in the past been used almost entirely as sources of heat and power. They turn the wheels of industry and transportation. Even though these substances are gaining increasing importance as industrial raw materials for the manufacture of a long list of products, it is

logical to expect that their major use will continue to be for heat and power. As petroleum has been mentioned as one of the minerals with a relatively short life expectancy, our development in this field may quite likely be governed by the adequacy of supply. The proved reserves in Kansas at the end of 1944 were estimated by the American Petroleum Institute as 601,751,000 barrels*, or enough to last for little more than six years at the production rate during the war year of 1944 if no new oil were discovered. It is of course increasingly difficult to find new oil deposits in a state as well explored as Kansas, but it is unduly pessimistic to believe that we will not continue to find new oil for many years to come, particularly when we consider such important areas as the Dodge City Basin which has to date only a few deep tests.

Our rank as a metal mining state is almost totally dependent on zinc and lead from Cherokee County. The many industrial uses of these metals are well known. Pyrite, the sulphide of iron, has been produced as a by-product of the coal-mining industry, and iron oxide could be produced for pigment and other uses from mine waters in southeastern Kansas and from some impure deposits in the central part of the state.

During the early part of the war when bauxite (the ore of aluminum) was reaching the country with difficulty, the State Geological Survey undertook research on the possibilities of producing alumina from Kansas clay. Although the experimental work was successful, ore again was reaching this country with safety and this process was not used. Also during the early part of the war the need for magnesium prompted the Survey to sample many of the oil-field brines of the state, and chemical analyses were made to determine the quantity of magnesium and other substances that might be extracted from this waste product of the oil industry. Future field

* A. P. I. Quarterly, April, 1945, p. 37. Since the preparation of this paper the A.P.I. estimates as of Dec. 31, 1945 have been published in The Oil Weekly, vol. 121, no. 1, March 4, 1946, p. 11. The estimated proved reserve in Kansas on that date was 541,846,000 barrels

and laboratory studies may reveal other metallic ores. An example of this is the discovery, by Mr. Norman Plummer, of small quantities of vanadium in some Kansas clay deposits.

Although accounting for only about 10 percent of the dollar value of the state's mineral output, non-metallic minerals furnish much of our diversification and supply us with many possible avenues for future industrial expansion based on enormous reserves of mineral deposits. The non-metallic minerals produced in Kansas and used primarily in the construction industries include rock asphalt, used as a paving material; hard ledges of even-grained chalky limestone for building stone and road material; and chat for aggregate, road material, and railroad ballast. We should also include in this list structural clay products, rock wool as an insulating material, and gypsum products such as wall board and plaster. Portland cement, sand, and gravel, crushed stone, and building stone constitute the largest dollar value of construction materials produced in Kansas. The various uses and possible future uses of these materials are well known and need not be repeated. The post-war period is generally believed to be headed for extensive construction enterprises which will, no doubt, furnish an extensive market for all of these materials. The present trend seems to indicate that the structural clay products will occupy an increasingly important position in the Kansas construction industry.

In addition to the construction materials there are a number of substances useful to industry included within the non-metallic mineral deposits of Kansas. A few of these deposits have been extensively developed but others are almost untouched, even though the reserves in some cases are quite large. Some of these and their possible uses are discussed briefly below.

Bentonite may be used for bleaching clay, as a bond in molding sand, as a ceramic material, and for drilling mud. Chalk is used as whitening in putty and

ceramics, and may find a use as a filler in paint and plastics, as agricultural and feed lime, in glass and glazes, in cement, and as a source of calcium carbonate and its derivatives for the chemical industries. Although some types of clay have been commercially produced in Kansas for many years, recent research by the Survey has brought to light the occurrence of several special types of clay within the state that will facilitate the manufacture of products ranging from art ware and china to structural materials and high duty refractories.

Diatomaceous marl discovered in northwestern Kansas may find a market as a filler, a filtering material, a ceramic raw material, or an insulating material and in hydraulic cement. Gypsum has been mined in Barber and Marshall Counties for a number of years for the production of such materials as plaster of Paris, Keene cement, wall board, and insulating materials, and as a chemical raw material. Our reserves of gypsum are large and are adequate to meet any possible increase in industrial needs. Kansas contains enormous reserves of salt which is being produced extensively at Hutchison, Lyons, and Kanopolis. Salt in its refined form is quite familiar; it is also a raw material of chlorine and soda ash, and is often used as a ceramic glaze.

A wide variety of limestone occurs in large quantities in eastern Kansas and can be used as aggregate, chemical calcium carbonate, flux, agricultural lime, cement materials, and for other uses. In addition to their use as a construction material some of our deposits of sand serve well as molding sands, and may be useful in manufacturing a few grades of glass. Shale is extensively used as a ceramic raw material, and the varieties and quantities of this material in the state are virtually unlimited. Research now in progress by the Geological Survey is demonstrating the value of certain shale beds for the production of "ceramic slag," or artificial aggregate material.

Kansas ranks first in the production of volcanic ash, and both dolomite and tripoli occur in limited quantities within the state. Ash is now extensively used as an abrasive, but can also be used as a ceramic raw material, as a cement diluent, and possibly as a filler in various products and as a raw material for certain grades of glass.

Water, although given little thought as an industrial mineral, nevertheless has a very real place in any such listing as this. An adequate supply of water of a suitable quality is essential to almost every industry. Some industries use large quantities of water in their processing or for cooling purposes, and in such cases the chemical character and temperature become quite important. The availability of ground water ranges widely over the state, both in quantity and quality. The cooperative ground-water program sponsored by the State and Federal Geological Surveys and the State Boards of Health and Agriculture is responsible for compiling data on the occurrence, quantity, and quality of the state's underground waters. This data, although extensively used for agricultural purposes in the irrigation areas of the state, is also of great importance to a new or contemplated industry.

It seems logical to conclude from the foregoing facts that Kansas, although now ranking ninth among the mineral-producing states, has many and diversified possibilities for expanded production, production of new mineral substances, and the manufacture of new products from the raw materials of the state.