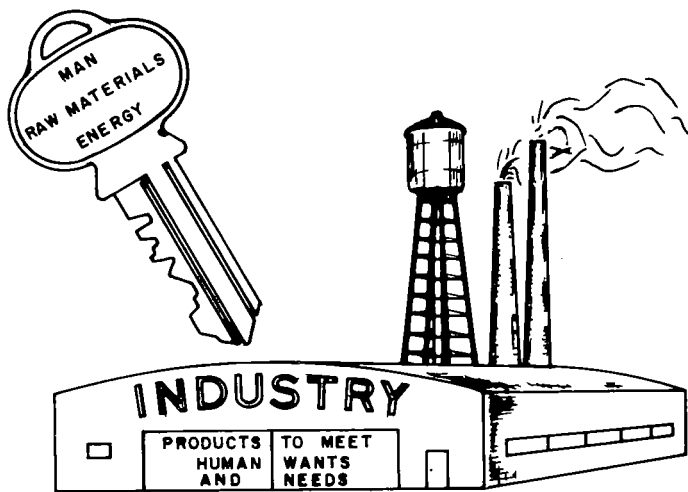


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MINERAL AND WATER RESOURCES AN ASSET TO SOUTH DAKOTA'S INDUSTRIAL DEVELOPMENT



KEY TO INDUSTRIAL PRODUCTION

by

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MINERAL AND WATER RESOURCES — AN ASSET TO SOUTH DAKOTA'S INDUSTRIAL DEVELOPMENT

By Duncan J. McGregor¹

ROLE OF MINERAL AND WATER RESOURCES

Mineral deposits, oil fields, and water aquifers are directly related to their geological environment. To discover them, one must depend upon the basic knowledge of the State's geology. Thus it can be said that a State that wants to know its mineral and water resources must first know its geology. Furthermore, one must constantly be reminded that a potential mineral deposit, oil field, or water aquifer can become a resource only if it is used in the development of the State's economy.

South Dakota's mineral and water resources contribute in many ways to the economy and industrial activity of the State. The first and most obvious contribution is the total dollar value of minerals produced each year. In 1964 the annual production value exceeded \$51 million, and was obtained from a wide array of minerals including beryllium, cement, clay, coal, copper, feldspar, gem stones, gold and silver, gypsum, iron ore, mica, petroleum, sand and gravel, stone, and uranium ores.

Second is the significance of minerals to the transportation industry, as most minerals must be carried in their raw state to processing plants, made into a product, and then transported on to market or point of use. Data provided by the South Dakota Public Utilities Commission show that 46 percent of the freight tonnage moved in the State by rail was of mineral origin. Data are not available with regard to the trucking industry, but it would no doubt reveal a similar percentage.

Third, minerals and mineral products provide for the building materials that are essential to the construction of homes, factories, and numerous other facilities required by modern industry.

Fourth, minerals provide the basic raw materials from which other products are manufactured. For example, cement and lime are made from high-quality limestone.

Fifth, minerals provide a source of inanimate energy which is necessary for the survival of industry.

Sixth, water is one of the essential raw materials for the State's all-important industrial plants. No industry or business can long survive where water is unavailable or inadequate as to quantity and

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quality. A major resource problem is the relationship of water to present and future development of industry and to the economic growth of the State.

If one were to examine various industrial processes, it would be found that three key ingredients are necessary to all types of industrial production. Man tops the list, with his keen sense of observation, imagination, incentive, and know-how. The second most essential ingredient is raw materials from whatever the source—mineral, animal, vegetable. The last ingredient, and a most important one, is energy that is used to shape, mold, combine, or in some way modify raw materials into some useful form. Energy may be inanimate or animate, but if man is to enjoy an expansion in his standard of living, he must use and control some form of energy that far exceeds his own physical capabilities.

With respect to the raw material and energy components, minerals provide by far the greatest share, and South Dakota's potential is considered good.

PROSPECTS FOR SOUTH DAKOTA'S MINERAL PRODUCTION

General Statement

When one stops to study the mineral industry and water sector of our South Dakota economy, it is found that the prospect is both gloomy and bright. Its gloom is revealed by the data that show a relative decline in the component parts of industry as measured in terms such as value, employment, wages, and salaries. Its bright side is indicated in that the above may be of short duration. It is well known that economic growth in the mineral industry sector can be much stimulated by bold forward planning and wise decisions. In the following sections, the economic activity is reviewed in more detail and some conclusions made with regard to what is needed to stimulate the mineral industry.

Value of South Dakota's Mineral and Water Resources

South Dakota continues to lead the nation in gold production, with an annual value of \$20,185,000. Silver, a by-product of gold processing, has an annual value of \$150,000. Gold and silver are extracted from rocks of Precambrian age, the oldest rocks in the Black Hills.

Uranium ores, extracted chiefly from lignite coal of Cretaceous age, have an annual value of \$1,931,000.

Cement, so necessary to the building trade, has a total annual value of \$6,107,000.

Plentiful sand and gravel deposits are another economic asset of the State. These raw materials are derived chiefly from glacial

deposits and are found principally in the eastern half of the State. Some \$16,313,000 of sand and gravel was produced in 1964.

Crushed stone is important to South Dakota's economy, and had an annual value of over \$7,000,000 in 1964. Limestone and dolomite in the Black Hills, and Sioux Quartzite in eastern South Dakota were the chief sources of raw material.

Other minerals found in South Dakota are restricted to the area of the Black Hills, and had a combined value of over \$3,000,000.

It is estimated that 76 percent of the water used in South Dakota comes from beneath the ground. Water is a commodity that does not have a direct value in dollars and cents. Its indirect value, however, is almost astronomical. Water, in the thinking of many individuals, has been considered a free commodity, to be captured by the most enterprising people. Also, water generally is priced relative to its cost, rather than to its value. As to the future, we can look for increased cost. The development of future water supplies will be more expensive than those already developed, because people habitually develop the cheap sources first.

EMPLOYMENT

South Dakota statistics show that the employment pattern in the mineral sector has fluctuated greatly over the years. In the period from 1956 to 1960, it is found that employment was stable, averaging about 11,675 workers. From 1960 to 1962, employment declined rather steadily to an average of about 3,750. For 1964, statistics show that in the Black Hills area 4,766 people worked in mining, quarrying, and contract construction. It is estimated today that about 5,000 workers are employed in mining, quarrying, and contract construction throughout South Dakota.

Stability of employment is directly related to supply and demand for mineral resources in the State. Significant growth is expected in the mineral sector if mining, quarrying, and the demand for construction materials continues to increase in the next decade.

Wages and Salaries

Total wages and salary disbursements in South Dakota from 1960 to 1963 averaged about \$12,000,000 for mining and about \$75,500,000 for other related segments of the mineral industry. The average hourly wage for the same period was \$2.15 and \$2.62, respectively. Wages and salaries are closely allied to population changes, concomitant construction, and consumer goods demands. The prospects for the next decade appear to be bright for the average earner as business activity picks up in the State.

COMMODITY SUMMARY

Oil and Gas

Production of crude oil and gas in South Dakota from 1960 to 1964 has fluctuated, but has averaged about 222,000 barrels per year. At present the petroleum industry in South Dakota is not an expanding one, but production should continue to be healthy. Future development and exploration work in the State is expected to expand, with much of the exploration being equally shared by both major and independent producers. Large areas in South Dakota are unexplored, either as to shallow or deep production. Future exploration depends entirely upon economic factors as they affect the petroleum industry.

Water

Much information has been compiled concerning the availability of water resources for industry, agriculture and municipal use through comprehensive investigations and studies. Even so, distribution of usable water resources is not totally known. The general nature and location of water in South Dakota poses limitations for economic development. Many areas in the western and a few areas in the eastern part of the State have a limited supply of usable water. Although the exact value that water adds to the economy is difficult to measure, attention must be focused on how water can be used for economic growth.

The integrated use of water with other mineral resources in such a way that natural resources may be used to better advantage holds possibilities for increased economic returns to the State. For example, the reduction in the evapo-transpiration losses will increase crop yields. Water recreation should expand as the growing recreational picture offers an added stability to the economy. The desalination of salt water may be an important factor in the future growth and development of South Dakota's economy.

Metals

South Dakota has always been the leading producer of gold in the nation. Although gold production has increased over the years, the cost of extracting gold has also increased. Therefore the margin of profit that is necessary to maintain a healthy business environment has steadily decreased. Because gold is sold to a captive market, and it looks as if a price increase for the product will not be forthcoming in the near future, gold mining in the State faces a difficult financial problem. Continued efforts on the part of people interested in maintaining a stable economy in gold production will undoubtedly do much to solve the problem as it exists today. It appears that two possibilities exist: either the price of gold is increased, or the Federal Government offers a subsidy to the gold producer.

As the economy picks up and the price for metals increases, it is predicted that new mining will take place in the Black Hills region within the next few years.

Much interest has been shown in the State as a result of magnetic investigations. Five core holes have been drilled on magnetic anomalies to provide materials for analytical work, and in one core in northern Yankton County, 28 percent elemental iron was found to be present. It is felt that most companies interested in the development and exploration of these anomalies are probably more interested in the trace elements, such as titanium, that accompany the magnetic highs than in iron itself. Therefore, the overall future of metal production in South Dakota seems good.

Industrial Minerals and Rocks

The production of industrial minerals and rocks in South Dakota has grown with the rest of the economy at a rate about proportional to the increase in population and general construction activity. Most industrial minerals and rocks are scattered rather widely throughout the State of South Dakota, with most of these commodities locally consumed and having a low unit value. Those commodities that have rather extensive markets face increasingly keen competition, largely as a response to high transportation costs. Historically it is found that in the industrial mineral and rocks segment of our economy that those parts that have developed new high-quality products or have improved the method of production and processing have shown the strongest gains. As new uses are found for the industrial minerals, it is predicted that greater returns can be realized, and this should encourage industries to come in to the State to process them. The multiplier effect produced by processing raw materials in the State holds promise for expansion in the South Dakota economy. For example, the value of raw gypsum, if produced in the State, would amount to between \$3.50 and \$4.50 per ton. This material could be made into a product that would sell for about \$20 to \$43 per ton. Therefore, we see that primary processing of the industrial minerals and rocks generates an extremely high multiplier effect on the dollar value within the State.

South Dakota has not been a major coal producer, but the production of lignite coal in the State has been responsible for the recovery of uranium as a by-product. Much interest has been focused on the feasibility of utilizing lignite coal for the generation of gas as a chief product. A pilot plant to investigate this aspect of the use of lignite coal has been approved, and probably will be put into operation within the near future. If the results of this pilot operation prove to be worthwhile, it can be expected that the economy of South Dakota will expand if the lignite coal deposits are developed. However, the State is in stiff competition with North Dakota in the

development of lignite coal. Reserves in South Dakota are estimated to be about two billion tons, whereas in North Dakota the reserve estimate is 320 billion tons.

Except for gold, the economy of South Dakota depends heavily upon the abundance of low unit value industrial minerals and rocks of the construction industry. These include cement, crushed stone, and sand and gravel, and the processed products of these commodities. South Dakota has lagged in its scientific evaluation of its industrial minerals such as clay and shale that serve as raw materials for the ceramic industry. Much exploration and research needs to be done in order to obtain realistic data on which all the commodities listed above can be evaluated.

Sand and gravel are low-unit value materials that are familiar to almost everyone in the State. The sand and gravel usage is widely dispersed, and many counties in the State are potential producers if not already producers of sand and gravel. The predicted outlook for sand and gravel production in South Dakota is good, with the rate of growth dependent upon other segments of our economy.

The rock formations of South Dakota provide abundant supplies for use as crushed stone and dimension stone. The development of these commodities is dependent upon new uses to be found for them, and like sand and gravel their rate of growth will depend upon other sectors of the economy.

Other industrial minerals known to occur, particularly in the area of the Black Hills, include such materials as feldspar, mica, beryl, and gem stones. These more or less miscellaneous materials have immense potential value for future development in the State.

South Dakota does not lack for abundance of mineral raw materials. To date it has made prudent use of its mineral resources, but if South Dakota is to expand in the mineral sector of its economy, there must be increased and continued research in this area. However, research alone does not guarantee production and use of any commodity, as it must be related to such factors as transportation and markets. Transportation and markets provide the greatest limiting factor in the development of primary processing of South Dakota's mineral raw materials. Research and product development, market analysis, and the integration of these aspects with prudent use of mineral raw materials that are found in the State, are essential if the State is to continue to compete for future markets.

ROLE OF THE SOUTH DAKOTA STATE GEOLOGICAL SURVEY

In open file and published reports, large quantities of data and information about mineral and water resources are available at the South Dakota Geological Survey, with offices in the Science Center

on the campus of the University of South Dakota, Vermillion. The Geological Survey is one of the scientific organizations of the State, and is responsible for conducting research on the geology of South Dakota, including the occurrence, quality, and usefulness of rocks and mineral resources. In cooperation with the United States Geological Survey and the South Dakota Department of Highways, the State Geological Survey is responsible for the detailed mapping of the State's surface topography. In cooperation with the United States Geological Survey in Huron, the State Geological Survey is responsible for and concerned with the geologic and hydrologic factors in the occurrence of ground water in the State.

Several of our staff specialists are engaged in work of direct interest to industry. The Survey's file of oil and gas records includes logs and sample descriptions, and is of assistance to the petroleum industry in its search for oil. Geologists of the Survey are concerned also with the study of the various industrial minerals and rocks, and provide data for those interested in these commodities. Survey specialists devote much time to the geology of water, which is of direct assistance to the individual farmer, city dweller and industry. Not to be overlooked is the pursuance of basic research from which the science of geology expands and permits further insight on the problems of the unknown.