SEVEN KEYS TO CHEMICAL INDUSTRY

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It has been said that there are seven key raw materials for the chemical and processing industries.

Air—the first key—is a source of oxygen and nitrogen. Oxidation is one of the more important chemical reactions. The combustion of coal, oil, and gas offers an example. The carbon dioxide produced in enormous quantities is usually wasted into the atmosphere but one Oklahoma concern does the unusual and recovers a portion. Reference is to the Oklahoma Portland Cement Co. at Ada. Atmospheric nitrogen is a source material for ammonia, cyanides, and cyanamide. Thus, air is a key to inorganic nitrites and nitrates, to nitrogenous fertilizers, and to high explosives. Oklahoma does not have a nitrogen-fixation plant.

Sulfur—the second key—does not occur in readily available form in Oklahoma. The fact that it is produced in Texas does not favor Oklahoma consumers because the freight rates to Oklahoma points are much higher than rates by water to points on the Mississippi River and its tributaries or to the eastern seaboard. A potential source of sulfur in Oklahoma is gypsum, with an estimated reserve in excess of 125 billion tons. Attention is called to the deJahn patents issued in 1942 which claim the discovery of a process to produce sulfur dioxide, together with lime and carbon dioxide, by the controlled heating of a mixture of gypsum and coal.

Salt—the third key—occurs in Oklahoma as rock salt in the western part of the State and in subsurface brines throughout most of the oil-producing districts. Crystallized salt is produced from brine at Sayre, and small quantities are harvested occasionally from salt plains in the northwestern districts. Many chemical industries are large consumers of salt but there are none of this type in Oklahoma.

Limestone—the fourth key— occurs extensively in Oklahoma. High-grade stone suitable for the glass industry, for iron and steel production, for the preparation of magnesium compounds for alumina purification, and for burning to lime is being produced in the state. Lime kilns are in operation at Sallisaw. Limestone suitable for agricultural purposes is being produced at a number of places. High quality dolomite is available but there is no production. The diverse uses of limestone products and their enormous tonnage are shown in the tables in *Minerals Yearbook* published by the U. S. Bureau of Mines. The importance of limestone to the chemical industry is very evident.

Coal is the fifth key. Chemicals from coal are mainly in the nature of by-products from the coking process. Coke is the primary product. Therefore, the availability of chemicals from this source is dependent upon the demand for coke, and the supply is not flexible. This has encouraged production of such chemicals from other source materials, principally petroleum. However, coal can be made a source material for gasoline, lubricants, and

many chemicals not now considered as coal derivatives, if and when economic conditions warrant.

Petroleum—the sixth key—is definitely a raw material for chemical industry. The manufacture of aviation gasoline must be considered as a chemical process and the product as a synthetic chemical. Oklahoma has already engaged in this business, and in the production of methanol, formaldehyde, and other chemicals from natural gas. Further expansion of chemical industry based upon petroleum should be encouraged.

The seventh key is water. It is required by many chemical industries in tremendous quantities. Plants requiring water in amounts comparable to those used by cities of the size of St. Louis are not exceptional. Plant location is often predicated upon the availability of water which will meet specifications as to quantity, purity, and temperature. Oklahoma needs to know more about her ground waters and to conserve her surface water.

Nature has bountifully supplied Oklahoma with five of the seven key raw materials for chemical industry. Sulfur and water are the exceptions. Research designed to put the State in a more favorable position on these two items should be undertaken without delay.