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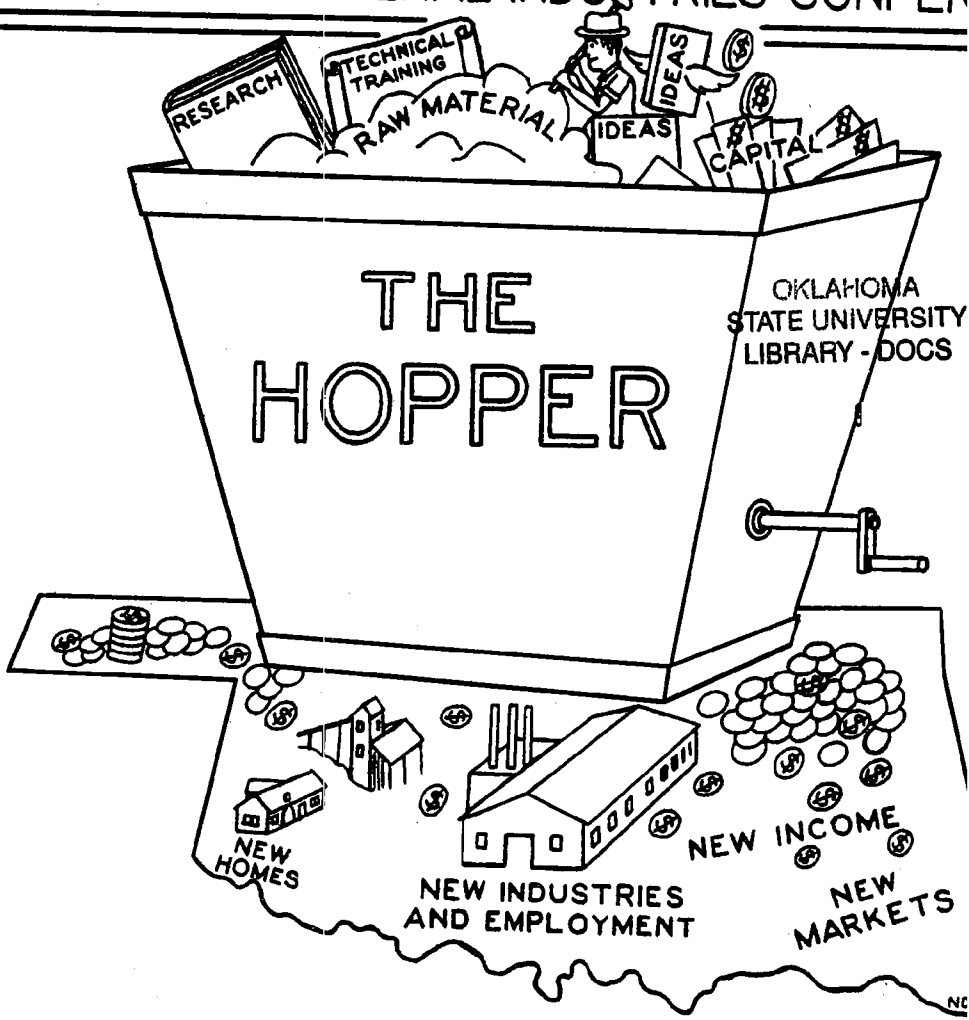

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NEW AND INTERESTING DEVELOPMENTS IN CHEMICALS FROM PETROLEUM

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Except to the clairvoyant, learning "what's around the corner" is largely a proposition of reviewing what's going on today and observing obvious trends that should give a fairly good preview of what may be around the corner for tomorrow.

During the past ten years our Southwest country has become the nation's center of chemical activity. Several month's ago the Industrial Bulletin of Arthur D. Little, Inc., one of the country's leading chemical consultant and research firms, made these significant comments:

"Greatest expansion of the chemical industry is in the Southwest, with its rich natural chemical resources. Although other manufacturing is minor, over 100 basic chemicals are made and sold on a significant commercial scale. Chemicals worth $700 million were produced in 1946, yet only four percent of the population worked in factories. Because migrants from farms to cities supply most of the factory labor, increasing mechanization of agriculture is expected to provide manpower for the new industries."

This expansion is largely a phenomena of modern developments in oil and gas technology. The American Petroleum Institute reports that 5400 industrial products are made from petroleum and the chemist knows that there are few, if any, organic chemicals that can't use petroleum or natural gas, in part at least as raw material in manufacture.

To tell of new developments in petroleum chemicals therefore is to review the entire field of modern organic chemistry, and since time is limited I have tried to assemble a few of the high-light developments that would appear to be of most interest to us in Oklahoma.

Recently the Baltimore American carried a story quoting a scientist of Cranbrook Institute of Science that the world's population is outgrowing its food supply and that the problem has less likelihood of being solved than does the solution of the problem of the atom bomb. And still another scientist reports that the average American, the best fed individual on the globe, consumes 172,000 calories per day--yet only 3000 of these go for food and 169,000 for the energies proportionately needed for his general livelihood in providing the necessities of clothing, housing, and transportation. Yet, he points out, the energy falling from the sun on about 400 square feet of land, would be sufficient to supply all of one individual's requirements were that solar energy harnessed and harvested.

Yet our present know-how of harvesting that energy crop in the form of agricultural products is limited by the other ravishing forces of nature such as fungus diseases, parasites, insects, rodents, and weather that the total seems almost astronomical when reviewed in total. Dr. R. H. Wellman of Carbide, in a very comprehensive review of the possibilities of new agricultural chemicals, recently estimated that the annual loss due to ten important fungus plant diseases alone averages close to a half billion dollars a year; the annual farm damages by rodents in excess of half a billion dollars per year; and the cultivation expense for weed control alone in some states such as California is rated as costing as much as 8 percent of the value of the crop. Several weeks ago the New York Sun carried a story wherein the 1948 crop losses

due to insects, parasites, and fungus diseases were set out as 4 billion dollars.

When one reviews what the biological chemist, the agricultural chemist, and the industrial chemist are doing to offset these hazards it is almost unbelievable.

These chemists are moving so rapidly with so many new discoveries that almost literally the farm of tomorrow is almost in the category of a food production plant, controlled by chemicals.

Ten years ago the weapons for fighting these various agricultural food production hazards amounted to half dozen or so proprietary items revolving chiefly about various combinations of lime, copper, sulfur, and arsenic.

Today over fifty organic chemicals are being made available, ranging from the highly publicized DDT and 2-4-D compounds to new materials freshly tested from experimental plots, and these are opening vast possibilities for getting this food and solar energy loss under control, and are opening up vast new industrial possibilities for new chemical plants for their manufacture.

That these agricultural chemicals spell big business for tomorrow is evident from the fact that last year 120,000,000 pounds of fungicides were used on two plant diseases alone, apple scab and potato blight.

Another line of investigation finds the chemist doing something about weather. A variety of chemicals, some of them derivatives of the same chemicals used for pest control, show promise in retarding bud developing when late frost periods threaten; others show promise in hurrying the ripening of fruit to beat an early frost. For the mechanized farm of tomorrow the chemist has ready

a variety of defoliating chemicals designed to accommodate such crops as cotton, tomatoes, and soybeans for mechanical pickers.

To round out his program the chemist has not neglected the other angle of improved farming by chemicals. A new wrinkle which looks like business for tomorrow involves rebuilding the nutrient value of the soil itself by injection of gaseous ammonia directly to the soil. The ammonia as a liquid with a vapor pressure of 197 pounds per square inch at 100°F., is fed to the soil from a pressure tank on a tractor. Hollow applicators reach into the soil some 6 inches or more to release the ammonia as a gas. In 1947 over 200,000 acres in the Mississippi Delta country were treated experimentally and estimates as high as a million acres are forecast for 1948. Something like two thousand machines are reported as having been constructed for use in this special application.

Another form of chemical fertilizer of tomorrow receiving study and experiment is Uraform, a Department of Agriculture development, designed to supply nitrogen by slow release to the plant throughout the growing season. A solid, only slowly soluble in water, Uraform is a combination chemical made from urea and formaldehyde, and not too far removed chemically from many of the common plastics.

The chemicals of tomorrow range far beyond the food field as outlined in this discussion. I have more or less concentrated on this phase because of its general interest and importance and the fact that we are essentially agricultural in our state and that all of these chemicals can be made from our mineral resources within the state.

In the field of construction the chemist has a variety of new developments that look promising for the products of tomorrow.

Several weeks ago the New York Herald & Tribune carried the story of a 30 story building completed in Dallas where a new chemical plaster permitted a savings of $235,000 in construction costs. The new material consisting of vermiculite, a mica-like mineral, combined with cement permitted development of a structure normally weighing 42;000;000 pounds to be completed with a weight of 11,000,000 pounds.

Another development of interest is the use of specially developed chemicals for use with cement which widely broaden the serviceability of this material in highway construction. One of the chemicals serves as a dispersant to give ideal mixture of the water and cement, the second entrains air to give a uniform porosity which avoids the weather damage of winter ice and snow, and the third applied as a spray after the finish is troweled out, holds the water content of the mixture until a full set occurs, and avoids the necessity of steady wetting, or covering with wetted burlap during the setup period.

The ever growing plastics business is really big business now. In 1948 consumption was one billion 600 million pounds--about 10 pounds of plastic for every individual in the country.

As one reviewer pointed out, a large part of this volume was in the gadget or toy or similar field. Now the plastic business is turning its attention to the more stable outlets which promise even larger and more durable markets.

News reports tell of General American Transportation Corporation, the large tank car builder displaying the first plastic chair produced from steel molds and the first of a line of proposed mass scale furniture from plastics.

Another old line plastics company reports setting up a special division to introduce new develop-

ments in the field of architectural and structural materials.

The entire field of household equipment is seemingly opening up for the newer, tougher, and structural type plastics. One item, the household refrigerator, is a homely example. In 1939 the average refrigerator used in its construction an average of 1 pound 6 ounces of plastics; the new models use 16 pounds 8 ounces.

The field of synthetic detergents is another line for new chemicals entering into new mass markets and introducing new and interesting usages.

During 1948 over 600,000,000 pounds of synthetic detergents will be marketed in this country. Experiments tried in some of the eastern cities with some of these detergents indicate that some of the newer detergents available at reasonable prices are effective agents in scrubbing the oil slicks and grease from the city streets and heavily travelled thoroughfares. As little as 5 pounds will clean an area of a square mile. It is not unreasonable to expect that the city street flushing procedure of tomorrow will really become a thorough job of cleaning and elimination of skidding hazards.

Some of these new detergents are remarkably effective sterilizing agents. One group studying the effect of the use of these materials in a large dairy found remarkable results. Butter is apparently rated on a scoring system wherein 93 is a score for high quality butter. Normally only about 35 percent of the production averaged 93 score. When synthetic detergents were included as part of the regular cleaning routine the average of 93 score butter was increased to 65 percent.

Another development of more than passing interest about which we will hear more tomorrow is sodium glutumate. Already labelled as the "third

shaker", many dieticians predict that we will shortly have this chemical on our dining tables as ready for reach as salt and pepper. Sodium glutumate, derived from the gluten of corn and wheat, apparently is the basic influence in effecting the palatability of most foods. This chemical reportedly enhances the appeal of all cooked vegetables and retards the sharpness of such raw vegetables as onions. The chemical now sells for about a dollar a pound, but only small quantities are ordinarily needed, concentrations as low as five hundredths of a percent being effective on many foods. Already five plants are in production of this chemical and we are sure to hear a lot more about it.

The New York Journal of Commerce recently listed chemicals as a 12 billion dollar industry and the fastest growing industry in the country today.

Throughout Oklahoma are various industrial chemical developments which are already at work on some of these chemicals of tomorrow--Ozark-Mahoning at Tulsa in the field of fluorine-phosphorus compounds; Dowell at Tulsa in the field of plastics for oil field uses and similar developments with Halliburton at Duncan.

All of the raw materials are here in Oklahoma for these new products. We have excellent universities developing our youth into technical workers who can man the plants. We have sincere and hard-working groups such as our Oklahoma Geological Survey Group constantly locating new supplies of the many raw materials, and we are developing a steadily increasing interest on the part of business as reflected in the work of the trade groups who participate in the state industrial tours. It would seem we may well expect our share in the exploitation of these products of tomorrow.

"GLASS IN THE INDIAN COUNTRY"

(Exerpts from an article from the February, 1949, issue of THE GLASS INDUSTRY, by Marcel Lefebvre)

"I'd rather be a wild uncivilized Indian than a glassworker."

This is the introductory quotation to an article by Marcel Lefebvre entitled "Glass in the Indian Country", which appeared in the February, 1949, issue of The Glass Industry. Scene was a glass factory at Coffeyville, Kansas, in 1902.

One of the themes of the article, in addition to historical references to early incidents in the industry, has to do with the importance of fuel and raw materials in the location of the glass industry. Some of the incidents are mentioned which deal with control of forests for fuel during the early stages of the glass industry in the Atlantic states. "Fuel was all important for survival, at any cost." The industry mushroomed in New York and Pennsylvania, and later, in Indiana, following the commercial development of natural gas fields.

The importance of natural gas to the glass industry is indicated in the following quotations:

"The Great Western Glass Company did not locate in Oklahoma (Indian Territory) merely to amuse the Indians. They chose the Bartlesville site immediately following the opening of the first oil and gas field south of the Kansas state line.

"In searching state libraries, historical records and old newspaper files for names, dates, locations and hundreds of other data necessary for an historic text on glass, the most successful trails to follow are two of four letters--F-U-E-L and S-A-N-D."

The importance of geology to the glass industry, and by inference the importance of state geological surveys to the development of all industries dependent on mineral fuels, ground water supplies, and mineral raw materials, is recognized:

"To fully appreciate the steady westward march of the glass industry, its growth and spread from the Atlantic states through the midwest and southward, a study of geologists' reports on natural gas and oil discoveries across the nation is necessary and very interesting. Glass has followed gas like the tail follows a dog."

The following paragraphs reveal something of the development of the glass industry in Oklahoma, and the important part played by geological investigations:

"The history of glass manufacturing in Oklahoma is closely related to the successive changes which took place in early gas fields throughout the eastern United States which directly affected the glass plants in those states."

"During the short period of three years, from 1902 to 1905, nineteen glass factories were established in Kansas and one in Bartlesville, just across the line in Indian Territory."

"In Oklahoma, by 1913, Bartlesville had 1 plant; Okmulgee, 2; Tulsa, 2; Avant, 1; six factories amidst abundant gas supplies but far from sand. The infant industry faced the same fate that had overtaken their neighbors in Kansas. Like a true and faithful guardian, geology came to the rescue."

"'To follow glass history, one must become acquainted with geologists.' Geologists have probably contributed more towards successful world competition for glass manufacturing in Oklahoma than has any other science. While the industry had ex-

panded from one plant in 1903 to six in 1913, note that it increased to a high of nineteen plants immediately following the year of Buttram's report." (Oklahoma Geological Survey Bulletin 10, 1913). Most recent contribution is Oklahoma Geological Survey Bulletin 65, by William E. Ham.

"True, some of the increase was due to easy capital available in a new land of inestimable wealth and opportunity. Towns and cities offered free sites and financial aid to industries that would help increase their populations and payrolls. Some of these were short lived, but others managed to struggle through the growing pains of modernization and, finally, complete mechanizing. One of the worst depressions to ever hit the industry was survived too, but only because the geological survey had made possible a source of supply for the most essential raw material, sand, within economical hauling distances. That, more than anything else, gave the Oklahoma manufacturers a more equal stand in a highly competitive market."

And, to picture the change in the lot of the glass worker since 1902, Lefevbre concludes:

"It would indeed be interesting to conduct the Old Chief through Oklahoma's fourteen glass plants. He would probably shake his head to clear it of the speed and hubbub just experienced before offering any comment, but it certainly is safe to assume that this stalwart son of nature would hesitate before repeating his previous opinion of the first glassworkers he had seen years ago when they had reminded him of a group of condemned men working in hell and beating a weary trail home after a hard day's work."

"No, it isn't using too much imagination to believe that the Old Chief would change his remark to, "I'd rather be a glassworker than an uncivilized Indian."