CHEMISTRY

Hydrogen Remakes Petroleum Into More Useful Products

Wonder-Working Hydrogenation Process Produces Ideal Oil At 3,600 Pounds Pressure and 1000 Degrees

HYDROGEN, lightest of the elements, is a wonder-worker in industrial chemistry. The pushing of more hydrogen into substances, called hydrogenation, makes fluid vegetable oils into synthetic hard fats, carbon monoxide into useful methanol or "wood alcohol," coal into lubricating oil and gasoline, and poor lubricating oil into superior lubricant.

The marketing of a synthetic lubricating oil, remade from indifferent crude oil by a process of hydrogenation, by the Standard Oil Company of New Jersey, signals the successful application of hydrogenation to the oil industry in America.

In Germany, the native home of hydrogenation applied to fuels, Leuna synthetic gasoline, made from lignite, has been on the market since 1927. Germany, without oil fields, had the problem of making solid fuel into liquids that could be used in its automobiles. America, flooded with petroleum from too numerous wells, had no such problem, but the Standard Oil Company chemical engineers have put the German tricks of hydrogenation to new uses and added some of their own.

On the Jersey flats at Bayway stands the oil hydrogenation plant, an intricate maze of pipes and towers, capable of changing for the better the characteristics of 3,500 to 5,000 barrels of oil a day. Hydrogen at the rate of two or more million cubic feet a day is made from gaseous by-products of gasoline refineries nearby. This is a new, inexpensive and American way of making hydrogen. The petroleum gas is mixed with steam and passed through tubes filled with a catalyst and heated to 1800 degrees Fahrenheit, producing hydrogen mixed with carbon monoxide. Other steps in the process turn the carbon monoxide plus more steam into more hydrogen and soda-water gas, chemically known as carbon dioxide, which is scrubbed out by a seawater bath.

FRONT COVER ILLUSTRATION

A striking view of the hydrogen plant framed in a maze of overhead piping. Refinery cracking coil gas is treated to obtain the pure hydrogen with which to build up the molecules of heavy oil.

See Front Cover

"Chemical parsons" or catalysts, substances that themselves do not enter into the reaction, boss the chemical changes in the hydrogenation plant. These catalysts are like mysterious minds that direct the chemical changes. How they do it is nearly as unknown as are the workings of the human mind.

"Chemical Parsons" At Work

The catalyst that puts the hydrogen into the oil is a white mixture of chromic and other oxides, looking like unmarked dice and drugstore pills. It does its work in immense reaction chambers, forty-foot alloy steel towers, with seven-inch walls, the world's largest alloy steel forgings. Through them are forced the hydrogen and oil at 3,600 pound pressure and 750 to 1000 degree temperature. The oil molecules have a rebirth under these terrific conditions.

So quiet and automatic is the process that an uninformed visitor standing a few feet from the concrete structure housing hydrogenation units working full tilt might think that the plant was idle.

Hydrogen is highly explosive and dangerous if mixed with only a little air. The extreme temperatures and pressures to which it is subjected increase the hazard, yet so many safeguards are introduced into the process that there has never been an accident in the two years of plant operation.

While lubricating oil is its principal product, the hydrogenation plant at Bayway and its duplicate at Baton Rouge, La., can make solvents for paint, varnish, lacquer, soap and textile industries, safety gasoline for use in aircraft and motorboats, benzol substitute, kerosene and other products.

The conversion of liquid vegetable fats that do not have all the hydrogen they can carry into solid saturated ones is an industry of great importance. The semi-solid vegetable shortenings that substitute for lard so extensively today are made by partially hydrogenating such liquid fats as cottonseed oil. Hydrogenated fats are also extensively used in the manufacture of soap. Dr. Paul Sabatier, French chemist, developed this process of hydrogenation using nickel as a catalyst, and he won the Nobel prize for chemistry in 1912.

Dr. Friedrich Bergius was the pioneer in hydrogenation of coal and petroleum, and the award of the Nobel prize for chemistry in 1931 acknowledged his achievement. The Bergius process was developed by the extensive research organization of the I. G. Farbenindustrie, the German chemical trust, and to Dr. Mathias Pier of that organization is credited the development of the important catalysts that boss the injection of hydrogen into the molecules.

When Dr. Fritz Haber and Dr. Carl Bosch combined hydrogen with nitrogen

PSYCHOLOGY

Finds Children Do Not Prefer Parent of the Opposite Sex

THE FREUDIAN theory that all children tend to prefer the parent of the opposite sex failed of confirmation in a study conducted by Dr. John E. Anderson, of the University of Minnesota, he announced in a report to the Southern Society for Philosophy and Psychology published in the *Psychological Bulletin.*

Dr. Anderson sent questionnaires to the parents of 3,178 children, of whom 1,626 were boys. They revealed that there are no outstanding sex differences at any age level in attachment for parents. About half of both girls and boys have no favorites in the household. Of the others, there is a slight tendency for both boys and girls to prefer the mother; this tendency decreases with age. Jealousy is displayed more often when the mother shows affection to another child than under any other circumstances. Jealousy decreases with age and is somewhat more likely to be present in girls than in boys.

Science News Letter, August 20, 1932