Rubber And The War

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We walk on it, ride on it, wear it, and use it in our pastimes. We make use of it for comfort and safety. We see it everywhere. Much of it that is used is hidden from us under silk, cotton, or steel. This popular product can be made to stretch ten times its length or treated so that it will not stretch at all. It can be spun so fine that it resembles a spider’s web or made so lasting that it will outwear steel. It can be made to withstand hot or cold temperatures, to absorb water or shed it, to hold up under the pressure of the ocean bottom or of the high altitudes where men fly in planes. A publication issued by the Department of Commerce states that it “is one of the most useful substances in the world today. Remove it entirely from our lives and civilization will be plunged into another Dark Age; gone would be modern systems of communication and transportation — the whole branches of the arts and sciences would disappear.”

Since the turn of the century America has become dependent upon rubber, but things are different now — war is being fought all over the world. But war or no war, America still must have rubber. Although the crude rubber supply has been cut off, methods are rapidly being developed today to solve the rubber problem facing the world. The purpose of this paper is to show how World War II has changed the rubber industry from natural to artificial rubber production.

The rubber shortage was not apparent until the conquest by Japan last winter of Malaya and the Netherlands Indies, an action which deprived the United States of the source of 98 per cent of its rubber supply just as it was launching one of the greatest war efforts in history. Ninety-eight per cent of the material vital to the prosecution of modern warfare and necessary for efficient functioning of the nation’s economy was cut off by that little country of the Orient. British Malay furnished the United States with 55 per cent of its crude rubber, while 33 per cent of the valuable product was produced by the Netherlands Indies. Ceylon, French Indo China, other British possessions, Africa, and South America in the past furnished the rest of the rubber supply to the United States. War has shut off our “crude rubber friends.”

The government, however, had accumulated stock rubber piles before Japan’s conquests. On June 25, 1940, an act was approved to authorize the Reconstruction Finance Corporation to create government corporations and make loans for the acquisition and holding of strategic raw materials. On June 28 of the same year the R. F. C. immediately set up the Rubber Reserve Company to accumulate a government-owned stock pile of rubber. Arrangements were made with the International Rubber Regulation Committee to release sufficient additional supplies to enable the Rubber Reserve Company to acquire 150,000 tons of the “Black Gold” by the end of 1940 without disturbing market conditions. In 1940, 1941, and 1942 the rubber purchase program was increased until in the spring of 1942 the national stock pile contained approximately 700,000 tons of rubber.

Although such expansive plans were made for rubber stock pile increment, the program was not as successful as had been anticipated. Deliveries were often cut short.
or not made at all so that at the end of the year, three weeks after Pearl Harbor was attacked, the rubber stockpile was more than 150,000 tons below the anticipated total. The stockpile, though far from sufficient, was the largest rubber reserve ever accumulated anywhere. It is being called upon, however, to supply indefinitely the military demands and the civilian needs of the United States in addition to a share of the rubber supply demand among members of the United Nations and among South American countries.

Rubber, indeed, plays a vital part in the world today. Although the rubber shortage is critical, the industry must meet new national demands. The mechanized army as we know it today did not exist in 1914 when men went to battle on foot or horseback. The modern army speeds along on wheels equipped with tires, on padded endless tracks, and its aviators take off from the ground and land again on pneumatic-tire wheels. Much rubber is being used for America's national defense program. Since army trucks have from four to ten rubber-tired wheels and carry one or two spares, it may take as much as 1,000 pounds of rubber to equip an army vehicle with tires. A new kind of scout car is being manufactured in large quantities which calls for mud-and-snow tires and for tracks of springy rubber blocks. Tanks with rubber tracks are being built. Airplanes constructed for the defense program are requiring vast amounts of rubber also. Approximately 400 rubber parts are used in ordinary airplane construction. De-icers, essential devices for the safety of planes which fly at freezing altitudes, are strips of rubber riveted to each wing tip. A new type of airplane fuel tank made of rubber has been devised which seals up punctures immediately. The defense program calls for collapsible boats for landing attack troops, for small rubber bags to hold high explosive powder inside large shells, and for waterproof garments to protect the Army and Navy men. How much rubber will America need to keep her fighters supplied? The government has estimated that 800,000 tons of rubber will be needed for defense purposes alone. Where will it all come from?

Synthetic rubber may be the solution to the shortage problem of this once billion-dollar business. In recent years the very meaning of the term "synthetic rubber" has changed with the change in viewpoint of the manufacture of this product. Thirty years ago synthetic meant a natural rubber. Such material, however, has not been produced. The term synthetic is now understood by most people to be a synthetic material possessing the approximate physical properties of natural rubber, according to a definition by Lawrence Wood in an article entitled "Synthetic Rubbers: A Review of Their Compositions, Properties, and Uses."

To keep up to date with this trend the term synthetic as used in this paper will mean merely an artificial substance which has physical properties resembling those of natural rubber; that is, it can be stretched to an elongation of at least 300 per cent and will quickly and forcibly retract to its original dimensions when released.

Synthetic rubber discovered years ago but only recently developed will in its three main forms replace the manufacture of natural rubber for the duration. Rubber was first discovered by Sir William Tilden in 1832 when he produced isoprene, the rubber molecule, not from rubber but from turpentine. Tilden found that the liquid, isoprene, when exposed to the sunlight for six months, turned into a solid mass having the same physical properties as rubber. In years of experimentation it was found that other hydrocarbons similar to isoprene, notably a gas called butadiene,
could be used to produce rubber-like substances. In 1922 Dr. J. C. Patrick, an American chemist, produced Thiokol, a substance which had the properties of rubber but was composed of completely different chemicals.

Synthetic rubber has been the dream of many during the past century, but only in about the last decade has it achieved any commercial success. Millions of dollars have been spent by chemists throughout the world to try to make synthetic rubber. They have not succeeded in making a product identical with that obtained from the Hevea tree, but they have evidently done better.

The expansion of the synthetic rubber program in the United States during the war is concerned with three forms of the artificial rubber, Neoprene, Buna rubber, and Butyl rubber. Neoprene, possessing special resistance power and designed to serve as an all-purpose rubber, was developed by Du Pont chemists. Using four raw materials, limestone, coal, salt, and water, chemists are now making "homemade rubber" known as Neoprene which looks like rubber, acts like rubber, and can be used in practically all articles for which rubber is now used. To make Neoprene coal and limestone are heated together in an electric furnace and result in the production of calcium carbide which on the addition of water makes acetylene gas. Carbide, as some of the older folks will recall, was used for headlights on bicycles and automobiles some years ago. Acetylene plus a material known to the chemist as a catalyst gives another gas which is called monovinylacetylene. The latter plus hydrochloric acid which is made from salt produces a liquid called chloroprene. The union of chloroprene molecules results in the new rubber-like Neoprene.

Although elastic and tough like rubber, Neoprene is chemically different. Because of this difference it does not fear rubber's enemies, gasoline, oils, chemicals, oxygen, sunlight, or heat. This artificial rubber is not a rubber substitute, but it is used for a variety of purposes for which rubber is not well suited. Although Neoprene costs more per pound than rubber, certain articles made from it are actually cheaper than corresponding rubber articles because of their longer life under severe service conditions.

A second type of synthetic rubber is known as Buna rubber made in the 1930's by Germany. Buna rubber rights are now held here by the Standard Oil Company. This vital synthetic product is produced by uniting through heat, pressure, and catalysts, two chemicals, butadiene and styrene which is derived from petroleum or coal tar. It is a specialty rubber with properties similar to those of Thiokol and Neoprene. Buna—S, one of the various forms of the Bunas product, is the principal synthetic rubber found practical for tires and tubes. Butadiene can be made by various processes from various materials. The principal sources, however, are petroleum and alcohol. It has been generally acknowledged that Buna-S can be more economically produced from petroleum than from alcohol. It is estimated that Buna-S produced from petroleum will cost 30 cents a pound and may eventually drop to 10 or 15 cents a pound.

Standard Oil Company in 1940 announced its own development of a third synthetic rubber called Butyl, made principally from isobutylene, an oil refinery byproduct gas, and mixed with small quantities of butadiene. Although both Neoprene and Butyl are intended for specialty purposes, Butyl can be used for tires. It is a superior synthetic rubber except that it is not oil-resistant. Tires from this third type of synthetic rubber have been considered by rubber companies
as good for about one-half the mileage of natural rubber tires and at speeds of only 40 miles an hour or less.

The American market for synthetic rubbers with all their valuable uses has, therefore, grown from about 2,500 tons in 1939 to 9,000 tons in 1941. On the other hand, operations are being limited to experimental work concerning synthetic rubber, and no large-scale commercial production is under way. Before the United States ever became involved in the war recommendations were made for an increased building program for production of synthetic rubber. In 1940 the National Defense Advisory Commission appointed a rubber committee which recommended that plants be constructed and produce at least 100,000 tons of synthetic rubber. In March, 1941, the Reconstruction Finance Corporation voted on the construction of four plants, one by each of the four large tire companies of this country. Later the capacity of the four plants was increased to 10,000 tons. The fourth plant did not get under construction until two months after the attack on Pearl Harbor. After the United States entered the war the capacity of the four original plants was again increased to 30,000 tons each. Then as Japan advanced over the rubber-producing areas of the Far East the program was progressively expanded to provide for a total of 800,000 tons of synthetic rubber. Contracts for additional plant construction have been negotiated through the Defense Plant Corporation, while other plants are scheduled to open before the end of the year.

With synthetic rubber production receiving a position of prominence in the industrial world, efforts have been made to alter the rubber program by legislation. The War Production Board announced just a few months ago that butadiene used to make tons of Buna rubber would be processed from alcohol obtained from grain sources. A major reliance was placed on the petroleum process of making rubber rather than the alcoholic process since there was to be a supposed shortage of alcohol. Measures to assure rubber for retreading tires are under consideration now. A group before the Banking and Currency Committee recommended that rubber be assured for retreading 30,000,000 tires annually for three years in order to keep passenger cars in operation. Various measures on the rubber program are either in the making at the present time or are waiting for consideration by government boards and committees.

Thus the billion-dollar business of making crude rubber may keep its billion-dollar status even if synthetic production replaces the original form of rubber manufacture of the world. Synthetic rubber has seen an increase in the quantity produced, the number of varieties available, and the number of applications within the last ten years. The synthetic rubber production in the post-war period has been predicted to exceed the manufacture of natural rubber. Authorities say that prices for production of the artificial rubber will be even below those for crude rubber manufacture and that consequently natural rubber will no longer be able to compete with synthetic rubber in the American market. Vice President Henry Wallace in an article in the New York Times Magazine, July 12, 1942, called attention to the fact that to prevent building of “vested interests which, after the war, would be sitting on the doorstep of Congress clamoring for a tariff,” there had been included in all synthetic rubber contracts a clause giving the government the right to acquire the plants at the close of the war.

What about the future of the rubber industry? The buying public that purchases rubber erasers, raincoats, rubbers, and tires may be little concerned about the
problems of the rubber industry as long as their physical comfort is not impaired. Producers of rubber, however, may see the once "black gold" turn almost overnight to "homemade" or synthetic rubber products.

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Winter Evening

DONALD RIDER

As the year evolves, nature contemplates, nature broods, nature rants, and nature breathes the warm glow of spring. She may brood the noisy thunderstorm of summer, rant the early autumn squalls, and whisper with zephyrs the heralding of spring, but tonight she contemplates. Tonight she contemplates and her utter silence pervades the hunter's cabin.

The hound lies by the fire gazing steadily into the dancing flames. No emotion is shown, no movement of the muscles is perceptible. What passes through his mind if animals have no reason? Does he think of the past chases, dwell upon his comfort, or contemplate the future? Or is his mind blank, sensing only contentment, warmth, and light? Or is he listening, listening to something imperceptible to human beings, unreal, unexplainable?

The master reclines in his favorite chair facing the sputtering logs. Slowly he raises his old briar, draws easily, deliberately, exhaling the blue smoke in idle curls. His eyes move from the fire and rest upon his faithful hound. He watches long and with patient interest, vaguely attempting to penetrate the other's thoughts. He strives in vain. Silence, the great gap between man and beast, cannot be penetrated.