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THE ARMY INDUSTRIAL COLLEGE
Washington, D. C.

Course 1939-1940

THE RUBBER INDUSTRY
by
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Gentlemen.

It is rather an unusual position to be in. It's entirely a new experience for me and I am sure it's going to be for you. I hope your patience will acquire some of the elasticity that is attributed to rubber. I see one or two friendly enemies - Captain Heiss, Commander Shaffer - always in the background but with their weapons ready.

It would be perhaps helpful in considering the rubber manufacturing industry to talk for a few minutes regarding crude rubber. I doubt if there is a single important industry in these United States that pays so much attention to its principal raw material, or one in which this raw material has a stronger influence in the daily operation of the industry, in the fabrication of the products that they turn out, than is the case with rubber.

The discovery of rubber has been credited to our friend Christopher Columbus. That is some time ago. He returned to his sponsors after one of his trips to the Americas with a substance that was taken from a tree and the nature of the substance and his description of the tree led to the application of the name "weeping tree" because of this liquid coming from the bark of the tree. Somewhat later - and the years mean very little in that period - the coagulated rubber was presumably picked up by Spaniards in the West Indies and taken back to Europe and at a later date pieces of this rubber were received and examined very carefully and it was discovered that in applying it to various materials that it would remove dirt and hence the name rubber. By rubbing this material on cloth or paper marks were removed and we gained the term rubber. Prior to approximately 1840 - for some thirty or forty years prior to that period - various attempts were made to use crude rubber. It was applied to cloth as a means of waterproofing, to certain types of footwear and many similar things. It was not particularly successful for the reason that it is affected greatly by heat or cold. In the warm weather it would become very soft and sticky and very uncomfortable thereby, particularly when applied to clothing and footwear, and in the cold weather it would stiffen up, become very brittle, break, and render any form of waterproofing quite ineffectual. In approximately 1839 Charles Goodyear, a Connecticut Yankee who had been struggling with this material for years, discovered that the application of sulphur under heat would control the plasticity of the material, in other words, make it impervious to heat or cold. It has been stated in connection with various historical sketches of Charles Goodyear that this discovery was quite accidental. The best information available in the industry does not bear out that statement. It is believed that Goodyear for some time before he actually achieved that objective was satisfied that sulphur and heat combined might bring about the control

of the hardness or softness of rubber and thus make it applicable to a wide variety of uses. I think it reasonable to accept the belief that Goodyear first knew what he wanted to achieve, second, as time went on had more than just an inkling of what would happen if he could put these articles together in the right proportions and he finally succeeded. At the time of his experimental work an Englishman, Hancock, also had similar ideas. He was quite a different chap from Goodyear - a businessman with some scientific training and perhaps earlier than Goodyear recognized the importance of heat with respect to the treatment of rubber. He tried sulphur not as an ingredient but as a catalyst but had been unable to produce any results. So that following Goodyear's completion of his research work, with the result that the control of the material was found, Hancock in England organized companies and produced quite a wide variety of rubber goods, particularly those concerned with waterproofing and protection from all of the elements.

Now in the years from 1840 up to 1875 and 1876 the use of rubber was largely confined first to all forms of waterproofing for the human being and in other respects where waterproofing was desired, and the development of what we call mechanical goods began in that period various types of hose for conveying liquids, crude forms of belt, particularly where moisture was present at all times, and very crude types of moldoo goods where a certain ease of cushioning was desirable. During all that period the rubber that we used in fabrication was obtained from South American countries, largely Brazil. As most of it came through the area or city of Para it was known as Para rubber. The method of obtaining that rubber was also quite primitive. It consisted of traders back from the coast to the interior some 1200 miles following the rivers, of course, loaded with such things as could be exchanged with the natives for rubber and similar products of the jungle. I presume the natives liked fancy beads and brightly colored cloths, some forms of cables, maybe a little whiskey - I don't know. It would be a rare thing there were any Yankees connected with the trading process. In any event obtaining rubber was a long operation and because it passed through the hands of several traders into the large traders' hands at the sea port crude rubber was very expensive, very expensive indeed, which limited to a great extent the research work of that period and its use in many products.

About 1876 an Englishman, Henry Wickham, succeeded in taking from Brazil some of the better seedlings of the rubber tree, acting on the belief that the climatic conditions were much the same in some of the English colonies as in the rubber-growing areas of Brazil and that rubber might prove to be the means of building up in those colonies a very large and profitable tropical agricultural venture. The first seeds were taken to London and planted in the Royal Gardens, which, undoubtedly, many of you have seen as they

are in existence at the present time, but they were not particularly successful and Wickham made another attempt to bring the seedlings from Brazil. That attempt was frustrated at first by the Brazilian government who believed that the seedlings belonged to Brazil and had unusual value and did not propose to see the English get away with another steal as they put it. However, Wickham finally smuggled these seedlings out. They were again tried with better success and over a long period of time he persuaded the British government of that time to try them in the East, particularly in the Malayan Peninsula. It was almost immediately successful in so far as concerned the tree growing to the age where the bark yielded the latex or milk in the tree. However, for a number of years the production was not sufficiently great to provide any serious competition or menace to the wild rubber gathering of the Brazilian areas. In the early 1890's the bicycle tire appeared in large quantities, particularly the pneumatic tire, which greatly increased the use of the bicycle, particularly the safety type. I presume there are only a few of us here who remember the old high bike, probably I'm the only man here who'd confess to a recollection of it. But I do and the advent of the safety bike was most epochal indeed and gave great impetus to the use of rubber and to the growth of rubber manufacturing plants.

Also in the '90's with the advent of the pneumatic tire the horseless carriage began to take very definite shape and become something other than a dream and the pneumatic tire was manufactured for the purpose of equipping the so-called horseless carriage. Neither the horseless carriage nor the pneumatic tire of that period could be called a great success. It certainly was an improvement. It was an advance but gave a great deal of trouble. As a matter of fact, it produced the motor vehicle of that day with the "get out and get under" songs and other jokes characteristic of the period which provided our nation with a great deal of amusement. However, in the early 1900's the research work with respect to the development of the car and the rubber used in the car made a great deal of progress and the rubber growing industry in the middle East likewise was growing in leaps and bounds until it became a serious competitor of Brazil. The lack of knowledge regarding rubber culture and the coagulation of the latex after it came from the tree, the necessity of keeping it free from foreign matter, was then little realized so that the rubber that reached the manufacturing areas of England and the United States was looked upon as of a very poor quality -- in fact, the quality was not very uniform and consequently it had a bad name in comparison with the so-called fine Para. But as time went on the quality of the rubber improved and it was produced in such quantities and at such a cost that it became equally desirable to the Brazilian type, and as we got into the period before the World War became the predominant factor in crude rubber supply. During the World War it came really into its own. I think that our office has given you some data having attached a sheet, a statistical sheet, showing the growth and consumption of rubber and that is placed before you in order that you may realize the rapidity of that growth.

Following the dominance of rubber production in the middle East we find the automobile becoming a more important factor in the nation's transportation facilities and this was largely made possible by the use of rubber, and concurrently with the development of the pneumatic tire in transportation which in turn promoted tremendously increasing production of crude rubber, the price became lower and thus permitted of greatly increased research and development work and brought in a great number of new uses in all lines. Not only in tires but the quality of footwear turned out was greatly improved; in mechanical goods we found new uses, particularly articles going into other industries. The transportation of materials over long conveyor belts made of cotton and rubber began to constitute a large industry in itself. I might illustrate that by saying that in that period I think one of the first large installation of conveyor belts was at the Frick Coke Company not far from Pittsburgh and they placed a five million dollar installation of conveyor belt about an inch and a quarter in thickness with a three-eighths rubber covering on front and back, six feet in width, covering a distance of about five miles in which hot coke was carried from the oven where it had been done before first with the donkey and the little cart on rails, later with the small locomotive and the small cars and then the conveyor belt came in and replaced the donkey and the locomotive.

We have arrived at the point where the automobile is growing very fast. The use of rubber in all forms of transportation is greatly augmented by the low cost, and research and development work. Then we encountered the world war and of course manufacturing was much restricted as well as the supply of the crude material. One of the first things that we encountered in connection with the World War was the dictum by the English Government that we could not have rubber. Not because of any particularly unfriendly feeling against America but because they didn't want their enemies to have rubber. We finally persuaded them that we could do a great deal of good with rubber - might even help them. They consented to a placing of responsibility for the rubber which largely rested in the industry under the most normal supervision of the British Embassy and later on our own War Industries Board, which allocated all of the rubber received from the East to the manufacturers according to their productive capacity as we measured it. Likewise manufacturing facilities were regulated in the same manner and the quantity of goods that could be turned out and sold was controlled. I speak of that in passing because I'm quite sure that somewhere in Washington in the sacred archives there can be found today a fully developed plan for controlling our industries, as well as other industries, with respect to the amount of production and the use of production and who is going to have it.

Following the war we experienced what might be called a boom. The automobile industry ran into a boom period with great improvements. The rubber industry did likewise and many other industries --

the shelves of commerce had become quite bare during the period when all productive facilities were devoted to war materials and consequently in the attempt to fill them our business boomed. Also it is recorded somewhere that the stock market did likewise and everybody became rich but many of us couldn't stand prosperity. Approximately 1920 when the first evidence of adjustment toward equilibrium was made evident the English perceived the disaster coming to them because of the rapid production of crude rubber much faster than the manufacturing industry in any part of the civilized world could absorb that material. Consequently they developed a scheme of regulation known as the Stevenson Scheme because Lord Stevenson headed the particular government department which supervised the operation of the scheme. Roughly, the scheme consisted of a form of regulation whereby rubber was released dependent on a certain price being reached. If that price was not reached in any particular quarter the rubber was not forthcoming. One of the difficulties of the scheme was this - that the speculative fraternity took very good care whenever possible that the price did not reach a certain level and therefore the rubber was not forthcoming which gave them a beautiful opportunity to bring about a very high price for a short period. They were careful to take it down again before the next quarterly period when a higher release could come. The scheme was applicable only to British areas and in the meantime the Dutch in Java and Sumatra were working day and night to promote rubber culture and without restriction they undoubtedly profited greatly from the high prices of that time which was very helpful to their development, and ultimately that condition was one of the most influential factors in breaking the scheme. So that in approximately 1928 the Stevenson scheme was abandoned and its effect might be visualized to some extent when I say that a few days after the abandonment of the scheme the price dropped from 70 cents a pound to about 40 cents a pound. You can imagine what happened to the manufacturing industry holding the bag with raw material at that price.

Following 1928 for the next two years the rubber industry ran along at a rather normal rate with reasonable success but was gradually drawn into the vortex of the depression like all other industry with the result that the English and Dutch in concert began to think about restriction of this material, while they were thinking about it it became such a drug on the market that rubber was sold in Singapore, London, and New York at approximately three and three-quarters cents a pound, the production cost of that period being around eight or nine pence, say seventeen and a half to eighteen cents a pound. So you can see that rubber selling at three and three-quarters cents to the primary consumer with a cost of eighteen to nineteen cents was not a very profitable venture. As the result of this the Dutch and English finally evolved the present regulation scheme which was predicated on an entirely different basis from the old one but keeping before them nevertheless the objective of a reasonable return on their investment.

The present scheme consists of an assessment on the reasonable production capacity of approximately eight and a half million acres. The production is divided approximately equally between the English and the Dutch colonies in the East. From this standard assessment a basic quota is established by this International Rubber Regulations Committee which in its constitution is a sovereign body representing the governments who are signatories to this agreement. The committee is given the power by these governments to at any time fix the quota, the percentage of this basic quota that may be produced and exported and briefly that is the entire operation of the scheme. It appears to be very simple and on paper it is, but extraordinarily difficult to follow in adjusting the quotas to the consumption requirements and to the market trends that follow those requirements. However, it also learned a lesson from the old scheme in that the primary consumers are permitted to have a voice in the operation of the scheme. The committee has an advisory panel. The advisory panel consists of representatives nominated through the various governments of the world where rubber is used. They have no vote in the committee but they have an opportunity in the committee meetings to tell the committee of the needs of the various areas which they represent. We believe that the existence of that panel and the work of the members has been very helpful to the welfare of the manufacturing industries.

It is doubtful if we can lay too much stress on the relation of crude rubber and its control to the operation of the rubber manufacturing industry. In order to do that I might say a few words regarding the very close attention that is paid to the cost of rubber. In fact, it is something that is watched every day for the reason that in our industry it has become the custom to sell a great many of our products on a forward basis. In other words, the automobile manufacturer wants in many instances a price for the entire model year. To illustrate that, the 1940 model is placed in the hands of the dealer in October of 1939. The planning for that car began last June; basic planning is going on all the time, but the specific plans for the 1940 model began last June. Last July the automobile manufacturer began to feel around to ascertain how cheaply he might buy tires and even though he is a good customer we have to admit that he takes us by the heels and shakes us down whenever he can, which is usually once a year. We are compelled, for competitive reasons and in order that the car manufacturer may establish a price to the public which he is reluctant to change throughout the life of that car year, to name our price. We must know something about the cost. Therefore, all of the suppliers are called upon to name a price -- in effect, a guaranteed price. The car manufacturer makes no guarantee to buy any quantity of goods; in fact, so far as the car manufacturer is concerned, he makes no firm contract at all, but the tire manufacturers do make a contract to supply the car manufacturer with tires for a stated period at a given price. If we have not made a reasonable estimate of the trend of rubber costs, production and cost, then it's a little unfortunate for the fellows who have

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the responsibility of operating the companies and even more unfortunate for the stockholder. That same process is followed with respect to many of our major products. We sell our footwear products six months ahead of the season. Obviously we can't sell it without a price and that price must be maintained and we must convince the large buyers and jobbers and they in turn the retailers who must stock these goods for long periods ahead of the season that that represents a reasonable price and thereby he will not suffer loss. If he does that we may reimburse him which we frequently do. A similar situation prevails in many lines of goods, conveyor belts, transmission belts, various lines of hose which are seasonable, molded goods - and I might say here in passing that the automotive industry takes approximately fifty-five pounds of rubber for each automobile, other than tires, in various forms of molded goods, window channels, various strips between the chassis, and the body, all of the engine mountings, radiator hose, bumper cushions, gaskets of various kinds to the tune of about fifty-five pounds for the average car go into that trade and nearly all of that is put out by so-called mechanical goods manufacturers, although there are many other manufacturers who specialize in supplying that form of production. In that case a price is demanded by the consumer. The mining industry in developing the conveyance of ores, the steel industry in the conveyance of crushed stone and similar materials, demand a price somewhat indirectly in that we produce conveyor belts and also transmission belts that we guarantee either for a period of time or to carry some million tons of materials. There again the price is fixed. I am emphasizing this price situation in order that you may see rather quickly that unless we try to keep on the right side of crude rubber, unless we follow its production, its export, its marketing, and our own inventories of crude rubber, we are lost. Because of this forward nature of our business we have to buy forward in our crude rubber purchases and the average price over a period of course either permits us to take a loss and on rare occasions a profit, if we have been somewhat near the market.

The rubber manufacturing industry has been like many of our very active and large American industries from the time of Charles Goodyear tremendously interested in research and development. Perhaps we like to think that in engineering and chemical research as it affects our industry we are somewhat ahead of these other industries. That may be a rather selfish claim but we still hold to it. As an illustration of what has happened with respect to research, consider first the engineering research regarding pneumatic tires, second the endeavor to find ways and means of hastening the cure of rubber - and I think we might say with reasonable certainty that next in importance to the discovery of vulcanization by Charles Goodyear is the development by a man, George Oenslager, some sixty or seventy years later, of what we call organic accelerators - in other words, the derivatives of aniline

oil that are used as a vehicle to convey the sulphur into the rubber and deposit that sulphur and disappear, in the early days before this discovery white lead was largely used as an inorganic accelerator for cure and that was not successful because the lead required a long time to bring about the cure - hours and in some cases days, according to the product, and even then it was not uniform because we could not prevent the appearance of a great deal of free sulphur on the surface of rubber goods. Some of you may have seen rubber goods with a sort of bloom or white appearance on the outside of a tire or a piece of hose or a belt. That was due to the fact that we were quite unable to use an accelerator, a vehicle for conveying that sulphur that would deposit the entire amount in the rubber and prevent its coming to the surface during the actual curing process. All of that was done by a man, George Oenslager of S. F. Goodrich Company who it is claimed was the first chemist employed in the industry to devote all his time to research and development work. I can't quite substantiate that claim but neither can I prove that it's wrong. And simultaneously with that tremendous advance in which the cure of many rubber articles was reduced from many hours to a matter of minutes under an hour, a similar advance in chemistry was made in its application to rubber in reclaiming the rubber that had previously gone into the construction of rubber articles. When these articles were picked up as scrap we had found a way by chemical treatment of disposing of all the foreign matter such as cotton fabric, all the chemical materials that had entered into the composition and retain the rubber content, not with the same tensile strength, same elongation capacity, but nevertheless very useful, and that brought out reclaimed rubber as we know it today, which is a very valuable ingredient in the manufacture of many rubber articles and one of the most valuable, of course, to the winning of war in the event of our supply being reduced or cut off. In addition to the rubber consumption of approximately 575,000 tons in the United States this year we shall probably use - and these are round figures, say 156,000 tons of reclaimed rubber. That is not an adulterant as many people might think but it is very definitely a valuable ingredient in the manufacture of rubber goods where a somewhat inert substance is required to give weight, to give strength, to provide resistance to abrasive wear and likewise to many other materials with which these articles may come in contact. One might spend hours talking to you about the results of our research and development in improving rubber production but I am sure that, first, I am not competent to bring that to you in comprehensive form, and, next, inasmuch as you are only hitting a few high spots here I'm quite sure you would be a bit tired and impatient.

In dealing with some of the economic phases of rubber manufacturing - it might be well for a moment to refer to the great growth of transportation and the boom effect on the industry

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during the period from 1914 to 1929. There came into being either as a stock promotion or as a serious enterprise some 300 new manufacturing establishments and undoubtedly the majority of them were projected in the belief that here was a bonanza of industry that apparently was going on with rapid growth and tremendous profits and that everybody should get in. Each community with a great deal of local pride had a desire to build up its industrial efforts and promoted a rubber manufacturing plant without any thought as to where the trained personnel might come from to manage that plant or who was going to merchandise the goods or who might be qualified to protect the quality of the goods and keep them comparable with the older establishments, with the result that in the period from about 1923 till the end of 1931 in the tire field particularly, these 300 establishments had boiled down to about 34 or 35, including many small companies that survived that period and the strong competition and therefore proved their ability to operate a business.

Coming down to the present time it seems somewhat foolish for any one from our industry to stand here and endeavor to describe to a group of intelligent men what the industry does today. You all know that there are very nearly 30,000,000 vehicles in transportation in the United States or approximately 70 per cent of all of the motor vehicles of the world. There are nearly a million miles of surfaced roads in these United States which I assume is of some importance to our military establishment. Incidentally, it might be worth while for you if your curriculum permits to go to the Hayflower Hotel some time today. The American Automobile Association are having an annual meeting and I think each state in the union endeavors to give a pictorial portrayal of the highways of 25 years ago and today. I looked as I came out of the dining room at breakfast and in spite of my 21 years in rubber and in highway transportation I was amazed at the improvement that these pictures brought home to me. I do think of rubber and transportation - rubber and the automobile which inspired this improvement in highways or made it necessary. I think it would be very much worth your while to go down there and look that over from the standpoint of what has been done with highways.

Again referring to the present time we might quote a few statistics and if there aren't any machine gun threats here against statistical facts, I'll make it very brief, if you'll hold your fire.

The annual value of all production of the industry at the present time is about 650 million dollars. Of course, the prices are very low.

We estimate about 32,000 different rubber products.

There are about 480 plants using rubber of which there are about 150 that we call rubber manufacturing plants because the majority of their products are generally known as rubber products. The others manufacture other articles and such rubber products as they have are incidental to their business.

It is estimated that the invested capital is approximately a billion dollars. In a normal period there are employed about 200,000 people directly in the rubber industry. We are now on a consumption basis of crude rubber of between 560 and 575 thousand tons per annum.

I believe we are rated as the largest industrial consumers of cotton. There are some 25,000 employees in textile mills either our own or mills under contract to us and back of that some 60,000 people in the production of raw cotton.

That statistical situation can be extended on like Tennyson's brook forever but I don't want to be involved and I'm sure you don't.

In the geographical situation of the industry as you probably all know, Akron is the manufacturing center and more than fifty per cent by dollars or tonnage or feet or whatever yardstick you want to use comes out of that area. New England is the original rubber manufacturing district and still is large in other products than tires, although they make some. The Trenton district is the next oldest in rubber, making a variety of mechanical goods, largely all of northern Ohio, including Akron, constitutes the largest district. There is considerable manufacturing in the Chicago area extending into Wisconsin and Iowa. On the Pacific Coast in Los Angeles there are 7 or 8 plants which account for about 10 per cent of the manufacturing industry of the country. There isn't any particular reason - any basic reason - for the location of the industry in those broad geographical areas - it just happened largely because somebody had sufficient courage to invest a little money in those areas. Akron owes its beginning as a rubber manufacturing center to Dr. B. F. Goodrich. Dr. Goodrich's belief in the future of rubber was very, very firm. He was one of the pioneers in promoting the manufacturing and particularly research and development and he arrived at Akron somewhat in this manner. He started from New York City and followed the industrial areas adjacent to the Hudson River. He needed local enthusiasm backed by money to help start the manufacturing plant for producing rubber goods. He received various offers up the Hudson River and up the Mohawk Valley in Buffalo and along the lakes. Finally somebody told him of Akron, then a city of 30 or 40 thousand people with a great variety of industries. He went down there and they offered him a site and four or five enterprising citizens with some regard for the welfare of the community and an equal regard for their own pocketbooks decided to go in with him, I think to the tune of about

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\$5,000 apiece. There were four or five of them and that was the beginning of rubber in Akron and the Goodrich Company today is one of the largest rubber manufacturing concerns in the world producing a variety of products. The heirs of the people who invested the \$5,000 don't work and they live on the proceeds of their forbears' long vision - longer vision than most of the heirs will ever have regarding anything.

If I waste too much of your time, Colonel, don't hesitate to say halt and in the military manner.

There are a few interesting things in conclusion that you might want to hear. I think we are the second highest wage industry in the United States. Our average hourly rate in the principal center is somewhere between \$1.10 and \$1.13 an hour. In the last 11 years the profit for the industry represents less than two and one-half per cent return on net worth compared with the six and six-tenths average return for 1720 corporations representing a cross section of all American business. For the last nine years on which figures are available from the Bureau of Internal Revenue the industry shows a loss of one-half to one per cent on sales.

There are some odds and ends here. I might say that we have been remarkably free from any restraint by reason of patents or processes being secretly held or on a royalty basis so high that no one could use them. Quite to the contrary, whenever any major development has taken place in the industry it has been made available either by an exchange between competitors of different patents or different processes or on a very nominal royalty basis which has been very helpful in the progress of the industry. There is one phase of development that might be rare. At the present time in connection with the production of crude rubber we are confronted with the problem of obtaining and transporting and using latex in liquid form. As our rubber experts, Captain Heiss and Commander Shaffer, can tell you, in our factories our preparation machinery is very heavy, expensive machinery. Our mills for breaking down the rubber into its sheet form and making it more plastic and again for mixing, compounding, vulcanizing ingredients are very heavy indeed. Our calendars for impregnating fabrics and producing rubber in sheet form again are very heavy machines, six foot rolls of two and one-half feet in diameter, 3 rolls in a tremendous frame operated by individual electric drives. Some of these machines cost 80 or 90 thousand dollars each and a long line of that machinery indicates clearly the expense attached to the production of rubber goods. Our engineers have for a great number of years wondered how they could get away from that tremendous capital investment and find a quicker and better way of producing the goods without going through all that torture. We haven't arrived at that point yet but we think we

see our way. One is the bringing of the latex from the tree to the rubber factory. At the present time we expect to very soon be using the dry weight equivalent of 50,000 tons of latex in liquid form. We anticipate within two or three years a hundred thousand tons in addition to the tonnage I had previously given you as our annual consumption. That latex comes to us at a cost that we find a little difficult but nevertheless within the range of our operations, because of a very effective means being found of concentration, or reducing the moisture content, particularly for transportation purposes at the present time. If we take the latex without concentration there is about 70 per cent moisture and pure moisture at \$18 and \$20 a ton from the Far East is a pretty expensive operation. They have found a way through a patented process of bringing that moisture down to about 40 per cent and have pumped the latex into a tank both in the storage point at the shipping ports, again pumping it into a tank on ships, and taking it out of those tanks by pumping it on the Atlantic Seaboard. There are four bulk plants on the Seaboard. Latex can be and is used for a variety of things but the principal use at present and what we believe will be the tremendous use and may in many respects equal the use of crude rubber in our major production, is for cushioning purposes. Today you can find in the better stores the sponge rubber mattress. That is a mattress produced from rubber that is called sponge rubber because it has the appearance of a sponge. It has cushioning qualities of springs and is produced by our process of taking the latex, adding the necessary compounding ingredients, and a chemical ingredient which brings about the same situation as the yeast in the loaf of bread - and I wish they'd go back to it - but it is a tremendous development. We are not only putting it in mattresses but in every Pullman Car - new ones - that you ride in you are sitting on either pure sponge rubber cushioning or sponge rubber laid over springs. Every mattress in a Pullman Car today is sponge rubber. The theaters are going in for sponge rubber cushioning. The automobile industry has started with this 1940 model to use a layer of sponge rubber cushion approximately one and 3/4 inches thick on springs, doing away with the cotton used for making these cushions. If you have a real high-class Government job you can buy a Cadillac with the full sponge rubber cushioning and you will find that very comfortable indeed but it is a tremendous development and we can't at this time even in our own enthusiasm visualize the proportions that it may attain. But it is indicative of the tremendous amount of effort and money - many millions a year - that are going into research and development.

With respect to synthetic rubber which you have undoubtedly heard of, there are 3 synthetic products being produced in this country. They are all proving to be useful. I think perhaps the duPont organization have produced the largest quantity and seem to be making a tremendous effort to bring the price within

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reach of the manufacturers. The price today is somewhere around 65 cents a pound which of course is not quite comparable to crude rubber, at 20 or below. But as the volume of that material grows undoubtedly it can be produced cheaper and as a material which safeguards our production and institutions against the shutting off of the crude supply it is of vital importance, along with reclaimed rubber. It can be very helpful and it will do many things which we have not found possible with respect to processing the natural rubber. It's quite impervious to the action of oils, which are harmless when they come in contact with the products made of the synthetic rubber. The same is true of sun or water and many other things that are very harmful to the product made wholly of the natural rubber. I'm not a chemist and quite without scientific knowledge but from the opinions obtained from the chemists, both of the pure research variety and the more practical group, I'm inclined to believe that ultimately the synthetic rubber and the natural rubber will work along together, probably until the most effective compound is discovered, and thereby will increase greatly the number of products we can make for a wider field in industry and for the individual need.

Colonel, I could stand here in this rather loose manner and talk to you about rubber all day. I think you would have not a sit-down strike but a run-away strike. If I may close at this point I express appreciation of the opportunity of meeting you gentlemen and talking to you, and hope that you find the data submitted and any other which you may wish to ask us for of some use in this quick educational process which you seem to be undergoing.

Thank you.

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Course 1939-1940

Discussion

"The Rubber Industry"

by Mr. A. L. Viles,

President, The Rubber Manufacturers Association, Inc.

November 16, 1939

Colonel Miles: I'm certain we are much obliged to Mr. Viles for this excellent talk. We are also very much obliged to him for the subtle humor which seems to have bubbled out on occasion without any restraint whatsoever. Are there any questions at this time?

Q -- Do you know anything about the situation in Germany with respect to their production? How close does it come to supplying their requirements?

A -- I can't claim to be an authority, but I think I know something about it. Germany for the past two years has been using crude rubber at the rate of about between 80,000 and 90,000 tons per annum. In May of this year I had breakfast in Amsterdam in Holland with Dr. Kearnegie who is the operating head of the Continental Rubber Company, Harover, Germany, being their largest rubber producer. I think approximately fifty per cent of all the rubber goods in Germany are produced by Continental. By the same token they are estimated to be the foremost research and development people. I was very anxious to talk with Kearnegie for the reason that some time prior to that a group of the I. G. people, which is the chemical trust whose production or whose

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processes rather are controlled in this country by the Standard Oil Company who are making many other things than synthetic rubber. They have been over here and approached our principal manufacturers who offered to send us a small shipment of buna for experimental work and they then talked about establishing a plant in Louisiana using petroleum as their base and predicted the production of 60,000 tons per annum within a very short period of time after beginning that operation. It might appear if they could produce 60,000 tons in the United States a short time after establishing a manufacturing plant that they must be producing a very large quantity in Germany. I have always believed and I can't give you any reason for this belief that the developed German mind carries more intelligence and more abysmal stupidity in the same spot than any other human being on earth. I illustrate, because this chap was talking about 60,000 tons and he was talking about tire tread stock made from buna that would run more than a hundred thousand miles, which is very impressive. Some of our technical people present when these assertions were made said, "Well, what have you done with the carcass of the tire?" "Well," he said, "We haven't been able yet to use it in the carcass or attach this tread stock to the carcass so it will stick, but we'll do that, of course. It just comes along in due time " We can make a tread stock out of natural rubber that will go a hundred thousand miles but if you put it on an Army truck most of your soldiers would either desert or kill the officers if they had to ride on it.

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It would be terrible stuff and I have the same idea of buna.

With that exhibition of German stupidity in my mind I was very anxious to talk to Kearnegie because I had an idea that he could come somewhere near the truth. Knowing that he wanted something from me he had to trade. So I laid that before him. He couldn't say anything about his fellow citizens who believe that he said that "if in the year 1939 we turn out in Germany 20,000 tons of buna we'll be doing very well indeed." I consider that authoritative from a man like Kearnegie - 20,000 tons in relation to an approximately 90,000 tons consumption of the natural rubber.

It is well known to us and admitted by some Germans that first the production of buna in one type did not produce an article like tires that was very useful. It was quite helpful in several lines of hose, several lines of mechanical goods like belts, not so good with respect to various types of molded goods, all of the gaskets and things of that type. It doesn't seem to have the qualities of resilience required and when they attempted to make tires the service obtained was very small indeed - 2,000 miles, something of that sort. So that they produced a different type of buna which was not so good with respect to this other line of goods but did improve their tire. The best information I can get is that with the present synthetic that they produce specifically for tire manufacture they obtain about one-third of the service miles or periods of time - whatever yardstick you want to use - that we get from our own commercial tire at a very high expense and it's very difficult to control the compounding process

of cure and to maintain uniformity as has been done by them and of course by ourselves with the natural rubber. So that I don't know; that is a long answer to your question but it seems to me that you should have that background and I don't anticipate any serious inroads on the tropical crude rubber by the synthetic of German production. I don't think that the synthetic produced by the Germans solves their transport or other problems that require rubber by any manner of means in the position they are in.

Q -- In case the sources of raw rubber are cut off are the rubber industry prepared to go ahead and produce it? Will there be a period of shut down and readjustment?

A -- There will be a period of readjustment and some measure of shut down. We have probably the largest supply of scrap rubber in the world. We have the capacity of turning out large quantities of reclaimed rubber which can be used for a great many products; undoubtedly the production of synthetic rubber would increase very rapidly but there would be a hiatus then that would be difficult to bridge. Consequently, I think that the plan of our government to build reserve stocks of that material is a very high purpose and will prove to be very useful indeed.

~~tax and other considerations~~

Q -- In other words, there is enough difference in the processes by which you go from the raw material to the finished product to make necessary readjustment within the plant itself?

A -- That's right.

Q -- Mr. Viles, is it impractical for the rubber industry

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to attain self-sufficiency of the raw material in our own southern areas and if it isn't impractical, why haven't they done it in the United States?

A -- It's certainly impractical for the reason that while many vegetable products will produce or a carbon content can be taken out with somewhat similar content as rubber you'll recall Mr. Edison's experiment with goldenrod, so to speak. He found it somewhat similar in that operation even in a large quantity basis. It would cost us \$2 or \$3 a pound. We^{are}/not able to get enough within the amount of money spent on the thing to carry on a reasonable experimental work. In Mexico and in southern California and along the Texas border they produce a sort of bush looking very much like cactus plants, which has a much higher content of that carbon and we use that regularly and have been for a great many years. We grind it up and bring that carbon content out by a flotation process but again it has a rather high resident content. It can be used without disturbing that resin, without going through the cost of taking it out. We have deresinated it and made a few tires, but the two processes, one of obtaining it in plastic form and the deresinating process have been very expensive, but it can be done in large quantities. But the ~~toxic~~ tree commonly known as the *brasiliensis* will not grow within the boundaries of the United States. But in the West Indies the Goodyear Tire and Rubber Company now are producing rubber in small quantities in Costa Rica. If it's success continues as they now see it

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they propose to increase this acreage. In Panama the same way. There is no prejudice against the Central Americas, certainly no prejudice against South America. We know very definitely what we can do there with the production of rubber. We'd like to do it. You must realize that when the American goes around the world to do things, it lacks for some stability in government and our recent ~~experiences~~ Mexican experiences illustrate that to a certain extent and some of those Central American governments have been known as unstable even with the Brazilian government of today, while the Central or federal government in Rio, though they tell you to the contrary, we hesitate to go into the interior of Brazil with a rubber planting project because we don't know whose going to be the next governor of the state in which this is located and what kind of a chap he is, whether he'll take it away from us gradually or all in one fell blow. I believe that ultimately and I believe the efforts of our present government to bring about closer relations with our South American brothers after a period of years will bear a great deal of fruit in bringing about a stability of government to the south of us and I would say that with stability of government would come a transfer as far as your needs are concerned from the middle east to the area south of the United States; we must have that stability before us before Americans will take the financial risk. I doubt very much if our own government can take enough more money from the few working people left to do it themselves.

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Q — I gather from your discussion of the large buyers asking for guaranteed prices that inventory is a serious problem for the producer. Does this present scheme of control give them more protection than they have had in the past as to their risk involved in carrying inventory of rubber.

A — I think so, because first the production for any year is determined upon sometime ahead of that quarter at a meeting of the International Rubber Committee meeting in London. Yes, and because Captain Heiss and Commander Shaffer have been raising the deuce about the slow buying process for their shops, they raised the quota 80 per cent for the first quarter; that means that is immediately known in the east and the rubber control in Singapore under the local government/^{issue}~~use~~ coupons for the amount of rubber to each plant in relation to his part of the basic quota and he is only permitted under the agreement to carry at any time something like 25 per cent of the standard assessment for a period of time so he cannot carry more than a reasonably safe inventory. The quota indicates clearly to/^{him}~~many~~ the condition of business and enables him to adjust his labor supply and other materials to that quota basis. The Malaysians bring in the ^{Hindustan}~~Indonesians~~ from/^{India}~~Indonesians~~ and the coolie from China under strict governmental supervision by the Indian government as well as the Malayan government and they are reluctant of course to add to their labor forces or of bringing the labor long distances with the measure of responsibility that they would have to take. Likewise, in the Netherlands Indies the Sumatran

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labor is drawn largely from Java and under a strict governmental control. So that they are reluctant - I mean the committee is reluctant as well as the planter They want to, but until they can see that that production may be maintained over a period of time in order not to bring that labor in and within six months ~~has~~ of the quota reduced so that they have to dispose of that labor ~~which~~ which means that broadly speaking they must return that labor to the country of origin free of charge. They offer, however, an incentive - I think in most areas and I'm quite sure in the Dutch area. The natives come in there and spend a period of enlistment, so to speak. They guarantee to stay for three years and if they keep that enlistment period they have them each given a garden of their own and the Dutch local government agricultural stations help them with respect to establishing that garden on a sound basis and they become individual planters. In Sumatra and Java there are 700,000 natives who are individual ^{of} planters on gardens/a hundred acre plot - a variety of acre ge but that is typical. I should say about half of the Netherlan's English production is in the hands of the native. I'm not so sure as to the percentage relationship in Malaya but it's somewhere near that so that inventory as a problem and that is one of the things that regulation is designed to meet and it's supposed to help us. Now the consensus of opinion in our industry is that we don't quite believe in governmental control or any form of control of raw materials but it is with us and we have to live with it and we have to think it has one virtue and that is if

the manufacturing industry and the regulations committee find a common ground for cooperating sincerely they can bring in a measure of stability of supply and stability of price not too far from a reasonable cost that will enable us to plan our business to produce at the price the public can pay for and to carry on research and become a competitor in other fields which we could not do at higher prices and that has been our recent experience up to the first of September. We have had a greater degree of stability at a reasonable price for 18 months than ever before in the history of the industry. Rubber has, I think, been the wild cat commodity of all times for a period of 10 years. The authority for this is Kent of the Royal Economic Society with their journal in London, a published article for a period of 10 years^{states that} in no year did rubber fluctuate less than 95 per cent between the high and the low which is the top for all commodities. That is the minimum. The maximum I'd hate to tell you.

Q -- I'd like to ask Mr. Viles before he closes to say a few words about the difficulties that the rubber industry may expect to encounter in meeting the requirements of the armed services in case of war. Do you have trouble getting raw rubber or labor troubles or will you have to expand? That is a pretty big question at this late hour.

A -- I have taken all sorts of chances so far - why not one more? First it would depend on whom we might have a scrap with. If we have no quarrel with the English and Dutch I wouldn't look for any great difficulty in supply of the crude material. Assuming that to be the situation with respect to labor

and planned expansion, we could/^{not} anticipate a great deal of difficulty in that respect because every day we are finding more mechanical processes; at one time we used to think with respect to tires of one worker to one tire per day and we now think of one worker to 8 tires or something of that sort. As to the capacity - well, that is somewhat of a guess - it would constitute the capacity of any plant or industrial - you'd get a thousand and one answers to that. I would say that we are working today about 75 per cent of our capacity. We are consuming rubber and producing goods in October at the highest rate that the industry ever obtained. I still think that can be expanded and without a great deal of expanding except the addition perhaps of some equipment. But I think that the tempo could be increased, the mechanical ingenuity could be stretched a little more - it should in a rubber plant. I wouldn't anticipate any serious labor difficulties - they are already among the highest paid workers in the country. I would think that our military requirements could be fully met. I think it is the purpose of the industry that without being prodded or being called upon to be patriotic there is sufficiently well founded in the rules of government and national welfare to bring about an answer to your needs without even being asked. I don't anticipate any difficulty.

Colonel Miles: That will be the last question from the class. Are there any guests who wish to ask a question? There seem to be no further questions, Mr. Viles. We certainly want to thank you for the patience and humor and all the good

information you have given us here this morning.

Mr. Viles. If you find that you want any data augmenting this little memorandum that you have, I'll be very glad to send them along for your records.