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CONFIDENTIAL

INDUSTRIAL ALCOHOL.

Address by Mr. H. S. Rubens,
President, U. S. Industrial Alcohol Co.,
before the

Army Industrial College,

December 10, 1924,

INDUSTRIAL ALCOHOL.

Colonel Ferguson:

Gentlemen:

We have today Mr. Rubens who during the war was called upon to make a preliminary survey of the possibilities of obtaining alcohol required in the war program. Mr. Rubens is still interested in the industrial use of alcohol, is chairman of the Board of the United States Industrial Alcohol Company, and also chairman of the board of various combined railroads in Eastern Cuba, and in control of many of the sugar factories, our source of raw material. His experience in the war is from a slightly different point of view from any we have had. He was first called upon by Mr. Baruch, who was then on the Council of National Defense or Advisory Council that was prior to the creation of other boards. The first call was for information as to the status of the industry. We have referred to that as our D plus 10 Day Census. Mr. Rubens has consented to talk to us this afternoon.

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Perhaps it would be interesting to tell you the beginning of things in the consideration of raw material in the great war. Mr. Hoover, as you know, was very anxious to spare the corn crop. It then became necessary to gather together enough raw material to take care of the program then laid out. That was primarily for smokeless powder. The powder plants were mainly plants in good condition so that it took only about one-half pound or six-tenths of a pound of alcohol for a pound of smokeless powder. For plants not equipped for solvent recovery the demand was for one pound of alcohol for every pound of smokeless powder or twice as much as other plants.

We have facilities in Cuba, Porto Rico, and San Domingo for the gathering of the by-products, molasses or blackstrap, which is the result of the centrifugation of raw sugar made in those countries. In addition to that supplies may be obtained from the Hawaiian Islands and some from the Philippines, although that has not yet been exported. The only other source of the Pacific is Formosa and that goes to Japan. The Japanese, by the way, are intensively studying the method of distillation of alcohol and also attempting to get at the methods of by-products which I will explain later on. We have seen that they got little information. The average production of molasses is about seven gallons per bag of 325 pounds raw sugar, which is the standard in Cuba and San Domingo. Porto Rico runs to smaller bags. There are about seven bags of sugar to the gross ton so that you would have 49 gallons to the long ton of sugar.

Molasses is stored at the mills in large tanks and then brought out to the seacoast, except where the mill is at the seacoast, and there is a fleet of tank cars which takes care of the movement. The companies I am interested in are the largest operating in the Islands and we have in Cuba over forty million gallons storage capacity for molasses. We have in this country twenty million gallons molasses storage capacity, which was done in view of the fact that communications might be interrupted. We were fearful during the war of a demonstration of submarines and wanted a large reserve supply.

The other companies are also provided with facilities so that I should say that about 70,000,000 gallons of storage is available in the Island of Cuba. You can see with a crop of from 220 to 270 million gallons of molasses you have to keep things moving. In Porto Rico there are three main points of distribution. In San Domingo the movement is very much more difficult because of the shallowness of the rivers and the difficulty of loading on account of nothers.

There was sufficient raw material without calling on the reserve of corn during the great war for all necessary things up to the time when General Pershing called for an extraordinary effort on the part of the government for the production of one thousand tons of mustard gas per day. One pound of alcohol goes into a pound of mustard gas so that was a call for three hundred thousand gallons.

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Then there is beet molasses, but it is now available and probably will not be because all beet molasses is used for yeast, where formerly grain was used. So it is quite likely that the grain crop would be spared in another war, and that we cannot count on beet molasses for distillation purposes.

The production facilities of alcohol shrunk from 1918 to 1920 over forty per cent. That was caused, of course, by the Eighteenth Amendment which wiped out the distilleries in Kentucky, Illinois, Ohio, and Indiana.

It costs about 3 to 3 1/4 cents freight per gallon to bring molasses from the Gulf Coast to Peoria, Illinois, where there are two or three plants. We have one capable of using 6,000 bushels of corn or 40,000 gallons of molasses, which would give you something like 16,000 gallons a day. That is a reserve. We use it for distribution purposes. We bought it during the war and left it there in case of accident to another plant.

The situation in Cuba is this; We have about 450 tank cars in operation and other producers have an equal number, about nine hundred cars. There would be considerably over eleven hundred tank cars available for transportation of raw material on this end. As a result of the experiences during the war we had created not only during the war but post war a storage capacity of alcohol equivalent to six million wine gallons. We have been very careful to separate our tanks, even in the same plant, due to the fact that something might develop so that we would lose everything. We have separated our storage facilities and we have distributing centers in about thirty-six different States, each having certain portions of this reserve. In addition to that there are about 125,000 drums and about 500 tank cars. I am speaking of our company alone to give you an idea of what an emergency might mean and what you could rely upon.

We have a seasonable business in alcohol during the cold months in the sale of anti-freeze for radiators. Last year this amounted to 28,000,000 gallons. The result is that with actual reserves beginning in February and in increasing ratio we run up to about five and one-half million in October. You could rely on an immediate emergency supply and as you go into the months of greater consumption, it would be necessary to cut off the supply of anti-freeze to automobile users so that any time during the year you could get a running start on any program so far as your major procurement of your powder and gas is concerned.

Now as to other things. While it appears that alcohol is a finished product, as a matter of fact you, yourself, are going to use it as a part of your raw materials and it is a raw material entering into a vast variety of manufactures. In the case of your uniform: you will find alcohol in your shoe polish and on the visor of your cap.

To get a proper alignment of distribution points of contact that you will have to supply with this not finished article, but raw material, will cause you to spread upon the map rather an intricate flow sheet, but one which is not very difficult to develop because the industries are all on the books of the alcohol producers and distributors. At the same time as you develop your organization you will find yourself that you will need to call on the alcohol industry for this, that and the other thing.

For instance it is the basis of your ether manufacture. It is also the basis now of the new anesthetic gas developing rapidly, Ethylene Gas, and used for anaesthetic purposes. We used it during the great war as a basis of oxidation into acetic acid and that in turn was developed into acetone. We still have that plant in operation.

The difficulties which were experienced during the war were mainly difficulties of transportation and difficulties of storage. When the order came for the development of the very large mustard gas program, we found that the government had only three tanks, which were taken off tank cars, for storage purposes and we were developing a program to give them three hundred thousand gallons a day. At the time of the armistice the government was consuming in the neighborhood of three hundred tons a day and tank cars were being used for storage purposes.

Some of the powder mills were in equally bad condition. So much so that in 1917 we had to arrange for special trains of 36 cars of alcohol to be rushed from New Orleans to the DuPont Plant and the trackage was used for storage purposes.

The next difficulty experienced naturally was the matter of fuel. Some of the plants are now on oil fuel, others on coal, but there is no reason in the world why the oil fuel could not be changed to coal fuel in a very brief time. Objections on the part of owners should be disregarded. Attempts were made during the great war to change from coal to oil, but fortunately that was prohibited.

One of the most serious things in connection with these plants is the danger of accident and danger of fire. The simple operation of loading alcohol into tank cars is fraught with a good deal of danger. We have made a metallic connection between the car and the ground and I suggested a formation something like a brush of very fine wires which is grounded with a copper plate and since then we have had no accidents. Accidents were very frequent as a result of the built up static and we had as many as three or four accidents a year.

Another thing to consider in point of view of my experience is the character of the power plant in each of the producing factories. Some of them are up to date; others are not. Some of the boilers are very old indeed and it would be a great danger to consider a constant production such as the program would have to have, if there were no provision made for the replacement of boilers. We had one experience where we had reserve boilers which we were not supposed to have - the Shipping Board wanted them but we finally persuaded them to let them alone, and within a couple of months a man with an Hibernian name, but there was no reason to believe he had any sympathy with the enemy, was in charge of cleaning out the boilers. He started the fires without putting any water in them at all. He was never heard of again. It was only by having that reserve that we could keep up the capacity which was essential. There is no reason why if your communications can be kept open from the sources of supply, that is by tank steamer, that production can not be kept up to capacity. In our companies we have 50,000 tons of tank devoted to molasses; other companies have something like 16,000 tons. The remainder is carried by foreign shippers. Recently arrangements have been made to import from Java. ***

Speaking about potash content, it is not generally known that we have developed a by-product process for obtaining potash out of the slop and we have held it in reserve and we now have a tonnage of 26,000 tons of potash at Baltimore and are constantly making more, and this year have developed a process for the first time for making sulphate of ammonia. On the basis of the use of 100,000 gallons of molasses a day, we get an average of 110 tons of sulphate of ammonia, which prior to this time came from other sources. This proposition will not fit in all of our factories but is capable of being put in all factories in the development of a supply as might be essential or ordered by the government. As far as any patent rights are concerned, we would forgo that on the demands of the Nation.

In addition to that there are other by-products coming along and when developed they will probably have a very decided effect upon the use of alcohol in general for solvents, particularly in connection with gums for varnishes which heretofore have not been put into solutions. The theory of the thing is that instead of having 95% alcohol and 5% water, it is 100% alcohol - anhydrous alcohol. It is a process which we control and which has been developed by American interests.

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Now that will have a very great development not along commercial lines but undoubtedly is going to have a very interesting phase in connection with areoplane dopes and films of all kinds. It must be stopped in case of war because the quantities used would be so large as to prevent the proper government use of alcohol. To give you some idea of the use of varnishes, of the ordinary shellacs, and ordinary varieties the United States uses per annum 84,000,000 gallons. Fortunately that has not yet developed to such an extent as to get ahead of itself because that is a varnish mixture of turpentine, etc. The commercial use of spirit varnishes will have to be stopped in addition to anti-freeze use of alcohol. *****

Opposed to that we have the methyl situation. You will probably be surprised to hear that we have developed a storage capacity in connection with the largest methyl alcohol distillery where we can take in 3,000,000 gallons of crude and whereby we can supply by distillation as much of the refined product as it is possible to produce. From that point of view you are safe for the use of methyl alcohol, formaldehyde, etc.

In reverting to the Islands and the sources, I wish to tell you confidentially that there will be a control of at least the Eastern lines of Cuba by Americans, that overtures have been made to us by the British owners of the Western, that we have absolutely refused to have anything to do with turning over the road to any foreign interests, and it will be controlled by American interests, although the corporation by railroad law is a Cuban corporation. Of course it is very essential from the point of view of the supply of raw material to keep those routes open and in good order.

Finally I wish to say that I will repeat on the part of the interests which I represent that which I told the Government in 1917 -- we are ready to go one hundred per cent government production under government control. Words won't bother us - the word "Commandeering" means

nothing; if you want to run it you can; if you want us to run it we will. You can at least rely upon a sufficient supply in the beginning of the program.

I want to say one more thing, that is about the development of sugar made from corn. We have tried it out and tested it. We have special research laboratories which discovered some of these things I have been telling you about, like the ammonium sulphate, anhydrous products, etc. We have made arrangements to take their surplus of this material to encourage them to sell it to us and distribute some of the black strap in other channels.

We use absorbents like alfalfa meal only to absorb the moisture of the molasses. As a rule they take about twenty per cent by-product, but prices have gone so high they do not use as much as they did. At one time the consumption of molasses for cattle feed was 1,000 gallons of molasses.

If there is anything you gentlemen would like to ask, I shall be very glad to answer any question.

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Q. How big is the market for anhydrous alcohol?

A. The market is constantly growing. We have in operation two apparatus, each capable of making about 15,000 gallons a day. Asperine people have also taken to anhydrous alcohol and in connection with lacquers anhydrous alcohol is used.

The real combination that is coming is the combination of gums which are dissolved by a nitrate of cellulose so that you get a combination of cellulose and gum with the result that you have a film which is very hard and practically water proof and will even stand a considerable amount of heat. A good deal of that is now used as a floor covering and floor varnish and is hard but not brittle and does not check. It has been tried out in laboratories by exposure to sun and rain, to salt water and fresh water and does not check. The only difficulty is that on account of the anhydrous quality they have not yet solved a method of using it as a brush application in hot weather. They are now working out a combination for brush use and it seems they are going to get it. We have turned the whole problem over to practically all varnish manufacturers in the country. We have also used it when the price of gasolene was high and the price of raw material of alcohol was low. You can get full information of the combination of alcohol with gas and motors from experiments carried on by aeroplanes in actual flights and also from the Bureau of Standards. The only question there is the question of money. Alcohol is very expensive now and gasolene cheap but when conditions were reversed, the addition of twenty and sometimes forty percent made a fuel that would give them better performance and made a large saving in the lubricant because of the low temperature at which the engine worked and naturally greater life to the spark plug and incidentally because of the lesser use of lubricating oil there was less carbon, but when they went to 6 1/2 compression they found a

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real increment in power and efficiency. Theoretically the higher compression, up to a certain point, the more efficient is alcohol. The only difference that was found in the matter was a difference in poundage because alcohol is naturally heavier than gasoline. This is a matter in the control of the Government, you might say, because it is not probable that the alcohol industry will be called upon in years to substitute gasoline. With the movement of the car you have absolute mix for the time being, but when quiet they separate. The Shenandoah on one of her first flights used the combination and my understanding is that the speed developed by some of the Navy planes in the races a year to a year and a half ago was due to the combination which they put in of gasoline and alcohol.

Q. Does the mixture do away with the tendency to take up moisture?

A. We have had that tested out and it does not take up enough moisture to count.

Q. Has any attempt been made to get the alcohol of the waste that is going on in the Hawaiian Islands from the Pineapple?

A. No. The question of other raw materials is a question of experimentation. We have a plant in Baltimore which we call an industrial experimental station. The purpose of that is to use every possible source to make alcohol. We tried to encourage people on the Eastern shore of Maryland to raise large quantities of potatoes, but could not get them to do it. Kaffir corn might spare the corn crop. In the question of the pineapple, for instance, the yield would be very low. It would be necessary to have a factory at the canning plant in order to get it before disintegration takes place. With pineapple especially it takes very little time from the point where it is acid to the point where it is rotten. One of the distilleries which used the actus fruits in the Southwest is out of business because it cost too much to gather the fruit and bring it to the centers. We are not in a position to do what is done in Germany because under the Prohibition Act it would not do to permit each to make a small amount of alcohol. In addition it would simply mean that there would have to be an inspector for each farm house and another inspector to inspect him.

Another situation of the bootlegging trade is rather serious. In Cuba there has been a growing demand for the blackstrap there produced by the local distilleries. That does not mean that it is being used in the country. It is being imported in small quantities and never reaches assumed destination, but is landed on the Florida coast. The trade has grown very much in the last two years and one of the things to look out for in case of a war or government demand is the great temptation to which people might be put is a question of diversion of the supplies which should go to the government. We have developed on the tank cars a lock which meets with the approval of the Revenue Department which will prevent stealage out of the usual outlets of the tank cars. But there is no way to prevent a steel worker, for instance, from drilling into a tank and taking what he thought he could get away with. We had very little of that trouble during the war because prohibition is a war time measure. What would happen in case of another conflict with vast quantities of pure alcohol

going to powder plants under government specifications is another matter and it might very possibly be that a special amount of surveillance would be necessary. I think that would be solvable by so routing your goods that they would not take too much supervision. From that point of view it is my opinion that in case of government demand, it would probably be an absolute necessity to have an army officer in each plant to prevent diversion and also to see that the distribution of the alcohol was properly made to the government. The government should be in a position to see to the absolute fulfillment of its requirements in an orderly way, by having someone representing the government at each plant. In addition to that I think it would tend to have a rather quieting influence on the labor of the plant because if there were any labor disputes and the government had an officer of distinction at the plant he could intervene in an amicable way and keep discussions smoothed down.

Q. Development of sugar from corn.

A. I have engaged to take 35,000 tons of their product this year. They are selling some of it for other purposes. There will be erected in the next two years two or more plants larger than the one they now have. What they do is to hydrolize their corn with hydro-chloric acid instead of sulphuric. It makes a sugar which is not as sweet as cane sugar nor as sweet as beet sugar, but is useful in certain forms of canning and to bakers in bread making, in which it is the impetus given to the yeast.

The United States is now consuming 100 pounds of sugar per capita per annum. If you cut it down, it would mean that the demand being less and production normal, the price of sugar would drop.
