The Story of the Production of Ethyl Fluid in Baton Rouge

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An address before the
Baton Rouge Lions Club
October 3, 1944
by
CLINTON W. BOND

The Story of the Production of Ethyl Fluid in Baton Rouge

IT IS a pleasure to have this chance to tell you, as leading citizens of Baton Rouge, some of the things I've learned about Ethyl in the years I've been associated in that business. It is a fascinating story to me and always has been. I think it is one of the most interesting romances in modern chemistry. But particularly in the last few years when Ethyl fluid has been a prime munition of war — and it has been recognized as such by the heads of the Army and Navy, as well as the pilots and engineers on the battle fronts—the drama of making chemicals which command and increase the racing power of great engines, has had a new significance to me. Our part in the war is clear, for in every gallon of gasoline that powers our air and ground attacks against the enemy there is a thimbleful of Ethyl fluid, a "power potion" which often spells the difference between success and failure.

Ethyl fluid in aviation and combat gasoline is a prime munition of war.

As a number of you gentlemen may know, most of the Ethyl fluid produced, and most of the several chemicals that are used in its manufacture are made in our plant right here in Baton Rouge. Nearly every one of the numerous buildings or structures in this plant houses a separate chemical operation, each contributing to the final end product, but we divide the plant roughly into three groups according to organization. What we call the sodium-plant —in reality the plant for the electrolysis of common salt to produce sodium and chlorine — is considered one unit. It is operated for Ethyl by the Electrochemicals division of duPont. The acid and chlorination plants for the production of ethyl

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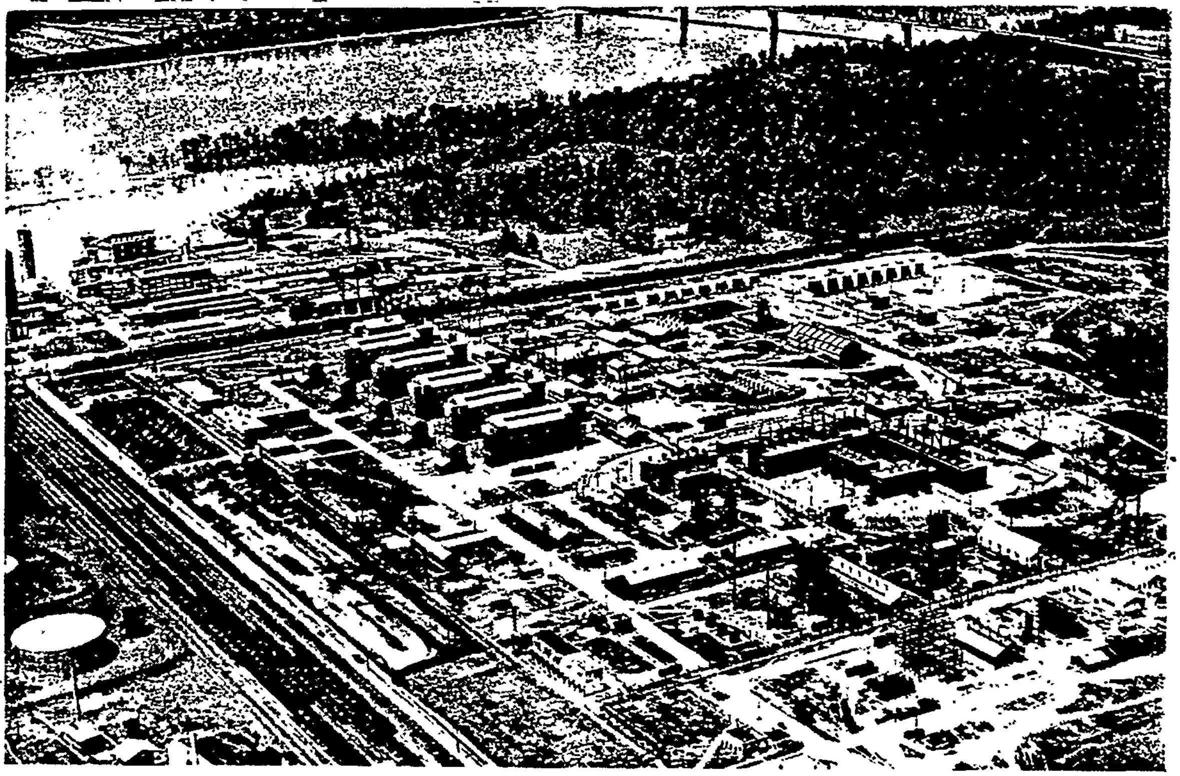

The Ethyl Corporation plant in Baton Rouge produces most of the Ethyl fluid now in use.

chloride are operated by the local division of Ethyl's manufacturing department. The tetraethyl lead plants, which together comprise the largest group of the three, are operated by the Organic Chemicals division of duPont. Thus, we have three groups of employees and supervisors working within one fence-line to produce one product. This might seem at first glance to be an odd situation and one that would present many difficulties of operation. And except for a spirit of cooperation and a mutual devotion to one cause on the part of everyone, it *could be* difficult I suppose. But we of Ethyl and duPont have a long history of association and cooperation, and as a representative of the Ethyl Corporation I'd like to say that we are proud to have duPont men as teammates in the manufacturing side of our business.

I think you will see better why this is so if I give you a quick once-over of some of the past history of Ethyl and touch lightly on the dramatic highspots of chemistry before going further into the wheres and whyfors of our Baton Rouge plant, what it does for the war effort, why we need more manpower immediately — and something of the post-war prospects of our business.

Origin of An Idea

Ethyl started as an idea in an automobile research laboratory. Over twenty-five years ago Charles F. Kettering, then, as now, in charge of research work for General Motors, assigned Thomas Midgley to the job of finding out why engines knocked and how to stop that knock — for knock was blocking the road to progress in the design of more efficient automobile engines. Tom Midgley was a mechanical engineer and knew little of chemistry. He and his associates, chief among whom were T. A. Boyd, now head of the Fuel Division of General Motors Research, worked for years on the problem. Before they found the answer they discovered it was a chemical problem and by the time they found the answer Midgley was a chemist. I think he is recognized as one of the outstanding chemists in the country today and is the inventor of two of our great modern chemical discoveries. One of these is the discovery of the antiknock properties of tetraethyl lead in gasoline and the other is the discovery of the non-toxic, non-inflammable refrigerant which is now sold under the name of Freon. Midgley is today president of the American Chemical Society, and vice president of Ethyl Corporation.

Thomas Midgley, Jr., who discovered the antiknock properties of tetraethyl lead.

Thomas Midgley, Jr. (at left) and T. A. Boyd, (at right) worked under the direction of Charles F. Kettering (center) for years in their search for a practical antiknock compound for gasoline.

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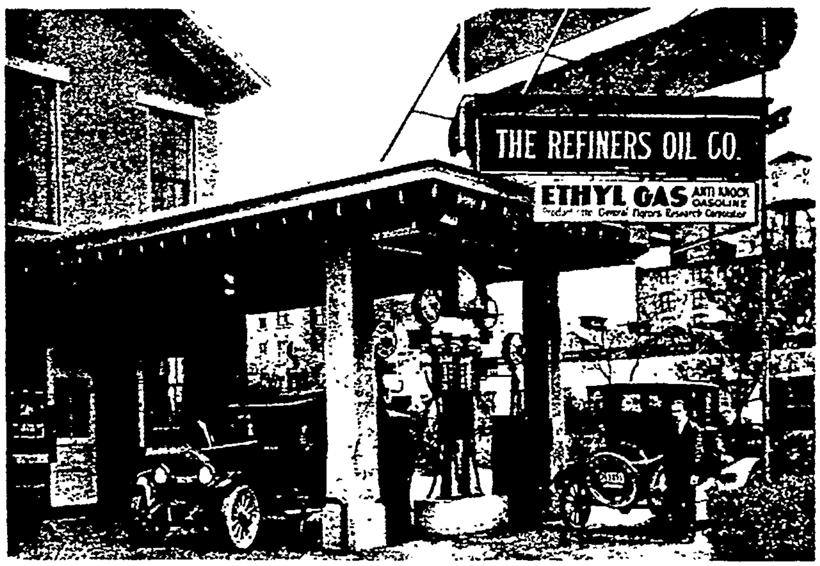
Dr. Graham Edgar, Director of Research in the early days of the Ethyl Corporation, and inventor of the octane scale for measuring antiknock value, now vice president.

When they finally found that tetraethyl lead was the chemical they were seeking to stop the knock in gasoline and proved they were right by testing it in engines, one might have thought that the research work was over. As a matter of fact it had just started. There was no commercial solution to the search for a practical antiknock compound for a long time afterwards. First of all, if tetraethyl lead were added to gasoline alone it would turn into lead oxide during combustion and coat the inside of the engine with white paint. Furthermore, there was no known method of manufacturing tetraethyl lead commercially.

Some Early Problems

The first problem — how to combine something with tetraethyl lead to make it a commercial antiknock compound — was solved by the addition of ethylene dibromide. When mixed in the proper proportion with ethylene dibromide, the tetraethyl lead combined with the bromine was blown out the exhaust pipe without building up objectionable engine deposits. The second problem — manufacture—was worked out with the discovery of a practical process, which also involved a chemical reaction of bromine. Certainly at this point you might have thought that the research work was over, the boys in the laboratory could shout "Eureka" and ask the boss for a raise. But they had still other problems.

They knew they had a compound



The first purchase of Ethyl Gasoline was made at this Dayton, Ohio, service station at about 5 p.m. February 2, 1923.

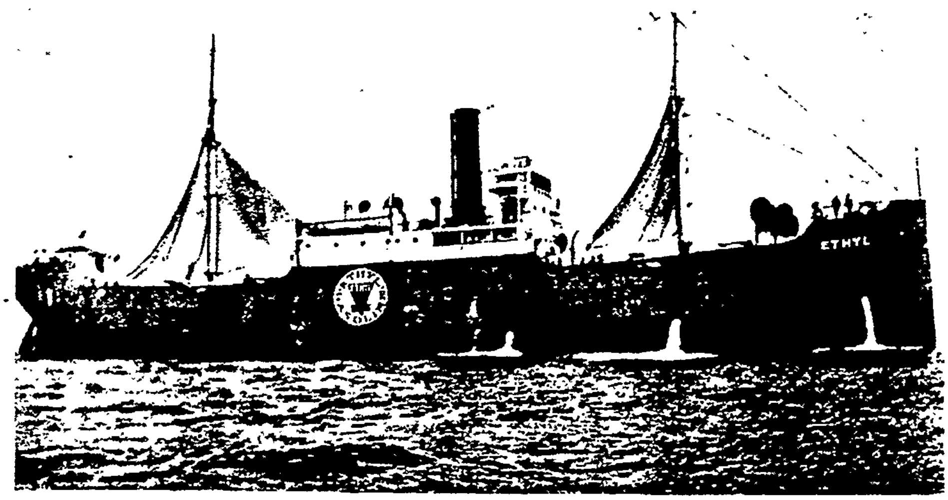
that would work and one that could be manufactured in small quantities, but they didn't know whether the public would buy their product or not — and if they did, there was still another fly in the ointment; for there was not much bromine in the world. If the discovery were ever to be a big commercial success they would need something like twenty times what was then the total world production of bromine.

To get enough Ethyl fluid to make a sales test, General Motors Corporation entered into a contract with E. I. duPont de Nemours & Co., then, as now, one of the world's outstanding chemical concerns. Under this contract a plant for the manufacture of tetraethyl lead by the bromine process was built and put into operation by the duPont Company in 1923. The tetraethyl lead was shipped to Moraine City, Ohio where it was blended with other ingredients by General Motors Chemical and on February 2, 1923 the first gallon of gasoline was sold under the Ethyl trademark at a service station of the Refiners Oil Company in Dayton, Ohio.

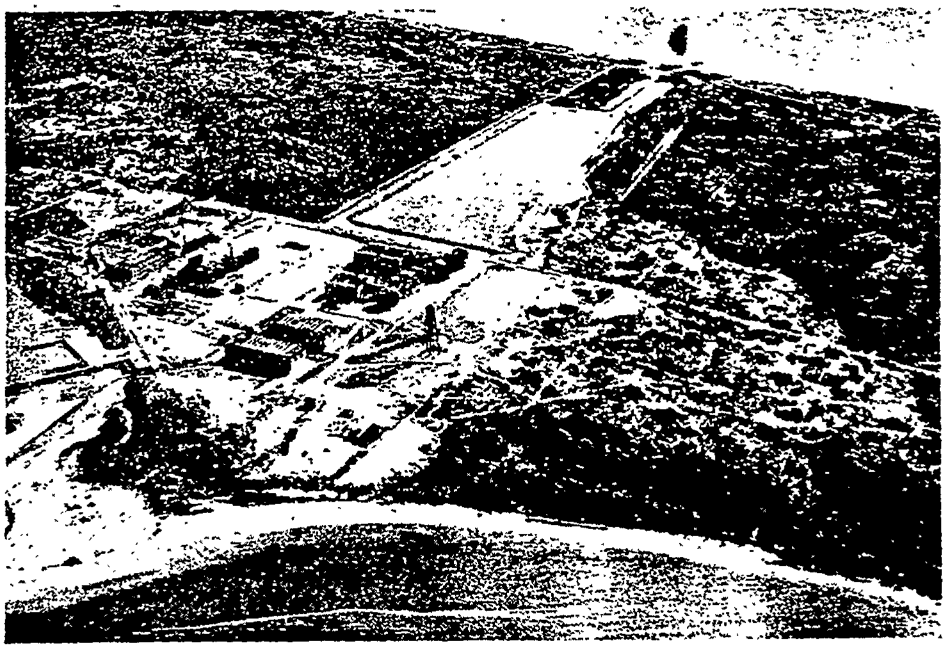
I will not go into the details of the sales history from that point on, during the period Mr. Kettering refers to as the "shirt losing era" in any business, but will come back to the manufacturing problem.

Bromine From the Sea

The Dow Chemical Company at that time was the principal producer of bromine in this country, but even an expansion of their facilities didn't promise sufficient quantities and besides, the price was very high. After a lot of digging around for ideas, it was decided to try to get bromine out of sea water. As a result of this the good ship "Ethyl" was equipped to go out to sea and "mine the ocean" to produce a compound of bromine. The venture was



The good ship Ethyl which successfully proved that the recovery of bromine from seawater was commercially practicable.



The Ethyl-Dow Corporation plant in North Carolina where bromine is extracted from sea water.

not a commercial success and cost another half a million dollars on top of everything else that had been put into the program. But it did prove that bromine could be recovered in quantity from sea water, given the proper kind of equipment. And subsequently, as a result, Ethyl went into a cooperative program with Dow Chemical Company to build and operate sea water plants. I think it is interesting that the Ethyl Dow Chemical Company, jointly owned by Dow and Ethyl, built and operated the first commercial process for the extraction of a chemical from sea water. Nearly all the bromine used in our business today comes from such sea water plants. When this war came, Dow Chemical developed a similar process for the extraction of magnesium from sea water and this metal, once scarce, has had a big part to play in our nation's aviation program.

A Marriage and a Birth

Meanwhile the Standard Oil Company (New Jersey) had become very interested in possibilities of anti-knock gasoline and were doing research work on the use of tetraethyl lead, as well as on the problem of reducing its cost of manufacture. At that time the manufacturing cost of Ethyl fluid was so high that General Motors could not offer any profit to the oil companies who were its prospective customers. The sales price to the oil company was three cents for enough Ethyl fluid for one gallon of Ethyl gasoline and the oil company charged three cents premium to the motorists for the Ethyl gasoline it sold. In other words, at that point it looked as though there might be a lot of business here — but no profit. Then the Standard Oil Company

(New Jersey) discovered and patented a more economical method of manufacturing tetraethyl lead. This was known as the Kraus-Callis process (after Doctors Kraus and Callis who discovered it) or the ethyl chloride process. As a result of this discovery we see this situation: General Motors had a product which appeared to be very useful to the progress of the automobile industry, and Standard Oil Company (N. J.) had a manufacturing method for that product that looked as if it might put some profit into the business. General Motors and Standard Oil Co. (N. J.) then formed a jointly owned corporation to manufacture and sell Ethyl Brand of Antiknock Compound to the oil industry. The new company took over General Motor's contract with duPont and entered into a new contract for duPont to operate tetraethyl lead plants at Deepwater, New Jersey by the Kraus-Callis process. Old plants, of course, had to be scrapped.

Earle W. Webb, president of the Ethyl Corporation since April, 1925.

An Expensive Baby

As you can see, Ethyl was an expensive baby. Before the product really got rolling it was in the red to the tune of about three million dollars. I have always felt that the success of the Ethyl business was a great tribute to the foresight of those executives in General Motors

One of the first manufacturing plants when under construction at Deepwater, N. J. in 1926. This building is no longer used.

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and Standard Oil Company who had the courage to invest large sums of money and to continue to back the idea through periods when less astute minds might have dropped it. It is an example to me of the American enterprise system at work that is very significant in times like these.

But the problems were not over yet. The young Ethyl Corporation was up against fundamental difficulty that the added quality which Ethyl fluid gave to gasoline was not of much advantage except in motors with higher compression ratios than any that were then on the market. On the other hand, automobile manufacturers could not very well build better engines until a better fuel was available and generally distributed in all sections of the country.

It was to lick this problem that Ethyl started the engineering and research program which is an important part of its activities today and includes substantial — and we think outstanding—laboratories near Detroit, Michigan and in San Bernardino, California. The ultimate answer to every chemical problem which the Ethyl Corporation has faced has always come back to the automobile engine. It doesn't matter how good a chemical theory we may have; the question is, "How much does it improve engine performance?" That is the only reason people spend money for Ethyl gasoline: engine performance.

I am going to skip quite a period in history now, during which the young business grew into sizeable volume, and come down to the time when we decided to put a manufacturing plant in Baton Rouge.

Ethyl Comes to Baton Rouge

By 1932 the full bite of the depression was felt in the oil industry. Sales of Ethyl gasoline fell — until less than a million car owners were buying it — and sales of third grade gasoline went up. Oil companies were losing millions of dollars. Many refiners could not meet the standards of quality set by the leaders for regular gasoline. So in 1933 Ethyl offered its customers antiknock compound containing tetraethyl lead for the improvement of their regular, or so-called housebrand gasolines. This resulted in a much larger volume of business and soon again we needed additional manufacturing facilities. Baton Rouge offered many advantages as a site for a new plant. It was a favorable area for the high type labor needed in chemical industries, it was convenient as a shipping point to large parts of the oil industry, and it was close to the source of supply of several chemicals used in the manufacturing process.

Other factors which influenced Ethyl to come to Baton Rouge were the favorable tax exemption plans of the State for new industry, the civic advantages of the community, the character and hospitality of its citizens, the healthful climate, good sanitation, modern fire and police protection for the homes of employees, good schools and good medical and hospital facilities for the families of employees.

After various inspection trips

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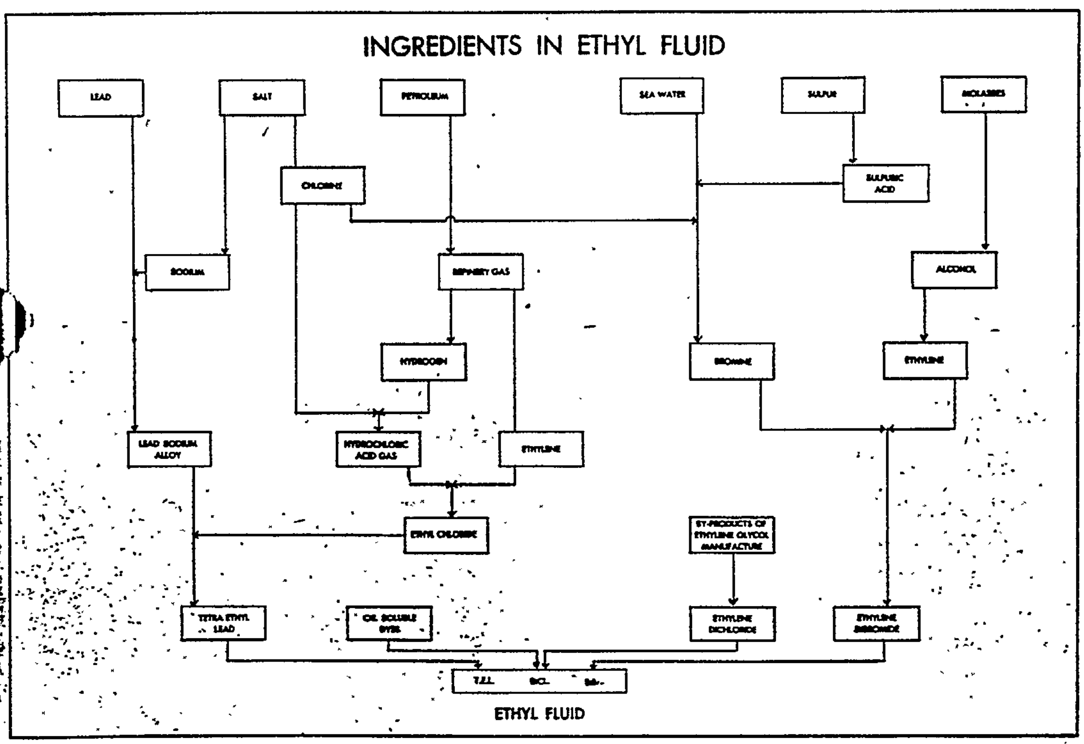
the decision was made and we bought about 200 acres in North Baton Rouge, adjacent to the property of the Standard Oil Company of Louisiana and to the Solvay plant. This is convenient because we purchase certain refinery gases from Standard, which they deliver by pipe-line over the road, and we also have pipe-line connections with Solvay for salt brine which they supply to us. Construction was started in 1936.

Like most people starting a plant, we underestimated the size of the place we would need eventually, and almost continuously since the first units were completed we have been engaged in one expansion program after another. I might say that at the time we bought the property we were selling less than one quarter of our present volume.

An Integrated Plant

Our Baton Rouge operation is what is known as an integrated chemical plant. Except for the ethylene dibromide which is manufactured at sea water plants by Ethyl Dow Chemical Company and shipped to us in tank cars, nearly all of the intermediate chemicals needed in the manufacturing process are made in our own plant. We purchase electricity from Gulf State Utilities, common salt brine from Solvay, pigs of metallic lead from several mining and smelting companies, refinery stabilizer gas from Standard Oil of Louisiana, sulphuric acid from Consolidated Chemical Co., alcohol from various sources, and that is about all, except for ingredients used in small quantities such as dyes to color the fluid and small amounts of kerosene. Of course, we buy supplies and construction materials and the other commodities that every manufacturing plant needs from time to time.



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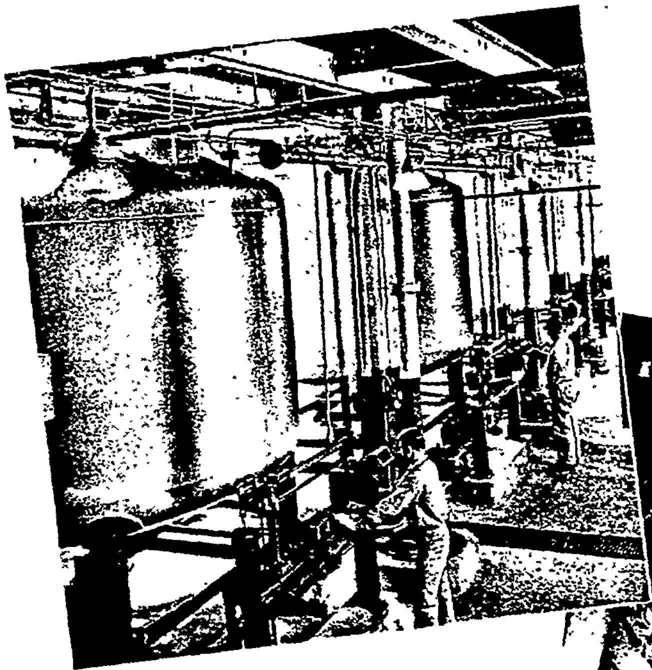
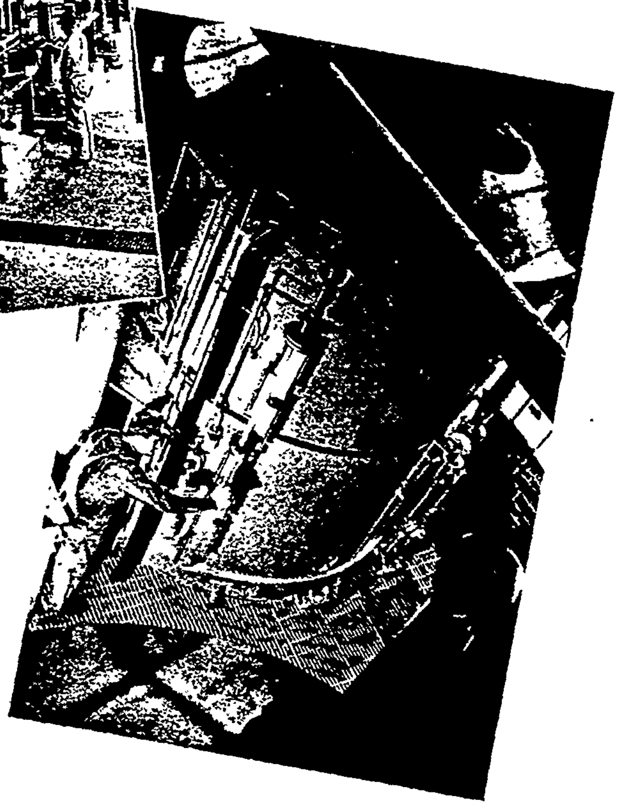
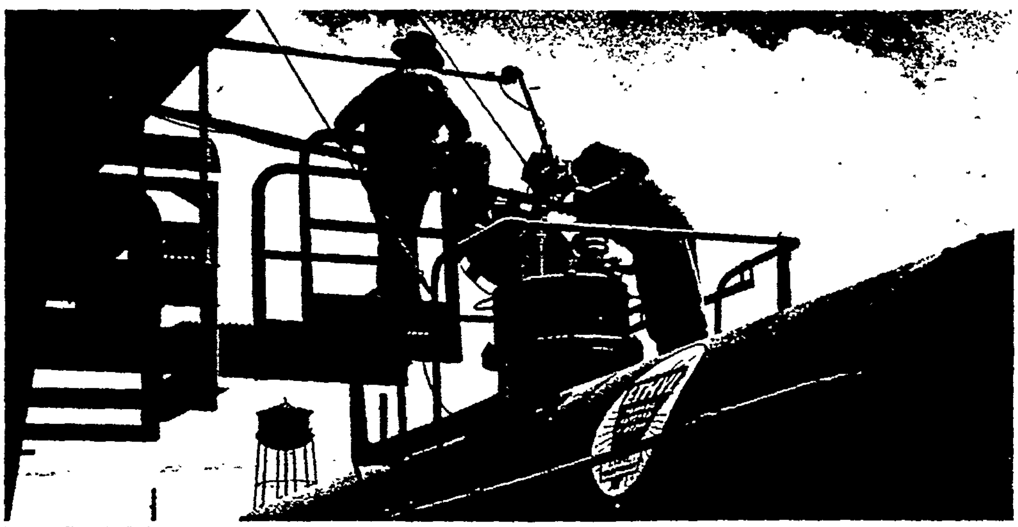


Blending plant where the several ingredients of Ethyl fluid are blended before loading into tank cars.



Interior of plant where salt brine is solidified for electrolysis in the manufacture of sodium.

Tank cars of Ethyl fluid are loaded at the blending plant for shipment to refineries.



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Manufacturing Processes

The manufacture of tetraethyl lead has represented serious problems from the start. There was no "prior art" in the large-scale production of any organometallic compound, and knowledge had to be accumulated by gradual experience.

Tetraethyl lead is manufactured by the reaction of ethyl chloride with an alloy of sodium and metallic lead, and the immediate raw materials are therefore ethyl chloride, sodium and lead. With the exception of metallic lead, none of these is available commercially in the quantities required, and for this reason, as well as in the interest of manufacturing economy, it was necessary to include their manufacture at Baton Rouge.

In the production of sodium, the two raw materials are salt brine and electricity. Salt is piped in from the Solvay Company's salt wells, twenty miles away. The salt is treated to high purity, evaporated to practically absolute dryness, and then charged to batteries of electrolytic cells where the salt is decomposed to sodium and chlorine. Of all of our Baton Rouge plant's electrical energy, a lion's share goes to the sodium process, and represents enough electrical energy for approximately five times the daily and domestic needs of Baton Rouge citizens.

The sodium we produce from the electrolysis of salt is used in the production of tetaethyl lead. The sodium is melted with lead to form the alloy which, after grinding, is ready for the final reaction.

In normal times, the chlorine formed in the electrolysis is burned with hydrogen, obtained from the adjoining refinery of the Standard Oil Company to form gaseous hydrochloric acid required for ethyl chloride manufacture. At present a substantial percentage of the chlorine is shipped to other war industries.

Ethyl chloride is produced by two distinct processes. The first is the reaction of hydrochloric acid with ethyl alcohol. The second is by the hydrochlorination of ethylene. In this process, refinery stabilizer gases consisting largely of propane are cracked and the cracked gases fractionated at low temperatures to separate the ethylene formed. This is allowed to react with hydrochloric acid gas in the presence of a catalyst to produce ethyl chloride. The Baton Rouge plant is the first commercial development of this method of manufacturing ethyl chloride. Ethyl chloride produced by either process is subjected to appropriate purification processes and is then ready for the final reaction with lead-sodium alloy.

Women technicians are helping as assistants in the Development Section laboratories.

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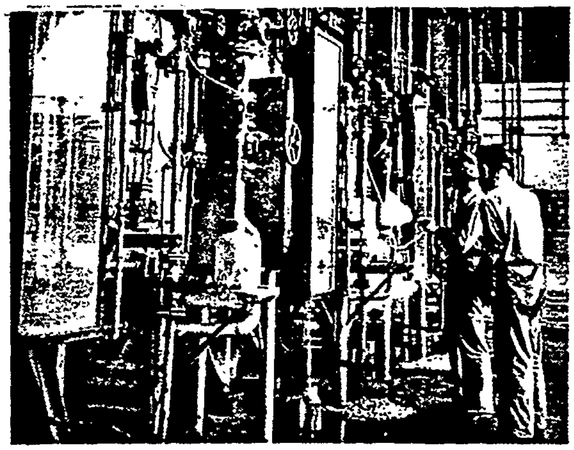
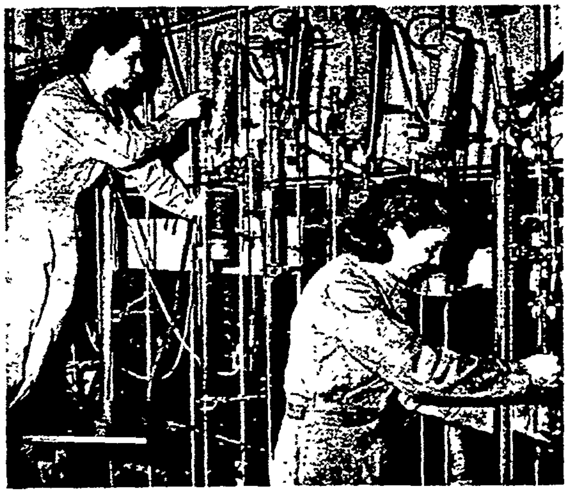
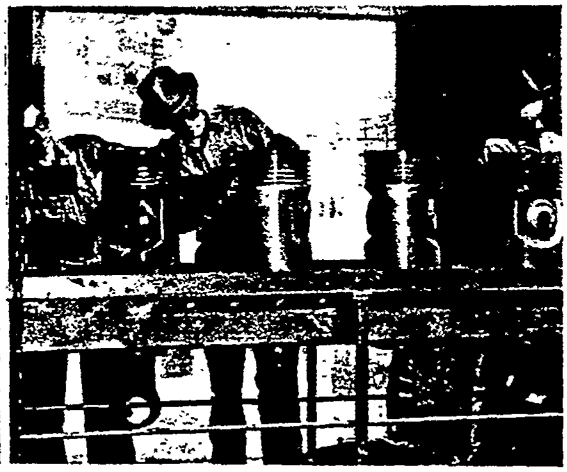


HCL Burners in manufacturing ethyl chloride.



Operating the distillation apparatus in one of the Development Section laboratories.



Normally, all of the chlorine produced in the electrolysis of salt to make sodium and chlorine is used to produce ethyl chloride, but when chlorine for total war became critically scarce, we built a plant to make our own hydrochloric acid from salt and sulfuric acid. Since that time we have sold much of our daily output of chlorine for other war uses.

In the tetraethyl lead manufacturing process, the sodium-lead alloy and ethyl chloride are allowed to react at moderate pressures and temperatures. At the completion of the reaction, the product is distilled with steam to separate the tetraethyl lead, and the lead sludge is collected and resmelted to pig lead. Our lead recovery operation is of considerable magnitude since only one fourth of the lead in the alloy is converted to tetraethyl lead.

In addition to tetraethyl lead, the finished antiknock fluid—Ethyl fluid—requires the addition of ethylene dibromide, ethylene dichloride, and dye and kerosene

The ethylene dibromide comes mainly from the Ethyl-Dow Corporation plants at Kure's Beach, N. C. and Freeport, Texas. At these plants, the sea water, which contains an average of only 67 parts of bromine per million parts of water, is acidified and chlorinated; the bromine is blown out with air and concentrated by absorption, relibrated from the concentrated solution, recovered by distillation, and finally allowed to react with ethylene to form ethylene dibromide.

Help for Synthetic Rubber

During the war period, particu-

Pistons from compressors in ethyl chloride plant.

larly during the early stages of the synthetic rubber program, we operated parts of our plant for purposes other than the manufacture of Ethyl fluid. For a while we made ethylene chloride for the Rubber Reserve Corporation and a part of our ethyl chloride facilities were used as an experimental operation to test and prove the workability of a process for the manufacture of butadiene: a compound that is used in the manufacture of Buna-N type synthetic rubber. The reason for this was that while a number of large plants designed to make this type of synthetic rubber were under construction, the process had never been tested outside the laboratory and our facilities provided an opportunity to work out some of the "bugs" in the process. Those two programs are now completed and once again everything we make enters into the final product except for a certain amount of liquid chlorine which we still furnish to other war industries.

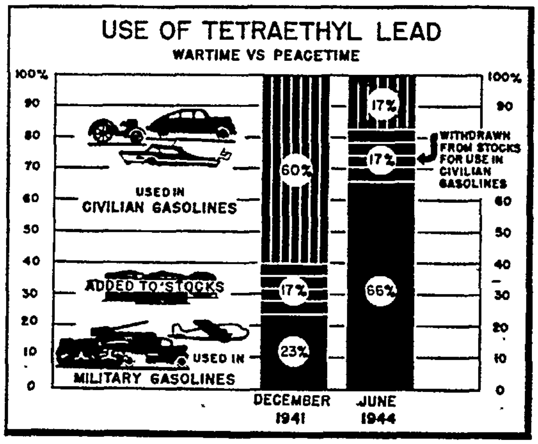
Ethyl Fluid in the War

Today approximately two-thirds of our production goes into military gasoline. In fact, if gasoline for essential civilian transportation is included in the estimate, at least 85% of our present production is used directly in the war effort.

In every gallon of high-octane gasoline now carrying the Allies' air and ground attack against the enemy there is about a thimbleful of Ethyl fluid. It has now become the nation's most needed material to win the war quickly. Not a plane,

HERE'S HOW THE WAR AFFECTED THE USE OF TETRAETHYL LEAD

We could not continue to withdraw from our stockpiles of tetraethyl lead to make civilian gasoline without endangering military supplies. Since this was impossible, restrictions upon civilian use were necessary.



(Reprinted by permission Petroleum Administration for War.)

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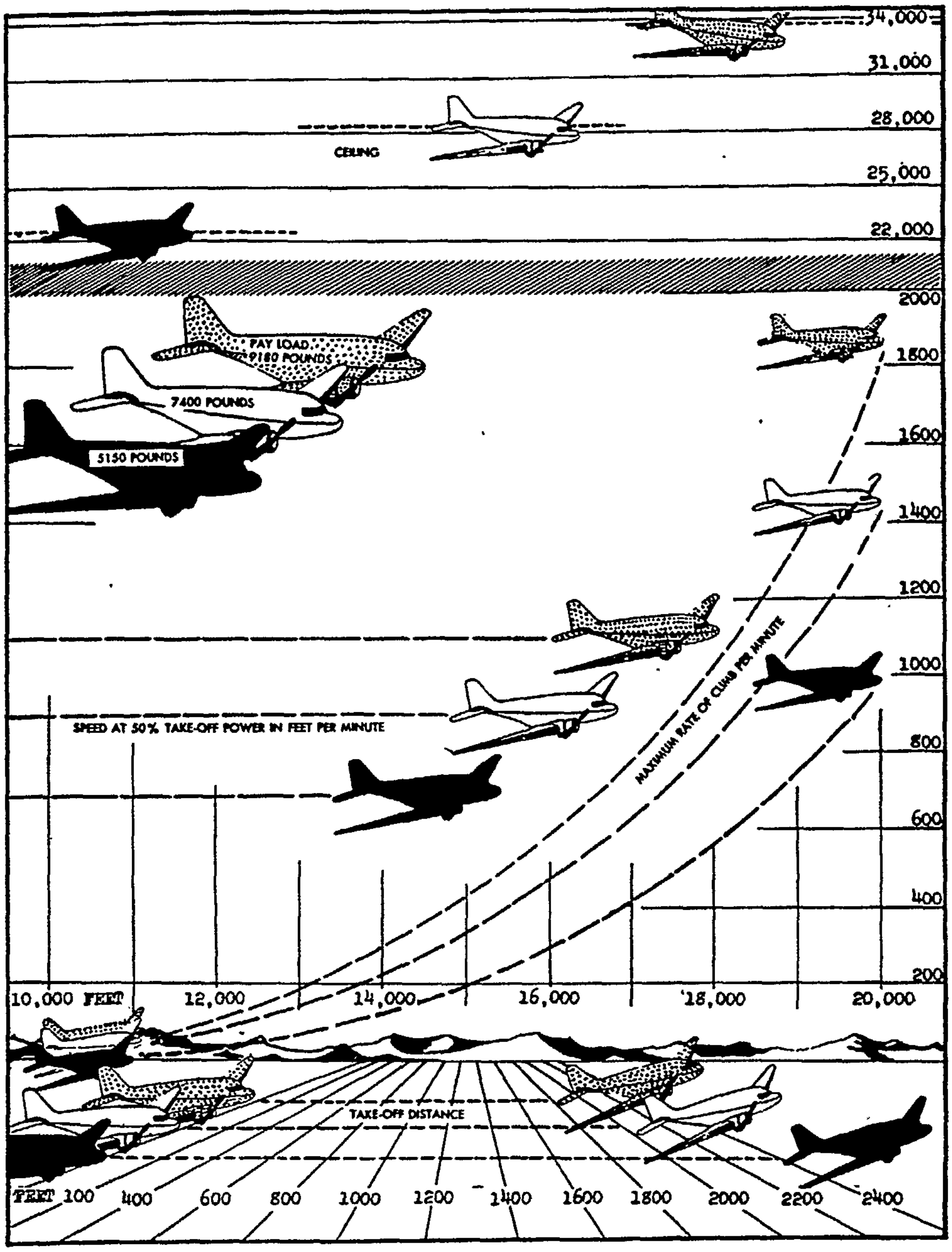

As fuel improves, airplanes fly higher, faster, carry more load.

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tank, jeep or PT boat could operate efficiently without high-octane gasoline, in the manufacture of which Ethyl fluid is necessary.

The very success of the Allied strategy, the tremendously broadened and speeded up movement of our troops have called for more and more fuel. Because of the marvelous production of planes and mechanized ground equipment, the extraordinary performance of these machines, and the excellent training of the flying and ground personnel, we have lost far fewer planes and tanks than had been anticipated. This fact has added to the unexpectedly great demand for high-octane fuel and its vital component, Ethyl fluid. And the faster the war moves toward the finish, the faster our fighting men close in on Berlin and Tokyo, the more Ethyl they will need.

Ethyl aviation gasoline made in America was credited with a large share in winning the battle of Britain, for it gave the RAF planes an advantage over the Luftwaffe. Geoffrey Lloyd, Great Britain's Petroleum Secretary, has remarked: "I think we wouldn't have won the Battle of Britain without 100 octane — but we did have 100 octane."

You can get a good idea of this high octane fuel by comparing tests on commercial planes with results in military planes. A twin-engine plane burning 87-octane fuel can climb at the rate of 1,000 feet a minute. This service ceiling on the same plane is raised from 22,000 feet to 28,000 feet by a change from 87-octane to 100-octane, and its cruising speed is increased from 176 miles per hour to 191 miles per hour. I might tell you, off the record, that although those are published figures, the full story when told will be even more dramatic.

Military Needs for Powered Gasoline

To the "A" card driver, who is used to buying his gas in three-gallon driblets, the volume of high-octane fuel consumed in this war is utterly fantastic. For instance:

It takes a tank-car of gasoline — 8,000 gallons — to fill up a B-29 Superfortress. The entire production of an average employee in the Ethyl plant at Baton Rouge for thirteen hours is needed to supply the Ethyl fluid for that one filling of gasoline for one B-29.

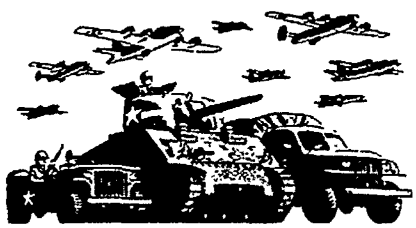
A single mechanized division of the Army uses 18,000 gallons of high grade gasoline every hour it is on the move. To keep each such division moving requires the constant production of five operators in the Ethyl plant.

Moving just one armored division from the French coast to Berlin — about 475 miles — would consume 350,000 gallons of high quality gasoline even if the division moved straight through without fighting on the way.

Every worker in the Baton Rouge plant must be on the job for more than seven hours to produce enough Ethyl fluid to make enough 100-octane fuel for just one tanker load.

A bomber group of B-17 Fortresses or B-24 Liberators is composed of 48 planes. To fuel but one group for one bombing raid requires

80 tank trucks of aviation gasoline — containing enough Ethyl fluid to make a week of work for nine employees in the Ethyl plant in Baton Rouge.



The gasoline requirements of this war are already ten times greater than in World War I. Practically all fighting grade gasoline used by the Army and Navy contains Ethyl fluid to give more power to our planes and combat vehicles when they need it the most.

Gasoline with a 100-octane rating can be made without Ethyl fluid, but it is very expensive and in volume it could not begin to meet the tremendous demands of this gas-powered war. In fact, without Ethyl it has been stated that the entire American oil industry could not make enough 100-octane gasoline to keep one squadron of planes in the air. The octane rating of even that scarce super-gasoline could be increased by addition of Ethyl. In fact, no fuel yet made is so good that Ethyl fluid will not improve it.

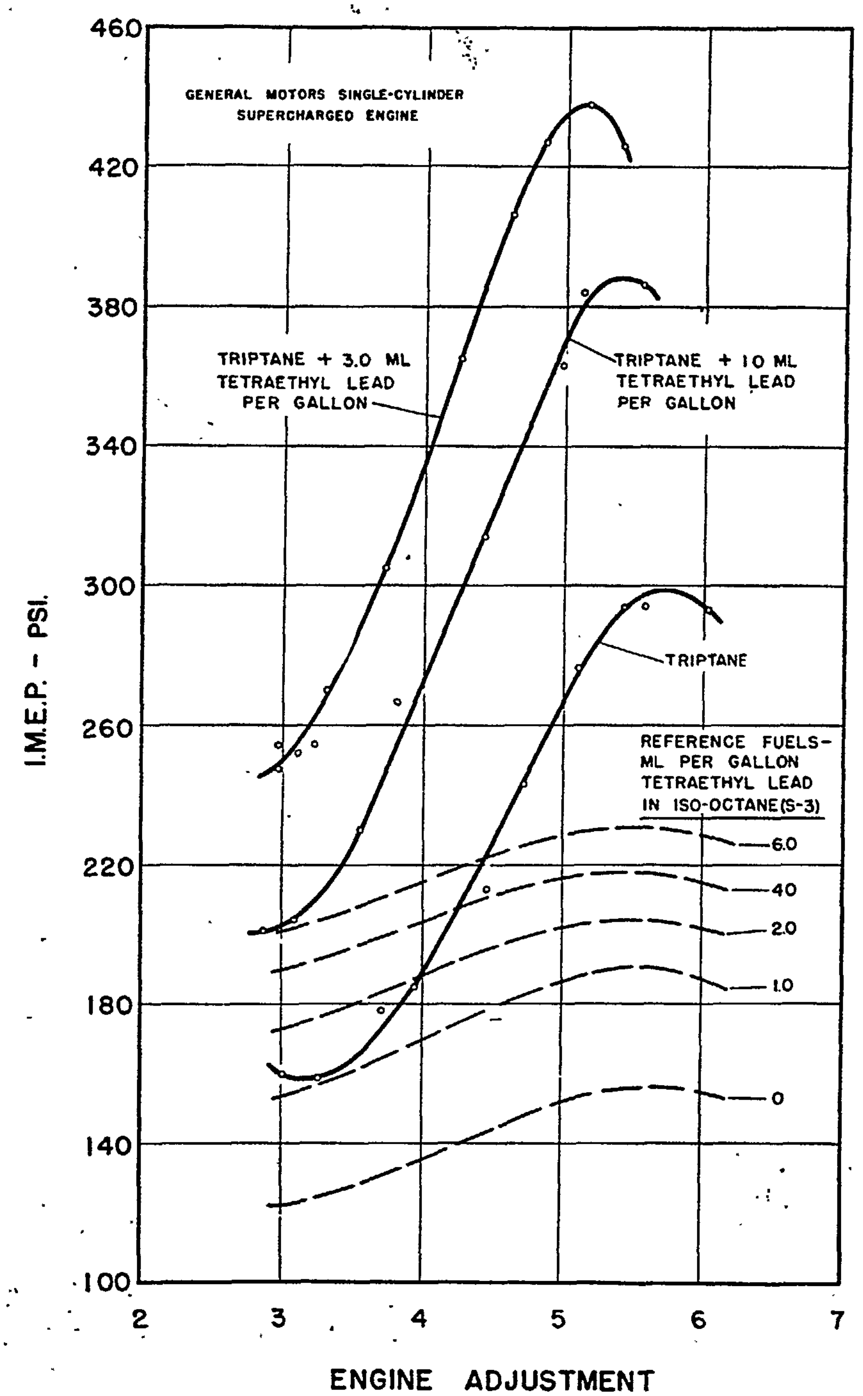
Triptane — A Super Fuel

For instance, just four weeks ago Mr. Kettering made a talk at the annual meeting of the American Chemical Society in New York about the most sensational anti-knock fuel yet discovered — a hydrocarbon named triptane. Pure triptane, as General Motors is manufacturing it today, will yield about twice as much power per pound or per gallon as pure iso-octane which is the standard of measurement for 100-octane gasoline. That is so good that it makes all other fuels which the oil industry has announced look insignificant by comparison. When people hear about these modern fuels some of them get ready to write the obituary of the Ethyl Corporation. Friends ask me with concern "What is Ethyl going to do when all these new high octane gasolines come on the market after the war?" Well, Mr. Kettering answered that question also in discussing the characteristics of triptane with about as good an answer as I know. Pure triptane, as I said, is just about twice as good in an engine as 100-octane, but with a little Ethyl fluid added his charts showed it to be three times as powerful as 100-octane. In other words, triptane is twice as good as iso-octane and Ethyl triptane is thrice as good!

This gives you an insight, as a matter of fact, into how the Ethyl business operates and why oil companies use it. Mr. Kettering estimated that after the war triptane could be made for something between 50¢ and $1.00 a gallon. Now consider that if the oil refiner wants to spend less than a penny more he can make that triptane nearly twice as powerful.

I admit that this is the prettiest case I know — but it gives you an idea of the economics of high octane hydrocarbons *plus* Ethyl fluid.

KNOCK LIMITED POWER CURVES FOR TRIPTANE



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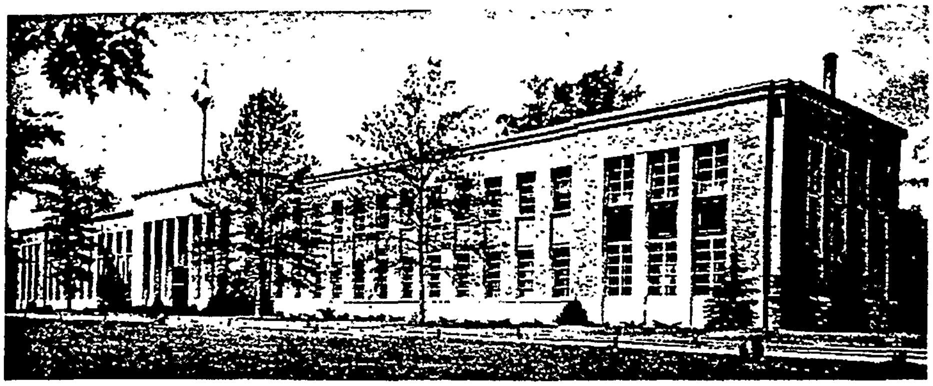
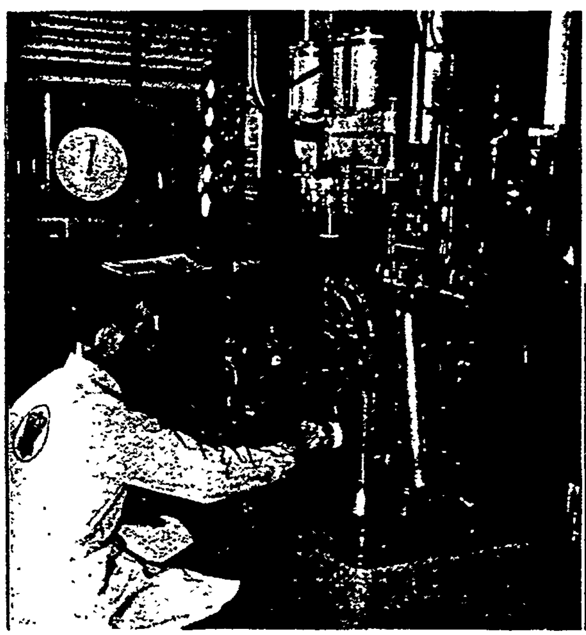


Exterior view of Engineering and Research Laboratories of Ethyl Corporation in Detroit, Mich.

Activities in Research

Having originated in a research laboratory, the Ethyl Corporation has always been partial to research and in addition to the engineering research work on engines which I have mentioned, we have chemical and aeronautical laboratories. We are constantly looking for ways to improve our own product and naturally we are always looking for new and better mixes or agents for antiknock fluids. On the latter type of research, however, it looks as though Midgley did too good a job in the first place to leave us much opportunity.

Also, we must keep informed on new developments in refining technology because each new process may introduce factors which will affect our business. We must help our customers get the most out of our products and we are expected to know the answers to all questions touching on the antiknock properties of gasoline. This has led our research people into channels seemingly far removed from the oil business. They have studied the effect of increased compression ratios on power and economy, metallurgy, ignition systems, heat losses to cooling water, exhaust gases and distri-



Knock Testing Engine Laboratory in Detroit.

Determining gasoline volatility in testing laboratory.

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bution of fuels in intake manifolds. With an eye to the future, they have been studying problems of supercharging for some years.

Of necessity we have been pioneers in knock testing equipment and knock testing procedures. We built the first knock test engine ever produced and at one time, when they were available nowhere else, manufactured and sold knock test engines to the oil industry and various research laboratories.

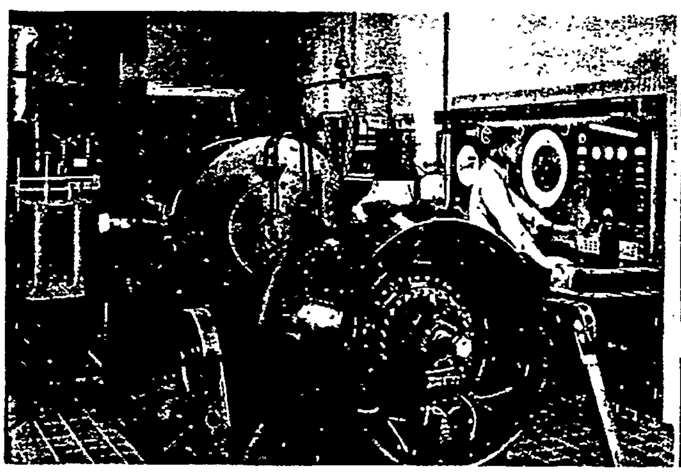
For several years the work of Ethyl's aeronautical laboratories has been devoted entirely to cooperative programs with the armed forces. The nature of their work and the projects on which they are cooperating are strictly confidential. But it may be said that, in effect, these laboratories are a part of the air forces of the Army and Navy.

Our Engineering and Chemical Research Laboratories today are devoting a major portion of their time and facilities to projects connected with the war effort. These projects include the study and improvement of fuels and engines for airplanes, tanks, invasion boats, trucks and mobile power plants.

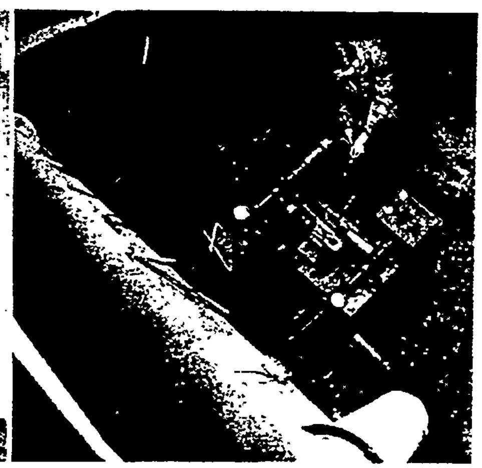
Lines carrying gasolines, water, etc., to engine and chassis dynamometers in Engineering Research Laboratories in Detroit.

Lead analysis in Gasoline Testing Laboratories.

Army tank engine being prepared for dynamometer tests in Detroit Laboratories.



Pilot plant for tetraethyl lead studies in Chemical Research Laboratories in Detroit.



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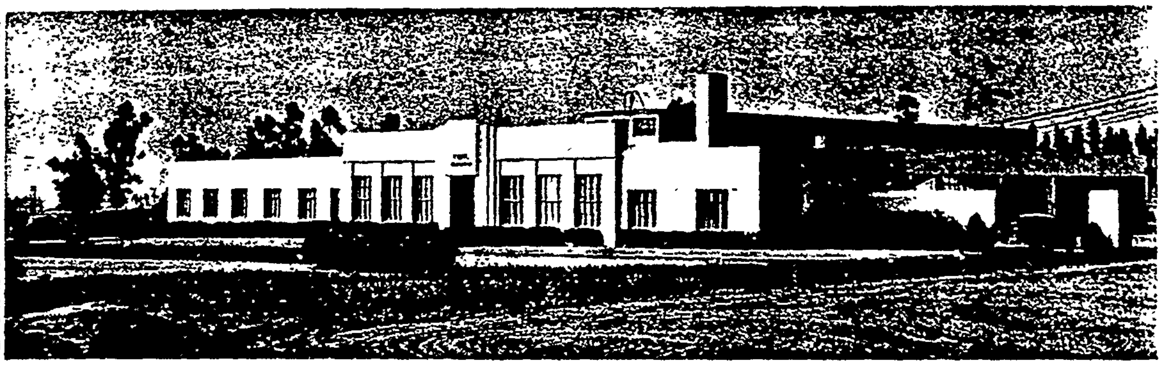


Research and Engineering Laboratory at San Bernardino, California.

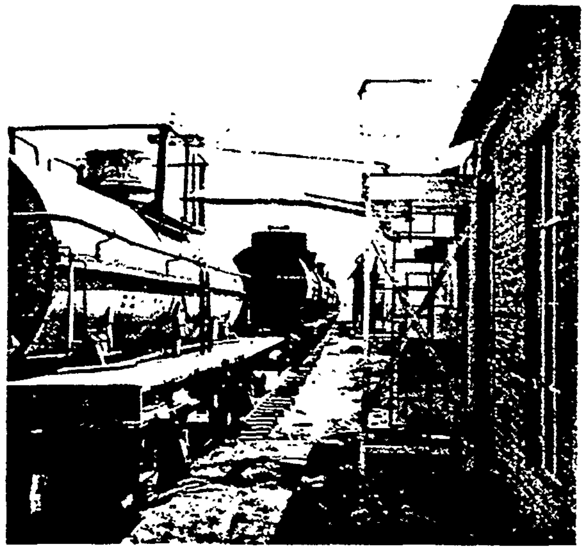
Gasoline Testing

In addition to the research laboratories we have six gasoline testing laboratories located at strategic points throughout the country. The function of this department is to provide the sample inspection services which our licensing agreement offers to customers. In other words, we test the refinery product of our customers to determine its requirement of Ethyl fluid to make Ethyl gasoline. Inspection reports on these samples are telegraphed to the licensee on the day the sample is received.

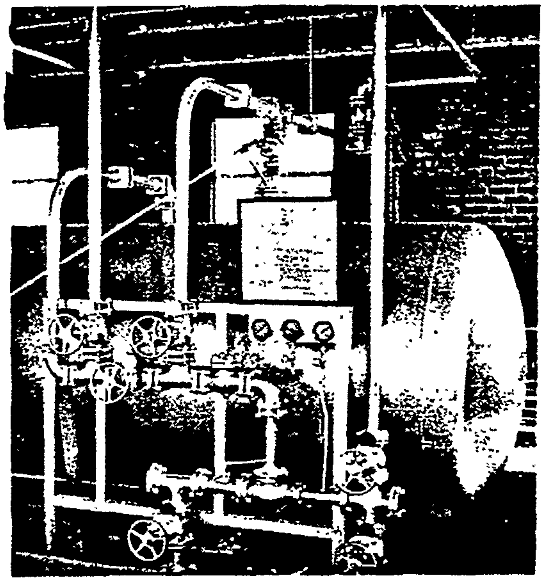
These laboratories maintain a close check on the quality of fuels being marketed throughout the nation through constant check of samples — some 14,000 a year — which are picked up by our field men. This information is of great value to our customers, to us and to automobile and airplane manufacturers in their efforts to determine certain design features of motors — compression ratios and pressures. The gasoline testing department also provides our research men with inspection data on special samples originating in various projects and furnishes information to the Safety Division on the blending operations of licensees.

Chassis Dynamometer showing duct for supplying air at velocities up to 85 miles per hour to vehicle radiator at San Bernardino, California, laboratory.

Tank car of Ethyl fluid ready for unloading at a refininery blending plant.



At refineries, Ethyl fluid is stored in weigh tanks for blending with gasoline under a completely closed system.



Safety Factors

Because of the toxic quality of concentrated Ethyl fluid we exercise rather rigid control over its handling even after it passes into the hands of the refiner. We evolved closed systems for blending fluid with gasoline at customer company refineries, which we think have been responsible for the excellent record of industrial safety over years of blending in literally hundreds of locations.

Because of the toxic quality of concentrated Ethyl fluid we take exceptional precautions in the manufacturing process. Despite the unfortunate accident at our Baton Rouge plant a few weeks ago, our record of safety in manufacturing is an excellent one.

Why Ethyl Pumps Are Dry

Right now we are being asked by the Petroleum Administration for War to produce all the Ethyl fluid we can. Our product is ranked in importance with the production of planes and we have top priorities of all sorts including manpower to aid us in this job.

Only a small percentage of Ethyl fluid production is today going into civilian gasoline and it is the opinion of Government agencies in Washington as well as automotive and petroleum technologists that any further reduction in these civilian supplies might handicap our wartime transportation seriously. Last week the Petroleum Administration for War reduced the amount of premium gasoline again so that now there are roughly only 100,000 barrels a day of Ethyl gasoline available and that is hardly more than is needed to take care of those trucks and buses which require a higher antiknock gasoline than the gasoline now being sold as regular grade. There is some tetraethyl lead in regular grade gasoline today but the average content is so low, and yet it means so much to the quality of that gasoline, that it is not deemed wise to deprive civilian gasoline of this small amount.

This brings us back to aviation gasoline, the production of which is today our principal concern. That is where most of the Ethyl fluid is going. Some, of course, goes into military gasoline for ground troops which the Army calls "all purpose" gasoline, a type of motor fuel very similar to the Ethyl gasoline you purchased for automobiles before the war. But that quantity is small in comparison to the amount of Ethyl fluid needed for aviation.

The 100-octane aviation gasoline or "fighting grade" aviation gasoline, as it used to be called, is used by all Army and Navy planes at the front. The oil industry in this country has done a titanic job in expanding the production of 100-octane gasoline and still supplies of it are so limited that a lower quality gasoline is used for training pilots in this country. So far we have never failed to deliver all the Ethyl fluid that the oil industry needed to make 100-octane aviation gasoline and we never intend to let that happen.

More Manpower Needed

Now, as I have explained, to make Ethyl fluid you need a lot of things. You need manufacturing plants, seawater, sulphuric acid, pig lead, electricity, sodium, and so forth. One factor I have not stressed that you need above all is manpower — intelligent, capable operators to run the plants. If we needed more pig lead or more salt our problem might be easy. If we needed a new plant, it would take quite a while to build it. As it is, when all the components that go into Ethyl fluid are considered, there is always the one bottleneck, which you might say determines the total amount which can be produced. It is like baking a cake. You may have all the salt and flour and sugar you need but if you don't have the baking powder, you can't make a cake or if you have only a little baking powder, then the amount of cake you could make would depend on how much baking powder you have. I don't like to speak of manpower as a bottleneck but right now it is the factor which is determining the quantity of Ethyl fluid which we can make. We need more workers immediately in the Baton Rouge Ethyl plant.

That is one of the reasons for the campaign to get more workers that has been put on here during the last month or so.

Of course, if Germany should fold up tomorrow, our needs for Ethyl fluid would be lessened. Victory in Europe will "take the heat off us" so to speak. But the Army

THE MAN WHO DANCED TOO SOON

Don't make his mistake! If Germany collapsed tomorrow, the war would not be over. Millions of gallons of high-octane gasoline are needed to deliver the knockout punch to Japan. That's why every man-hour in this plant is so vital to complete victory. Don't let up — keep the Ethyl coming!

EVERY DROP OF ETHYL COUNTS

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and the Navy do not figure on enough supplies for the most favorable conditions. Their strategy is to get enough material to win under the worst conditions and I can assure you that from their schedule of estimates of requirements for Ethyl fluid, they are not banking on Germany folding up tomorrow.

Ethyl Fluid After the War

That brings us to the position in which our business is going to find itself and the question of the function of the Baton Rouge plant after the war. Some of our friends are worried and some people even seem to be hopeful that the business of the Ethyl Corporation won't amount to much in the post-war years. I'd *like* to assure you that it is going to be better than before the war started but I can't do that because in business you don't make promises until you have all the facts in hand. That is one of the differences between politicians and business men. Some politicians seem to think it's all right to paint a pretty picture of promises and then if they are not fulfilled, they pass the buck to somebody else. Business men seem to feel that if they make a promise they have to be sure they can deliver. So all I can say is that, so far as we can see, and we've looked into the picture mighty closely, the prospects for the business of the Ethyl Corporation and, therefore, the prospects for its Baton Rouge plant, look sound to us. We were doing a nice business before the war started when Ethyl fluid for aviation gasoline was such a small part of our business that it didn't count. And we are laying our plans to surpass that business in the peacetime years which are ahead. Only the future can tell how accurate our estimates are. Right now there is only one job: to supply all the Ethyl fluid we can until Victory, and I can assure you we are not worrying about what will happen after the war is over. *We are looking forward to Victory,* looking forward with hope!