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**THE APPLICATION OF THE OIL FUEL FOR AUTOMOBILE  
TRANSPORT.  
(THE FIRST HALF OF THE 20<sup>TH</sup> CENTURY)**

So far development of the automobile transport was accompanied by means of change of the composition quantity of the oil fuel. From the moment of the invention of the internal combustion engines of the carburetor type was began the era of the use benzene of the motor oil, which was became the general product of oil refining.

The invention of engines with high degrees of compression required fuel with the sufficient anti-detonation characteristics. In connection with that fact there was a tendency to gradual substitution of pure benzene with mixed benzene. Such additions as benzole, tetraethyllead and alcohol served as antidetonation dopants.

The creation of such cracking-systems allowed to increase octane numbers of benzene.

At the end of the 19<sup>th</sup> century the invention of the new diesel engine lead to the creation of another type of motor fuel. Diesel engines burned oil fuel. Thus, at the first half of the 20<sup>th</sup> century oil fuel took first place among motor fuel of all sorts on the foreign market.

**DISCUSSION**

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At the end of the 19<sup>th</sup> – at the beginning of the 20<sup>th</sup> century the invention of the internal-combustion engine turned benzene from waste matter into the main product of oil refining. It stimulated the increase of oil extraction and the exploitation for oil fields.

In early 1980-s O.S. Kostevich, an engineer and seaman of Russian Navy, offered to use benzene for internal-combustion engines instead of gas. But the benzene engine was wide spread only after its improvement by German inventor Daimler.[1]. The epoch of the development of carburetor engines and fuel for them began in 1885 when Daimler got the license on his motors and installed them on automobiles, motorcycles and motorboats. The surface carburetor required fuel with low specific gravity and high evaporability.

Putting in practice the carburetor of air-jet type gave the possibility to use more heavy but less volatile sorts of benzene. During the World War I the increased demand on motor fuel led to reduction of anti-detonation (abilities) characteristics of benzene and more rough oil refining. The problem of motor cylinders and heating of inlet pipes. For a long time it was impossible to use high degrees of compression.[2].

The attempts to use methane so called "morass gas" as motor fuel were made in Germany during the World War I. Methane was produced by burning coke in generator furnace, installed on the automobile. At that time these attempts did not give any positive results.

In 1926 benzene represented the blend of different hydrocarbons. Their composition depended on characteristics of earth oil and methods of its refining.[3].

Later pure benzene of direct refining was gradually substituted by blended fuel. The employment (use) of tetraethyl lead in proportion 2-3 cm<sup>3</sup> per gallon gave an excellent results but for a while it was prohibited because of extreme toxic compound.

The mixture of 40% of benzole with 60% of benzene was wide spreaded due to the fact that it had antidetonation characteristics which corresponded to standarts requirements.

During the World War I such countries as England, Germany and France paid much attention to synthetic benzene and production of benzole.[4].

The mixture of benzole with benzene burned calmly and evenly, not leaving coke's lodgments and quickly evaporated in carburetor. These characteristics of benzole were in great demand and demand exceeded supply.

At that time cracking-benzene as antidetonation fuel had won a good reputation.

There was a long lasting depression on the foreign benzene market because the benzene recourees of oil industry exceeded the possibilities of supply.

On the one hand, three new states of America produced light machine oil with the great content of benzene. On the other hand States (U.S.) produced about 50 % cracking benzene.

At the same time Russia produced 3 sorts of export benzene:

- Bakinsky heavy oil;
- Groznensky heavy oil;
- Groznensky light oil.

Groznensky oil gas gave the great out put of gas benzene. On the whole the antidetonation characteristic of gas benzene was taken in proportion 2/3 (two thirds) for benzole or toluene.

In American domestic market gas benzene was consumed as a blend to benzene of direct refining- and cracking. There was several sorts of gas benzene (Grade A-G or Grade 1-4).

Some countries put into practice the politics of compulsory addition of alcohol to motor fuel on the level of legislative decrees.[5].

The main reason of such a politics was the fact that the development of agrarian crisis required a new methods for consumption of the agriculture products such as grapes, potatoes and grain, which were refined into alcohol.

During the World War I the countries which had not their own oil production were forced to consume all sorts of oil substitutes, including alcohol.

But some countries kept the trademark of consists of 80% of benzene and 20% of alcohol.

For the first time the law about the compulsory addition of alcohol was passed in France, on March 1, 1923. This law had the only one purpose – the creation of so called “national” fuel. Later the same laws were adopted in Italy, Czechoslovakia, Spain, Yugoslavia, Brazil, Austria, Poland and Hungary.

In Latvia, Bulgaria, Chile and Cuba such laws were adopted but they didn't come into force.

In England colonies such mixtures were also wide spreader.

The factory for the production of absolute alcohol was built in Panama.

In Estonia, Greece and Argentina this question had been in the stage of consideration for along time.

In Sweden, South Africa and Australia the special laws didn't exist, but alcohol added to benzene and this sort was sad equally with pure benzene.

From this point of view Germany was the classic example. In contrast to other countries the German legislation didn't foresee the steady proportions of the mixture.

For a long period of time there was a competition between benzole, blend of benzole and benzene and pure benzene.

In 1931 Germany tried to use methane as motor fuel.[6]. Methane is transported on the automobile in the steel large bottles in thickened condition. These large bottles were very heavy, that's why it was recommended to use them only for trucks.

At the end of the 19<sup>th</sup> century Diesel engines at last found its use in automobile transport. From this moment the era of absolutely new type of motor fuel- diesel fuel began.

The first engines burned fuel oil, solar oil, and even earth oil as fuel. The production of special “diesel fuel” began in the oil industry. There were several sorts of this fuel: summer, winter, arctic etc.

In 1907 Kutsbah found out that the products of oil refining which are rich in hydrogen were the most suitable diesel fuel. Paraffin hydrogens were more desirable than aromatic hydrogens.

The characterization of benzene which existed on domestic and foreign markets was given on the conference which was held in 1933, Moscow.[7]. According to its data German sorts of benzene had the highest antidetonation characteristics in the world: 67 – for ordinary sorts and 90 – for bonus sorts. These qualities of bonus sorts were received by adding alcohol and benzole fuel.

The dynamics of the increase of the antidetonation qualities was the following. The average octane numbers of ordinary sorts in England, increased from 43 in 1922 to 62 in 1932 and for the best sorts – from 51 to 70.

The increase of octane numbers was achieved by two ways:

- 1) by adding of tetraethylend:
- 2) by adding of cracking benzene with high octane number.

From this point of view USA was the leading country because in 1932 the average octane number for the ordinary commercial sorts was 62,5 and for bonus sorts – 77.

The total number of cars in Russia required octane number 55 for “Fiord”-type engines and 60 for type “Hercules”. Benzene, being in the exploitation had octane number witting 42-48 and didn’t satisfy the requirements. The new sort of benzene offered in 1933 must be consisted of mixture of cracking benzene with octane number 60-62 and Bakinsky ligroin with octane number 60.

In 1934 the production of crecking-benzine in the USA reduced till 43,7% contrary to 44,6% in 1933 by using the consuption of gas benzene of direct refining. Gas benzene raised not only octane number but also its chemical activity with regard to ethyl liquid.[8].

At that time German boosted the production of synthetic benzene.[9]. To the end of 1934 the monthly norm was 15 thousand tons of synthetic benzene.

In 1934 benzene became one op the main products of consumption on the domestic market in Russia.

In 1937 Germany preferred to produce synthetic fuel which was more expensive, thanto spend foreign currency and gold for import fuel.[10].

Germany produced benzene from her own oil and coal. Germany produced such sorts of fuel as benzole, potatoes alcohol and chemical alcohol in 1935.

In the USA it was very profitable to produce benzole as motor fuel not only for the domestic market but also for export in such countries as France, Belgium, Holland and the others.[11].

The increase of oil consumption for high-speed diesels in the USA leed to the new methods in the production of diesel fuel.[12].

Thus, the analysis of oil fuel’s consumption showed that this sort of fuel in its qualitative and quanta-tive characteristics took first place among fuel of all sorts on the foreign market of motor fuels.

## REFERENCES

1. Kostrin K. // Neftyanik. – 1965.- №11. - P.36.
2. Burrel G. // Neftyanoe hozyaistvo. – 1931.- №1. – P.123.
3. Goldberg A. // Neftyanoe hozyaistvo. – 1926.- №5. – P. 751.
4. Bukshpan Ya. // Neftyanoe hozyaistvo. – 1937.- №10. – P.77.
5. Feynberg M. // Neftyanoe hozyaistvo. . – 1933.- №2. – P.150.
6. Neftyanoe hozyaistvo. – 1931.-№6. – P.60.
7. Yakovlev N.M. // Neftyanoe hozyaistvo. – 1933.- №1. - P.12.
8. Sedyih N. // Neftyanoe hozyaistvo. – 1935.- №5. – P.72.
9. Neftyanoe hozyaistvo. – 1934.- №10. – P.53.
10. Sedyih N. // Neftyanoe hozyaistvo. – 1937.- №8. – P.68.
11. Bukshpan Ya. // Neftyanoe hozyaistvo. – 1937.- №3. – P.67.
12. Sedyih N. // Neftyanoe hozyaistvo. – 1938.- №7. – P.48.