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Petrol Fuel Compositions with Improved Ecologic-Operational Properties for Internal Combustion Engines

Mahmud Safaev, Marat Mukhamedjanov, NasrillaIbragimov, LatofatRakhimova, AbdulkhoshimTurgunov, PokizaRasuleva, RaximaIsanova, FayzullaRaxmatullayev

Technician, department “Ecology and Environmental Protection”, Tashkent state technical university, Uzbekistan
Associate professor, department “Ecology and Environmental Protection”, Tashkent state technical university, Tashkent, Uzbekistan.
Associate professor, department “Ecology and Environmental Protection”, Tashkent state technical university, Tashkent, Uzbekistan.
Associate professor, department “Ecology and Environmental Protection”, Tashkent state technical university, Tashkent, Uzbekistan.
Associate professor, department “Ecology and Environmental Protection”, Tashkent state technical university, Tashkent, Uzbekistan.
Senior teacher, department “Ecology and Environmental Protection”, Tashkent state technical university, Uzbekistan.
Senior teacher, department “Ecology and Environmental Protection”, Tashkent state technical university, Uzbekistan.
Senior teacher, department “Ecology and Environmental Protection”, Tashkent state technical university, Uzbekistan.

ABSTRACT. In article is during the last of years we conducted the initiative researches directed to decrease the content of harmful substances in emissions of the motor transport. It is revealed that insufficient access of oxygen of air for full oxidation of a kernel of micro particles of fuel for very short period of stay of fuel mix in engine combustion chambers is the main reason for incomplete burning of hydrocarbon fuel in DVS combustion chambers. Ensuring full burning of hydrocarbon fuel is considered expedient in the economic, technological, power and ecological relations.

KEYWORDS. Oxygen, carbon monoxide, nitrogen, enterprises, plants, devices, incinerators, zone, alcohol-containing, cotton stalks, among methanol, ethanol, isopropanol, isobutanol.

I. INTRODUCTION

Air is one of six main components of the environment influencing development of all biospheres and life of human society. Content of hydrocarbons and fine soot, one of products of incomplete burning in air though in insignificant concentration, irritates internals, gastrointestinal and respiratory paths. Under the influence of poly-nuclear aromatic hydrocarbons - representatives of products of incomplete burning of DVS hydrocarbons in air there is an exacerbation of already available respiratory diseases, reflex change of some function of a cerebral cortex, there is a trend of a hyperglycaemia, hypo-vitaminosis, lag in physical development of children and other undesirable changes in a children's organism is observed. Experts established close connection between the content in air of poly-nuclear aromatic hydrocarbons and lung cancer mortality rate. Besides, in many countries of the world are proved growths of mortality of the population at increase in degree of impurity of air by hydrocarbons, especially among the inhabitants living nearby or in most in the industrial zone.

Development of complex measures, including synthesis of composite fuel mix for use in engine systems of internal combustion (DVS) without unit of additional mechanical hardware knots for ensuring full (maximum) burning of hydrocarbon fuel in combustion chambers is an issue of utmost importance, need and also going with regrets with big delay.

Development of an environmentally friendly complex multipurpose way and technology of receiving the synthetic fuel composition providing full combustion weed component organic fuel with simultaneous increase in

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octane number in DVS where on a flexible production cycle at full sanitary ensuring process, without decrease in energy potential of the used energy carrier is one of the main objectives of today.

II. SIGNIFICANCE OF THE SYSTEM

In article is during the last of years we conducted the initiative researches directed to decrease the content of harmful substances in emissions of the motor transport. The study of literature survey is presented in section III, methodology is explained in section IV, section V covers the experimental results of the study, and section VI discusses the future study and conclusion.

III. LITERATURE SURVEY

Fuel mix for engines of internal combustion and emissions in the atmosphere. Fleet of vehicles which is one of the main sources of environmental pollution is concentrated generally in the cities. If on average in the world eleven cars, then density them in the largest cities of the developed countries are the share of 1 sq.km of the territory is 200-300 times higher. For example at almost identical territory of of Tashkent and Seoul the quantity registered across Seoul only of the automobile motor transport is 3.500.000 units, apart from registered in rural areas. Their number grows from year to year in Tashkent too. Especially it is strongly noticeable after commissioning of a domestic automobile production. In confirmation of the aforesaid it should be noted that the total number of automobile units in the Republic of Uzbekistan strongly grew in 2004, by 106 units. At the same time annual fuel consumption is more 9×106т, including 2,5×106 t of diesel fuel.

Increase in its contribution to air pollution is a consequence of growth of fleet of vehicles. Experts [1] established that one average car annually absorbs from the atmosphere on average more than 4 t of oxygen, throwing out with the fulfilled gases about 800 kg of carbon monoxide, about 40 kg of oxides of nitrogen and nearly 200 kg of various hydrocarbons.

To motor transport (as DVS are considered as mobile reactors on production of toxic substances) as to a source of pollution of the air environment, a number of distinctive features is inherent: First 61% all of toxic emissions whereas from the industrial enterprises – 16%, power plants – 14%, heating devices – 6% and incinerators of-3% fall to the share of cars [2]. Secondly, unlike the industrial sources of pollution tied to certain platforms and remote from the housing estate by sanitary protection zones, the car is the moving source of pollution which is widely found in residential areas and vacation spots. Thirdly, automobile gases represent extremely complex, insufficiently studied mix of toxic components coming in urban development to a ground layer of air where their dispersion is complicated. And, at last, modern opportunities of decrease in toxicity of exhaust gases are not able to provide desirable degree of purity of air yet. These features put a problem of protection of the atmosphere against pollution by motor transport in a row of the most complex and current problems in the modern city.

IV. METHODOLOGY

Synthetic composite fuel mix of new generation. The real analytical and research direction provides studying of ensuring full burning of hydrocarbon fuel in combustion chambers for very short period, preventing formation of products of incomplete burning that positively influences increase in power engine capacity at identical unit of an expense of volume of fuel. The prime cost of the studied synthetic composite fuel mix (SCFM) is not higher than prime cost of traditional fuel. Besides, during application of efficiency of engines increases due to increase in full volume of combustible fuel in the DVS cameras.

According to the State committee of the Republic of Uzbekistan on conservation the volume of emissions from motor transport in 2008 was 1397.42 thousand tons that makes 67% of total amount of emissions. And emissions of products of incomplete burning made 107.768 thousand tons that makes 6% of masses. from the general the number of emissions.

The refusal of tetraethyl lead (thermal power plant) as anti-detonator put producers of fuels around the world before a problem of finding of a cheap and effective alternative. All known ways of increase in octane number are more expensive than thermal power plant, and some recommended lead even to deterioration in ecological and operational characteristics of fuel.

Increase in octane number of gasoline's to the required level is possible or expansion of production of high-octane hydrocarbon components of fuel, or selection new non-toxic an octane of the raising additives and components not of oil origin.

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In modern conditions for domestic fuel industry most we accept the second way therefore now in our country the question of development of effective, inexpensive and environmentally friendly high-octane additives more than ever is particularly acute. Long-term experience of use of various classes of anti-detonators showed that the most perspective are oxygen-containing connections – oxygenate (filched derivatives, etc. oxygen the containing substances).

Experiments about an octane were conducted by the raising additives on the basis of alcohols in the Republic of Uzbekistan for a long time, however the offered developments have only prescription character, and researches are directed to decrease in the known shortcomings of alcohol-containing fuels, such as phase stability, corrosion aggression, etc.

Development of high-octane petrol compositions with addition of aliphatic alcohols and their mixes in the form of their derivatives meeting modern requirements of GOST on the decision which present scientific and analogical and technological information is directed is on today's one of necessary is paramount important questions. For achievement of a goal a number of scientific and technical tasks from which the following is the most important was solved:

- the analysis of anti-detonation efficiency of individual aliphatic alcohols and their derivatives in Tax Code fraction - 78 ° C of straight-run gasoline and a reformate, and finding of the additives giving the greatest gain of the lake of h with development of technology of definition of an optimum way of dehydration of oxygen-containing additives.
- stay optimum oxygenate the additive showing high an octane the raising ability and resistance to stratifying in composition with gasoline;
- development of structure of oxygenate-petrol composition for receiving the high-octane fuel conforming to modern requirements of the specifications and technical documentation.

On the basis of the carried-out analytical research works the synergetic effect an octane of the raising properties for the first time is found at joint presence at fuel composition of hydrocarbons from oxygenate.

It is established that the dependence of pressure of saturated steam of composition of Tax Code fraction - 78 ° C of straight-run gasoline (C3-C6) from oxygenate from concentration has the extreme character caused by formation of an azeo-trop. The provision of a maximum of the curve displaying this dependence corresponds to contents of the oksigenat and fluctuates in the range of 5-15% about. also depends on concentration of individual hydrocarbons as a part of a petrol component. At the small content of aromatic hydrocarbons in gasoline of the lake of h mix considerably exceeds additively. With increase in content of aromatic hydrocarbons the mixture octane number at first approaches additive, and then to become below it.

It is shown that achievement of temperature of turbidity of o oxygenate containing fuel established by standards does not demand deep degrees of the added component. On the basis of the conducted researches the structure is picked up and the pilot pilot lot of automobile gasoline which is used as AI-92 brand gasoline replacement is released. In our case instead of pure ethanol the ethanol concentrate as a part of products of pyro-condensate of bio-plant material, in particular in a liquid part of products of pyrolysis of a cotton stalks is applied.

The choice of oxygenate was based on their properties and opportunities of their production. Methyl alcohol has the highest anti-detonation properties. Ethanol - the most mass product among aliphatic alcohols. Isobutyl and isopropyl alcohols besides of the properties possess also stabilization action in relation to alcohol-petrol mixes. Therefore it was represented necessary to estimate their anti-detonation effect as separately, and at mixes with other alcohols.

The fact described in literature that paraffin has the worst dissolving ability and the best acceleration performance to alcohols, and aromatics opposite became the basis for the choice of petrol components. Fraction of straight-run gasoline for 82,3% of masses-from paraffin hydrocarbons, and reformate for 62,8% of masses consists of connections of an aromatic series. Therefore the chosen petrol components will be extreme cases of solubility and anti-detonation efficiency of alcohols among components of commodity gasoline’s. At the same time gasoline’s straight-run and reforming make the main share in petrol fund, 11 and 54% about respectively.

Octane numbers (the lake of h) of basic oil products and fuel compositions decided on single-cylinder motor installation in accordance with GOST 8226-82 (a research method) and GOST 511-82 (a motor method), a calculation method on use IK- spectroscopy on the IROX-2000 analyser. Determination of moisture content of the oxygenate was carried out by culonometric titration. Temperature of turbidity was determined on the low-temperature KRIO-VT thermostat in accordance with GOST 5066-91.

Anti-detonation efficiency of alcohols and their mixes in Tax Code fraction - 78 ° C of straight-run gasoline and gasoline of catalytic reforming

Showed researches that the anti-detonation efficiency of individual aliphatic alcohols is located among methanol> ethanol> isopropanol>isobutanol. We believe that such dependence is explained by the mechanism of anti-detonation effect of alcohols. It is known that the detonation in the engine of the car has the radical chain mechanism. Alcohols have the high resistance to reactions of radical splitting decreasing with M.'s increase of mass of alcohol. At

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compression in the engine there is a structuring a system as a result of which alcohols, possessing as a part of a molecule hydroxyl group, can shield the most active radical IT'. Influence of functional group also decreases with increase in a hydrocarbon radical. Therefore also the anti-detonation efficiency of aliphatic alcohols will go down with increase in mass of a molecule.

V. EXPERIMENTAL RESULTS

Comparison of the results characterizing distribution of detonation firmness of the blank reformat and its composition from 10% about.theoxygenate, shows that addition of the oxygenate to a reformat not only raises it O.Ch., but also improves distribution of detonation firmness on fractions that allows the engine to work evenly in all modes of its operation. The main focus was directed to a research of anti-detonation efficiency of mixes of oxygenate. For specification of parameters mixes were made: "Ethanol Methanol", "Ethanol Isopropanol" and "Izobutanol Ethanol" in ratios 1:2, 1:1 and 2:1 on weight. Mixes added in the number of 5, 10 and 20% about. The best anti-detonation efficiency Tax Code fraction - 78 ° C of straight-run gasoline has, and in case of the reformat on absolute value the mix "Ethanol Methanol" possesses, and with reduction of content of methanol in it the efficiency decreases. The smallest gain of octane number shows the mix " Isobutanole Ethanol", and "Ethanol Isopropanol" has intermediate value. In two last cases with reduction of content in ethanol mix the anti-detonation efficiency decreases.

Proceeding from the received results we assumed mutual influence of several oxygenate at their joint presence at oxygenate contain fuel. For confirmation of the assumption we carried out comparison of real and settlement gains of O.Ch., and calculation was made by the rule of additively on the basis of experimental data on its gain for the individual alcohols received by us during the previous researches. Comparison showed that at all cases there is a positive (synergetic) effect of mixture of alcohols.

The received results showed that, the size of synergetic effect increases with increase in content of oxygenate mix in fuel composition. Comparing various mixes among themselves, it is possible to note the next moments: for the oxygenate of mixes the optimum ratios (showing the greatest value of synergetic effect) are identical both in a case with straight-run gasoline, and in a case with reformat. For the mix "Ethanol Methanol" an optimum ratio 1:1, "Ethanol Isopropanol"-2:1 and "Isobutanoleethanol" - 1:1. However if to arrange them in ranks on decrease in size of synergetic effect, then they will differ for compositions with a different hydrocarbon basis. For compositions on the basis of NK-78 fraction of straight-run gasoline, that is gasoline of the paraffin basis, the sequence looks so: "Ethanol Isopropanol".

Researches showed that the method offered by us is suitable for industrial conditions, allows to receive oxygenate the set purity without consumption of toxic or expensive reagents and to reduce competitive adsorption, reducing, thus, ethanol losses. Phase stability of oxygenate-petrol compositions with mixes of alcohols was in addition studied. This research was conducted by us on NK-78 fraction of straight-run gasoline at addition of mixes of alcohols to it "Ethanol: Alcohol", investigated by us earlier on octan ability, in number of 10% about. (Table-1.)

Table-1

Gain of the lake of h due to mutual influence of alcohols in reformat compositions with mixes of alcohols

№	Composition of composite fuel mix	Value of octane number (motor method) at concentration of the oxygenate, % about		
		5	10	20
1	Ethanol – methanol – 1 : 2	0,6	1,2	1,6
	Ethanol – methanol – 1 : 1	0,6	1,1	1,7
	Ethanol – methanol – 2 : 1	0,6	0,6	1,1
2	Ethanol – isopropanol – 1 : 2	0,4	0,6	0,8
	Ethanol – isopropanol – 1 : 1	0,5	1,2	1,5
	Ethanol – isopropanol – 2 : 1	0,6	0,9	1,6
3	Ethanol – isobutanol – 1 : 2	0,5	0,6	0,8
	Ethanol – isobutanol – 1 : 1	0,4	1,0	1,3
	Ethanol – isobutanol – 2 : 1	0,4	0,7	1,1

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Follows from results of a research that compositions with use of the mix "Ethanol Methanol" at all ratios of alcohols do not reach the value of temperature of turbidity demanded by state standard specification in conditions of production of -30 °C. The mix "Ethanol Isopropanol" gives the chance to receive the alcohol-petrol compositions satisfying to standards for this indicator, but at ethanol content in spirit additive less than 30% of masses. The curve characterizing phase stability of compositions with addition of mix of alcohols "Isobutanol Ethanol" shows that at ethanol content in additive of 0-55% of masses, temperature of turbidity is in limits, admissible standards.

Thus, comparing results on octan containing ability of mixes of alcohols and phase stability of compositions it is possible to draw a conclusion that the optimum additive to gasoline's improving anti-detonation properties is mix of alcohols "Isobutanol Ethanol" in the ratio 1:1 on weight. Addition of ethyl alcohol to gasoline changes its many characteristics including pressure of saturated steam of fuel. For a research of this phenomenon compositions with different amounts of ethyl alcohol from 5 to 50% were made about. At addition of alcohol in quantity up to 6% about.pressure of saturated steam of composition sharply increases. With further increase in concentration of alcohol in gasoline pressure of saturated steam gradually falls, aspiring to pressure of saturated steam of pure ethanol. Such behaviour of fuel is connected with what at mixture of alcohol with hydrocarbons is formed azeotrop, having more high pressure of saturated steam, than the components making it. Azeotrop with ethanol form only some of the hydrocarbons which are present at gasoline. Existence of a maximum is also explained a curve of pressure of saturated steam which corresponds to the content of the ethanol sufficient for formation of an azeotrop with all attendee in gasoline amount of hydrocarbons by it.

VI. CONCLUSION AND FUTURE WORK

Thus, the synergetic effect of joint presence of ethanol with methyl, ethyl and isobutyl alcohols at their application as anti-detonation additive is for the first time found. The size of this effect depends on qualitative and quantitative composition of spirit additive, its concentration in alcohol-petrol mix and group composition of basic gasoline.

It is established that the fuel containing more than 40% about. the oxygenate, allows to reach necessary phase stability without additional dehydration and introduction of the additional stabilizing additives.

With use of the regularities received during the research the structure of high-octane fuel compositions of gasoline's with addition of the aliphatic alcohols meeting modern requirements of normative and technical documents is offered.

It is shown that use of oxygenate not only raises the lake of h fuel, but also saves expensive hydrocarbon components, gives the chance to reduce the content of high-octane toxic aromatics in gasoline, improves distribution detonation of firmness on fractions of gasoline's on the basis of the reformat and also expanding a source of raw materials for production of fuels at the expense of raw materials not oil origins.

REFERENCES

[1]. Turabdjanov S.M. Environmental protection and solutions of environmental problems in Uzbekistan. Scientific and technical journal of a problem power-and resource-saving .№1-2 2002 189-200 pp.
[2]. SafayevM.M., AlikhanovB.B., SaydakhmedovSh.M.,TadjiyevK.D., etc. The patent of the Republic of Uzbekistan "IAP 02859 on "Installation and a way of processing of waste" with a priority of 22.09.2003 date of registration.№ 3.2005.
[3]. Safiyeva R.Z. Chemistry of oil, M., Chemistry, 1998, 488 pp