ENVIRONMENTAL ASSESSMENT OF VARIOUS FUELS FROM GREENHOUSE EFFECT POINT OF VIEW

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The quantity of greenhouse gas released during complete combustion of various fuels comparing with the received heat energy is evaluated. The mentioned values were compared with each other and given in form of a diagram. Besides, the article discusses the advantage of methane over petrol as automobile fuel. Testing results of automobile running on natural gas are given as well.

Key words: **greenhouse effect, global heating, methane, natural gas, exhaust, combustion products.**

Within the recent years ecological situation of our planet keeps deteriorating day by day. Floods and wind storms frequently occur in number of regions on the earth and ice cover on the land as well as seas and oceans significantly diminished. This causes the elevation of the sea bottom and it is expected that a lot of living or agricultural lands will be flooded in some of the regions of the earth. Besides, scientists assume that a lot of other cataclysms may occur.

The scientists name global heating as one of the major reasons for the deterioration of the ecological situation. The global heating process, from its side, significantly depends on the concentration of gases with greenhouse effect in the atmosphere. Main part in gases with greenhouse effect is plaid by CO_2 which is complete combustion product of various fuels. Apart from CO_2, N_2O CH_4 and other excess of the greenhouse gases that are related to human activity and observed in the atmosphere in various quantities break heat balance on the earth. Heat potential of each of it is different, that is why CO_2 is taken as an etalon and the potential of all other greenhouse gas is taken in relation with it. For instance, the greenhouse potential of CH_4 is 21 times more than of CO_2, the greenhouse potential of N_2O is 310 times more, and the potential of some greenhouse gases is even more although their concentration in the atmosphere is far less than the concentration of CO_2 or CH_4. Such gases differ from one another also by the duration of their presence in the atmosphere [1]. For instance, CO_2 is present in a given form during 7-10 years, CH_4 during 4-7 years, N_2O for 2.5-4 years.

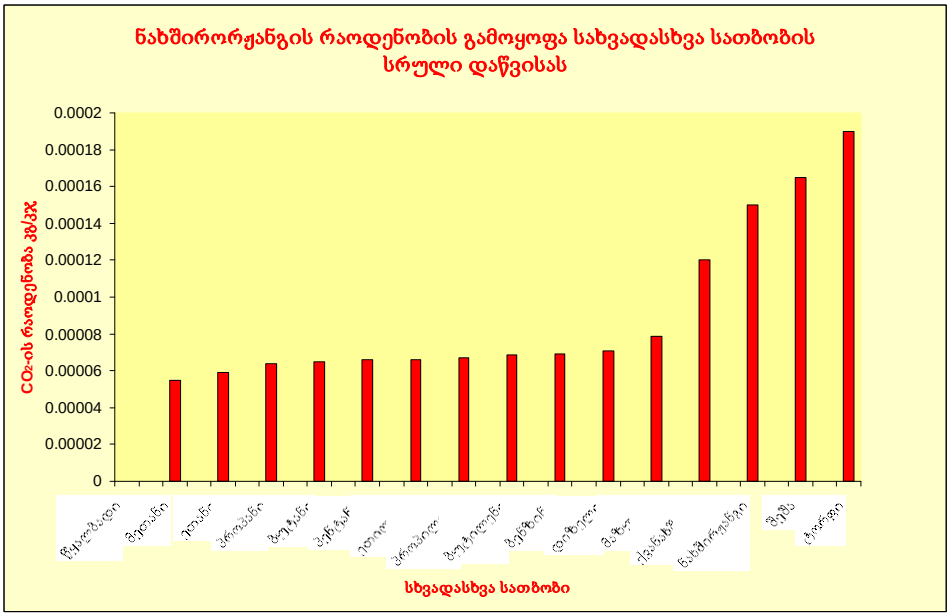
Given all the above, it is obvious that ecologically clean is the fuel which during the complete combustion emits and spreads less CO_2 in the atmosphere. Heat obtained as a result of burning fuel is its basic property. That is why, we consider the quantity of the greenhouse gas release with regard to the heat obtained during complete fuel combustion.

Below is the diagram showing the quantity of greenhouse gas released during the complete combustion of various fuels (in this case CO_2) at 1 kg/1 kJ heat.

It is seen from the diagram that just water is obtained when burning hydrogen, hydrogen is ecologically much cleaner fuel than the rest fuels, but it is used as fuel in just special occasions. From the diagram it is also clearly seen that among fuels discussed by us which are used widely, methane compared with the others is ecologically cleaner as less CO_2 is released during its complete combustion than in case of other fuels. The higher the content of carbon in fuel, the higher the share of CO_2 in the combustion product [2].

Among fuels that are widely used today natural gas is ecologically the cleanest fuel as CH_4 content in it in some cases exceeds 98%. Although, when getting in the atmosphere in a free form, even a small piece of methane is enough for changing its ecological advantage with opposite outcome. All this will be caused by high greenhouse potential of methane itself.
It is easy to determine how much methane should be lost without burning in order for it to equal, in terms of the greenhouse effect, to the greenhouse effect of CO_2 released as a result of its complete combustion. It is known that 1 kg CH_4 makes the same effect as 21 kg CO_2. 2.74 kg CO_2 is obtained during the complete combustion of 1 kg methane meaning that 0.13 kg CH_4 will have the same greenhouse effect as CO_2 released as a result of the complete combustion of 1 kg CH_4.

Quantities of CO_2 Released During the Complete Combustion of Various Fuels at 1 kJ



Given the above, during using natural gas, it is necessary to pay special attention to the elimination of technical losses of gas from the gas supply network as well as incomplete combustion, as basically these are the two ways of methane emission into the atmosphere which is associated to the human activity. In order to identify the amount of unburnt gas content in the combustion products emitted by the automobiles operating on natural gas, we ran the test at three different speeds 1000, 2000 and 3000 rpm of Gaz-3110 engine operation. The content of the automobile emission was measured with Gasurveyjr 3-500. The test showed that unburnt methane in the emission was so insignificant that regardless of its greenhouse potential, its elimination does not have any impact on total effect.

As it has been already mentioned, among fuels used today natural gas, as seen from the diagram, is ecologically the cleanest fuel. Therefore, it is ecologically reasonable to replace other fuels by natural gas (where methane is more than 90%). For instance, let's take petrol, which is consumed by the automobiles in million kg in big cities and its emission is one of the main source of environmental pollution. If we compare it to the automobile operating on natural gas (comparison is based on just the amount of greenhouse gas content in the emission), we will see that in complete combustion of 1 kg gas, 26% less CO_2 is released than in combusting petrol. Calculations showed that each medium size petrol operated light car emits 50 kg more greenhouse gas CO_2 annually than the same power car

operating on natural gas, i.e. we will get better ecological situation if there are more cars operating on natural gas.

Transferring motor transport to natural gas has another important economic privilege, natural gas is cheaper than petrol and the price of natural gas ranges less than the price of petrol which increases the potential of its use in the vehicle significantly.

R E F E R E N C E S

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