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Negative Electrization of Gasoline as a Means of Improving Its Consumer Properties

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Abstract: It is well known that the electrization of liquid fuels increases their explosiveness. The analysis of the conditions that increase this very explosiveness allowed concluding that all of them cause precisely the negative electrization of liquid fuels. Since most internal combustion engines actually use the explosive energy of liquid fuels, it was hypothesized that the purposeful preliminary negative electrization of the latter will increase the efficiency of these very engines. During the experimental verification of this hypothesis, it was in particular found that the previous negative electrization of gasoline increases the duration of the test internal combustion engine by about 30%. Like this, the ability of free electrons to transform relatively inert molecules of organic substances, including carbohydrates, to their chemically active radicals was experimentally confirmed. Accordingly, the theory of combustion, which implies that free radicals are initiators of branched chain reaction, received additional experimental confirmation. Moreover, this very experimental verification made it possible to find out that a decrease in air humidity reduces the efficiency of this same engine, while an increase in air humidity increases it. In fact, this dependence on water confirmed the correctness of the reports that minor admixtures of water improve the customary properties of liquid fuels. Of course, this very dependence can also be perceived as an additional confirmation of the long-known ability of water impurities to contribute to the electrization of liquid fuels. Be that as it may, this same dependence agrees well with views on the catalytic properties of water.

Keywords: Electrization, Liquid, Fuels, Gasoline, Alkanes, Carbohydrates

1. Introduction

Since the electrization of liquid fuels increases their explosiveness, the conditions contributing to it have been studied in detail. In particular, it was established that significant electrization of liquid fuels occurs when they flow through metal pipes. It was also established that water impurities contribute to the electrization of liquid fuels. However, the sign of the electric charge acquired by electrized liquid fuels is usually overlooked [1]. Since such an oversight is unfounded, the aforementioned charge sign should at least be able to estimate.

It should be noted right away: since typical liquid fuels are dielectrics [2, 3], direct measurement of their electric charge is problematic. In view of this, in order to determine the sign of charge, which is usually acquired by electrized liquid fuels, it was necessary to involve a theoretical analysis, in particular, Kyon's rule: upon contact of the two phases, the phase which a higher dielectric permeability acquires a positive charge, whereas the phase with a lower dielectric permeability acquires a negative charge [4]. Since the dielectric permeability of liquid fuels is 2÷3 [2], and the dielectric permeability of metals is much higher (the dielectric permeability of metals is usually assumed to be infinite ∞ during theoretical calculations), it was concluded that liquid fuels flowing through metal pipes acquire an exclusively negative charge. (Electron-donating properties of metals [4] were also taken into account.)

Moreover, it was Kyon's rule that made it possible to conclude about the negative electrization of liquid fuels containing water impurities: this conclusion was based on the fact that the dielectric permeability of water is 55,1 ÷ 88,3 (depending on the temperature) [4].

Therefore, the theoretical analysis allowed assuming that it is the negative electrization of liquid fuels that can cause their explosions. Since most internal combustion engines actually use the energy of such explosions, it was hypothesized that prior negative electrization of the liquid fuels burned in these engines would increase their efficiency. The results of experimental testing of this hypothesis are presented here.

2. Materials and Methods

A95 gasoline was used.

Negative electrization of gasoline was carried out in different ways. Of course, the van der Graaf generator, designed for electrization of liquids (Figure 1) [5], was primarily used.

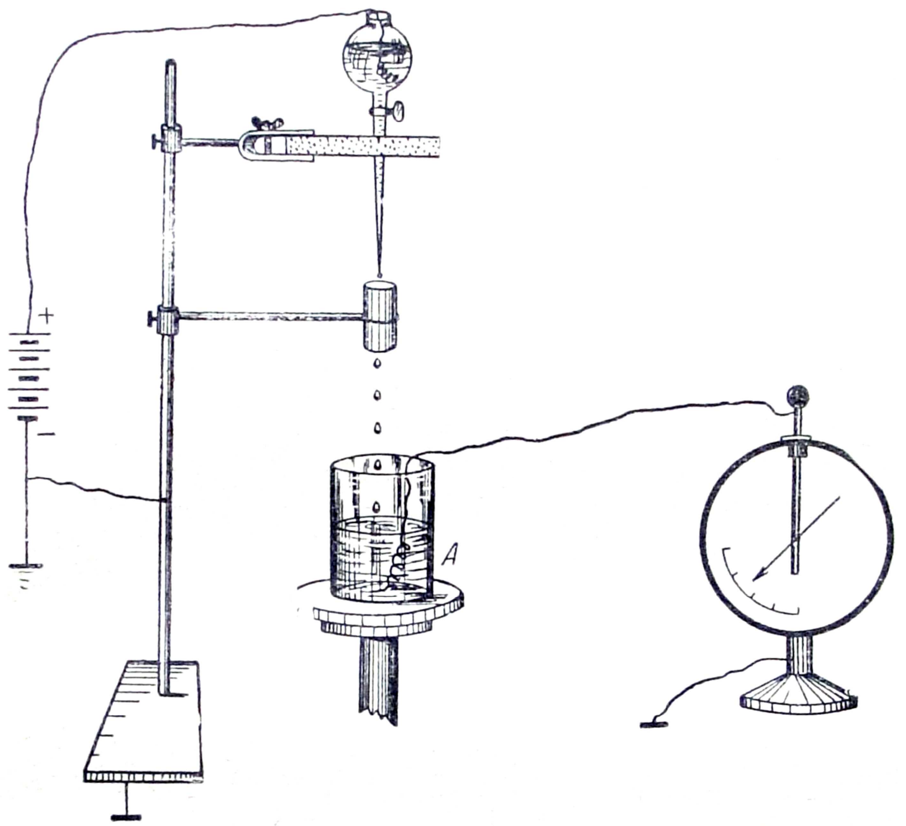

Figure 1. *This is a scheme of a van der Graaf generator designed for positive electrization of liquids [5].*

Thus, each falling drop accumulates an electric charge, the sign of which is similar to the sign of upper electrode, while opposite to the sign of charge of cylinder.

To obtain a negatively charged liquid, the upper electrode was connected with cathode, while the cylinder cathode with anode of battery.

On the other hand, the fact that vertical metal wires are polarized just like clouds (Figure 2) has also been used to obtain negatively electrized gasoline.

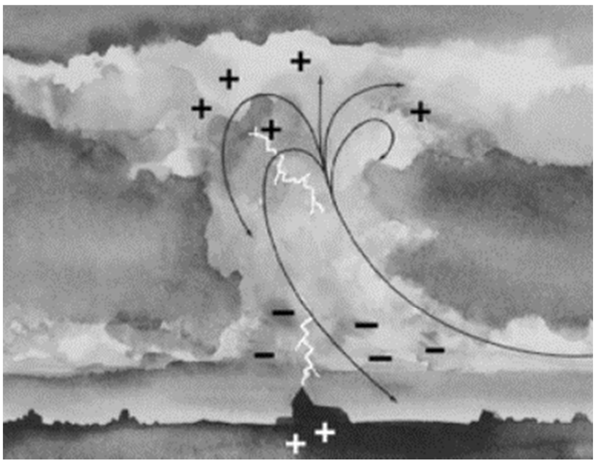

Figure 2. *Polarization of clouds: the lower part of a typical cloud has a negative charge and the upper part has a positive charge [6, 7].*

Thus, the increased concentration of negative charges at the lower ends of such wires, which enhances their electron-donating properties, made it possible to replace the cathode of the battery immersed in gasoline with pieces of vertical wire 1 – 2 meters long.

As well, the accumulation of positive charges in the upper ends of the vertical metal wires, as in a cloud (Figure 2), allowed connecting them to the cylinder of the van der Graaf generator (Figure 1) and, in this way, replacing the latter's anode.

(In fact, all this made it possible to further confirm the possibility of charging the capacitor with the help of the earth's electromagnetic forces [8].)

Negative electrization of flowing gasoline was also used (Figure 3).

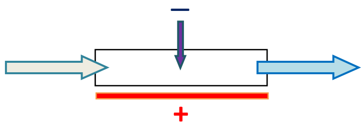

Figure 3. *This is a general scheme of negative electrization of flowing gasoline.*

The left horizontal arrow indicates uncharged gasoline flowing into a rubber pipe located above the anode (red horizontal line), and the right horizontal arrow indicates the negatively charged gasoline flowing out of this pipe.
The cathode immersed in gasoline is marked with a dark blue arrow pointing down.
A 12 volt source was used.

A FIRMAN SPG 950 (China) gasoline electric generator was used. The generator was placed on a dielectric stand during all tests. The generator was alternatively refueled with either uncharged gasoline or with gasoline negatively charged in different ways. The generator was under a constant load of 2,8 kilowatts during all experiments.

During the experiments, the following data were determined:

Volumes of both uncharged and negatively charged gasoline consumed by the generator within 30 minutes;

Duration of operation of the generator filled with 500 ml of both uncharged and negatively charged gasoline.

Voltage sources of 12 and 24 Volts were used to obtain negatively electrized gasoline.

In addition, the possible influence of negatively charged air on the operation of the same generator was evaluated. An electron emitter manufactured by Spinor International (Ukraine) was used to negatively electrify the air surrounding the generator.

3. Results

So, it was determined that the generator consumes about 480 ml of uncharged gasoline (25°C), while about 340ml of negatively charged gasoline (25°C), within 30minutes. During all these tests, relative humidity of the air remained close to 75%, and its temperature – up to 25°C; it is also worth noting that the generator was protected from direct sunlight during all experiments.

It was also found that the generator filled with 500ml of uncharged gasoline (25°C) could function no more than 27minutes (before stopping), while the generator filled with 500ml of negatively charged gasoline (25°C) could function no less than 35minutes. During all these tests, relative humidity of the air remained close to 85% and its temperature – up to 22°C; since it was cloudy throughout the testing, the generator was not exposed to direct sunlight.

Later, it was found that both dry air and direct solar radiation of the generator practically nullify the mentioned effect of negative electrization of gasoline. Under these conditions, exclusively negative electrization of gasoline flowing into the carburetor (as in Figure 3) allowed to increase its efficiency (however, by no more than 6%).

Separately, the influence of negatively charged air on the duration of operation of the same generator was evaluated. The maximum extension of the working time of the generator, which was registered during such experiments, was 37% (at a relative air humidity of93% and at an air temperature in the range of 13÷15°C).

4. Discussion

Thus, the assumption that negative electrization of liquid fuels increases their reactivity and, because of this, improves their consumer properties, has received experimental confirmation. In turn, this very confirmation suggests that the negative electrization of liquid fuels, primarily gasolines, contributes to the formation of chemically active free radicals, primarily singlet, in their composition. However, it is worth considering that the combustion of gasoline in oxygen consists of branched chain reactions initiated by singlet radicals, in the absence of which this combustion does not even begin [9]. This, consequently, allows concluding that this very negative electrization is a mandatory precondition for the ignition of liquid fuels, in particular – in the internal combustion engines.

Be that as it may, it was tetraethyl lead, which deactivates free radicals, that was added to gasolines until recently to prevent their preignition in the internal combustion engines. As you know, it was this admixture that prevented the knocking of such engines, which is caused by this very preignition [10, 11].

As well, it is worth adding that water is a source of free radicals (H*, HO*, HO_2*), which initiate the oxidation of alkanes [9, 12, 13]. Of course, the fact that the lower layers of the atmosphere are enriched with negative air ions exclusively at low atmospheric pressure should not be overlooked either, as well as the fact positive electrization of the near-surface atmosphere is observed at high atmospheric pressure [14].

It is also worth adding that superoxide anions, namely O_2^- (which are also chemically active radicals), are able to form in negatively charged air. Thus, the above-mentioned effect of negatively charged air on the generator should not be completely unexpected.

Considering all this, the following conclusions should not appear too categorical.

5. Conclusion

The fact that the negative electrization of gasolines makes it possible to improve their consumer properties seems quite possible. Probably, this is exactly what should be taken into account when analyzing the proposals of some inventors.

First of all, the proposal to pass gasoline through a cartridge of balls, the dielectric permeability of which is greater than the dielectric permeability of gasoline [15], is worthy of attention. Despite the fact that the authors of this proposal do not mention the negative electrization of gasoline, the above-mentioned Kyon's rule [4] shows that it does take place. This, accordingly, suggests that it is the negative electrization of gasoline that caused the improvement of its consumer properties, which was noted by the same authors [15].

As well, the proposal to treat liquid petroleum fuels, including gasoline, with an induced electric current [16] also deserves attention, since such treatment undoubtedly causes a skin-effect [17] in the metal pipes through which the fuel flows, and therefore its enrichment with electrons.

So, even these two examples allow assuming that at least part of the proposed methods of treating gasoline, which improve their consumer properties, are actually based on the above-mentioned negative electrization (even by default of the authors of these methods). This, in turn, allows concluding that the desired negative electrization can be carried out in a variety of ways. In view of this, the use of photoelectrons [3], as well as electrons generated by skin effect [17], looks very promising.

Nevertheless, all this allows assuming that the injection of electrons into gasolines causes ionization and, therefore, the rupture of their molecules, in particular such: $RH + 2e^{-} \rightarrow R^{-} + H^{-}$. (Here it is worth adding that similar both ionization and fragmentation are purposefully carried out in mass-spectrometers [18].) Thus, this very injection of electrons allows saving energy, which is usually involved in breaking covalent bonds in the molecules of gasoline hydrocarbons.

However, it seems that this very injection of electrons increases the reactivity of gasoline hydrocarbons in the same way as the electrization of gaseous both oxygen and hydrogen [4]. This, in turn, allows assuming that free electrons are able to partially replace those electrons that form covalent bonds between hydrogen and carbon atoms in hydrocarbon molecules, in particular gasoline ones. (Consequently, it is quite appropriate to consider the free electron as a separate chemical element and, with this in mind, to include it in Mendeleev's table.)

In any case, both the negative electrization of air and its humidification should be considered as promising energy resources.

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