Laboratory for Polymer Chemistry and Technology

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LITERATURE SEARCH REPORT ON MAGNETIC TREATMENT OF FUEL TO IMPROVE COMBUSTION AND REDUCE EMISSIONS

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Introduction

Mr. Miro Mencin contacted us due to the need of consulting about the influence of magnetic fuel treatment on the combustion reaction, increase of engine power and reduction of fuel consumption as well as on the reduced emissions. The agreement on the first meeting was that we should do a literature search and to prepare a report on this topic.

RESULTS OF LITERATURE OVERVIEW

Literature search gave initially only one literature source related to this topic
1) Authors: P. Govindasamy, S. Dhandapani
Title: Experimental Investigation of the Effect of Magnetic Flux to Reduce Emissions and Improve Combustion Performance in a Two Stroke, Catalytic-Coated Spark-Ignition Engine
Source: International Journal of Automotive Technology, Vol. 8, No. 5, pp. 533-542 (2007)

From this source a few other references were obtained:

2) Authors: I.G. Tretyakov, M.A. Rybak, E.Y. Stepanenko
Title: Method of Monitoring the Effectiveness of Magnetic Treatment for Liquid Hydrocarbons
Source: Elektronnaya Obrabotka Materialov (Sov. Surf. Eng. Appl. Electrochem.) Vol. 6, pp. 80-83 (1985)

3) Authors: A. Janczak, E. Krensel
Title: Permanent Magnetic Power for Treating Fuel Lines for More Efficient Combustion and Less Pollution
Source: US Pat. 5,124,045 (1992)

4) Authors: K.J. Kronenberg
Title: Experimental Evidence for Effects of Magnetic Fields on Moving Water and Fuels
Source: IEEE Trans. Magnetics, Vol. 21, pp. 2059-2061 (1985)

In the working principles of their publication Govindasamy et al.[1] describe the physical priciple of magnetic treatment of fuel. Magnetic fuel treatment works on the principle of magnetic field interaction with hydrocarbon molecules of fuel and oxygen molecules Liquid fuel is a mixture of organic chemical compounds consisted predominantly of carbon and hydrogen atoms - hydrocarbons. Due to various physical attraction forces, they form densely packed structures called pseudo compounds which can further organize into clusters or associations. These structures are relatively stable and during air/fuel mixing process, oxygen atoms can not penetrate into their interior. The access of appropriate quantities of oxygen to the interior of these molecular groups (associations) is thus hindered. This results in the incomplete combustion of fuel in the interior of such associations and causes the formation of carbon particles and carbon monoxide as well as increased quantities of hydrocarbons emitted into the environment.

In the scientific literature[1] it is stated that hydrocarbon molecules treated with a high magnetic field tend to de-cluster forming smaller associates with higher specific surface for the reaction with oxygen leading to improved combustion. In accordance with van der Waals' discovery of a weak clustering force, there is a strong binding of hydrocarbons with oxygen in such magnetized fuel, which ensures optimal burning of the mixture in the engine chamber. The consequence of treating fuel with a high magnetic field is improved combustion of fuel and consequently increased engine power as well as reduced fuel consumption. An additional consequence of improved fuel combustion is reduced emissions of carbon particles, carbon monoxide and hydrocarbons.

Results reported by Govindasamy et al.[1] show that treatment of two stroke engine fuel with a magnetic field of 9000 gauss increases the indicated mean effective pressure and break mean effective pressure of the engine threfore increasing also the mechanical power and break thermal efficiency (BTE). Authors[1]

conclude that magnetic energizing (magnetic field - 9000 gauss) increase the peak pressure by 13.5% improve break thermal efficiency by 3.2% and also reduce the exhaust emmissions of: CO by 13.3% and HC (hydrocarbons) by 22.1%.

Tretyakov et al.[2] studied the effectiveness of magnetic field treatment on electrical properties such as: permittivity (ε), dielectric loss angle (tg δ) and ohmic resistance in relation with magnetic field strength and temperature on air fuel T-7. Results showed that magnetic field strength (H) of 320 kA/m increased the maximal tg δ from 4 for nontreated fuel at app. 80 °C to the value of 11 at app. 100 °C. Magnetic treatment (magnetic field stzrengths H = 320 and 480 kA/m) also reduced the ohmic resistance of the fuel while no effect was observed on the permittivity of fuel. These changes in dielectric properties of fuel are an indication of the effects of magnetic treatment on the physical and chemical properties of hydrocarbons.

Kronenberg[3] showed experimental evidence about the effect of magnetic field water treatment on the properties of water and the solutes such as $CaCO_3$. Magnetic field causes the formation of microcrystals which form a stale suspension and do not precipitate out of the water. It also reduces the surface tension and viscosity of water by up to 2%.

CONCLUSION

There is experimental evidence about the influence of magnetic field on physicochemical properties of water and hydrocarbons (automotive and air fuel) as well as direct experimental evidence about the improvment of the combustion reaction and about the increase of the engine power as well as about the reduction of exhaust emissions. On the basis of reported experimental results we conclude that improved fuel combustion, increased engine power and reduced fuel consumption as well as reduced emissions of pollutants as a consequence of magnetic fuel treatment are feasible.

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