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BIOETHANOL FUELS IN IC ENGINE – A COMPARATIVE ANALYSIS OF TWO DIFFERENT MANUFACTURER'S BIOETHANOL FUELS

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ABSTRACT: In the EU, the European Parliament approved a reform of the 2020 biofuels target. The new version of the Renewable Energy Directive (RED) distributes the 10% cal. biofuels target into a share for crop-based biofuel (limited at 7% cal.) with the rest to be met with another biofuels and renewable electricity containing multiple counting possibilities. Merely 2% of the EU's fuel consumption can be covered by its own resources, which looks good pretend a strong dependence on the oil exporting countries. The implementations of biogenic fuels produced from fast growing plant are continuously gaining in importance with regard to economic and environmental effects. Generally, they are not offered in their pure form but just as blend components to conventional fuels. Their mixtures can bring about fundamental feature improvements. Ethanol fuel output in 2015 reached a peak high helped by rising gasoline demand in the US. Besides, the changes in the fuel taxation in Brazil and an increase in the minimum blending ratio also pushed along the ethanol fuel demand. The weaker euro and low grain prices on the back of a record wheat crop turned into a considerable growth in output in the EU. Disregard the stimulating developments on the legislative side, it must be confessed that the decreasing crude oil prices took their customs on the 2015 biofuel markets. For ethanol fuel, more growth could theoretically arrive from an extending of E-10 in EU member states. Unnecessary to discuss that an outlook for a post-2020 biofuels target at the EU level does not valid.
Keywords: renewable energies, biofuel target, blending ratio, ethanol fuel demand

1. INTRODUCTION

While all EU countries have domestic renewable energy resources to exploit, some areas of Europe have a greater potential for renewables than others. For instance, some countries may have more rivers suitable for hydroelectric power, while others may have more yearly sunshine better suitable for solar. The creation of Europe's internal energy market creates great opportunities for countries to work together to exploit these renewable resources and meet their 2020 renewable energy targets. The Renewable Energy Directive (RED) establishes an overall policy for the production and promotion of energy from renewable sources in the EU. It requires the EU to fulfil at least 20% of its total energy needs with renewables by 2020 – to be achieved through the attainment of individual national targets. All EU countries must also ensure that at least 10% of their transport fuels come from renewable sources by 2020.

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Renewables excluding large hydro accounted for 48% of new GW capacity added worldwide in 2014, so the renewable energies increased to 15.2% of world cumulative generation capacity, from 13.8% in 2013.

2. MATERIALS AND METHODS

In order to implement the objectives of research task the comparative analysis were made with two different manufacturer's bioethanol fuels (AGIP-E85, OIL-E85) in the engine testing brake. The measuring apparatus contains – a Honda GX 160 type (one cylinder, 4-stroke) gasoline engine, equipped with Energotest-MMP-4 type electric-brake and a computer based control and evaluating system connected to it.

The test was based on three short-term runs operated with commercial gasoline (reference) and two different bioethanol fuels with the aim to compare the internal combustion engine behaviours by unchanged settings. The engine test was made according to directives of ECE 24 standard, so the engine was fitted with the original intake and exhausting systems and these drove the moving parts. The measurements were made in 23 operating points between 1400 rpm and 3600 rpm.

The values of torque (M) and the effective power (P_{eff}) were measured in case of full throttle and fixed dispenser lever position in every operating point. After selecting a given operating point the control of the measurement, together with the collection and the evaluation of the data are completely automated.(Energopower Software)

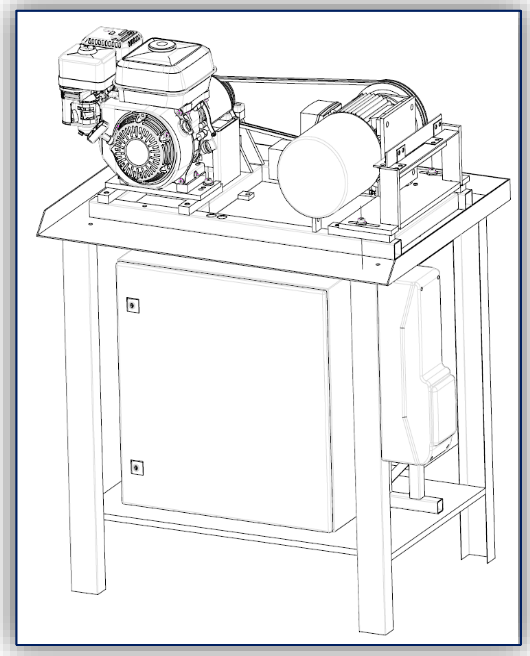

Figure 1.MMP-4 „Electric brake"

3. RESULTS

Deviations in the combustion behaviour and the functions of the engine control unit are quantifiable at the test bench. For the two bioethanol (E-85) fuels tested their torque and effective power parameters were less than the reference E-95 values. Diagram 1 shows the relations between torque and revolution and the 2-nd one describes connections between effective power and rpm.

We established more less values in case of both parameters (less, than 50%), which can explain with lower calorific value (26.7 MJ/kg) and stoichiometric ratio (8.97) of bioethanols opposite gasoline' same parameters (43 MJ/kg and 14.7). According to the measurements, our statement is that as the bioethanol content increased the effective power and the torque reduced.

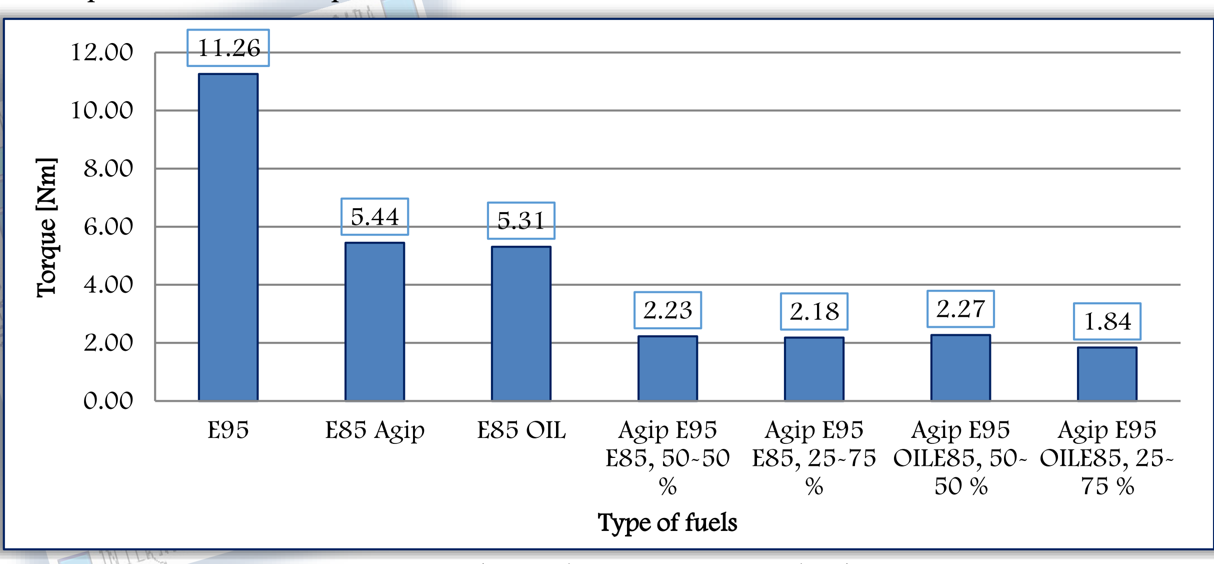

Diagram 1. Relations between torque andfuel types

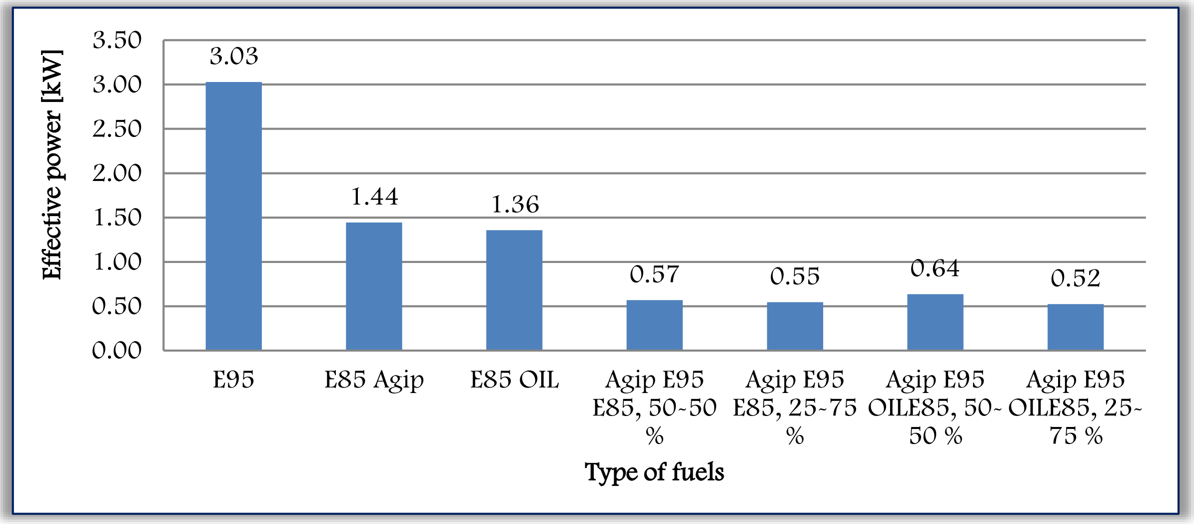

Diagram 2. Connections between effective power and fuel types

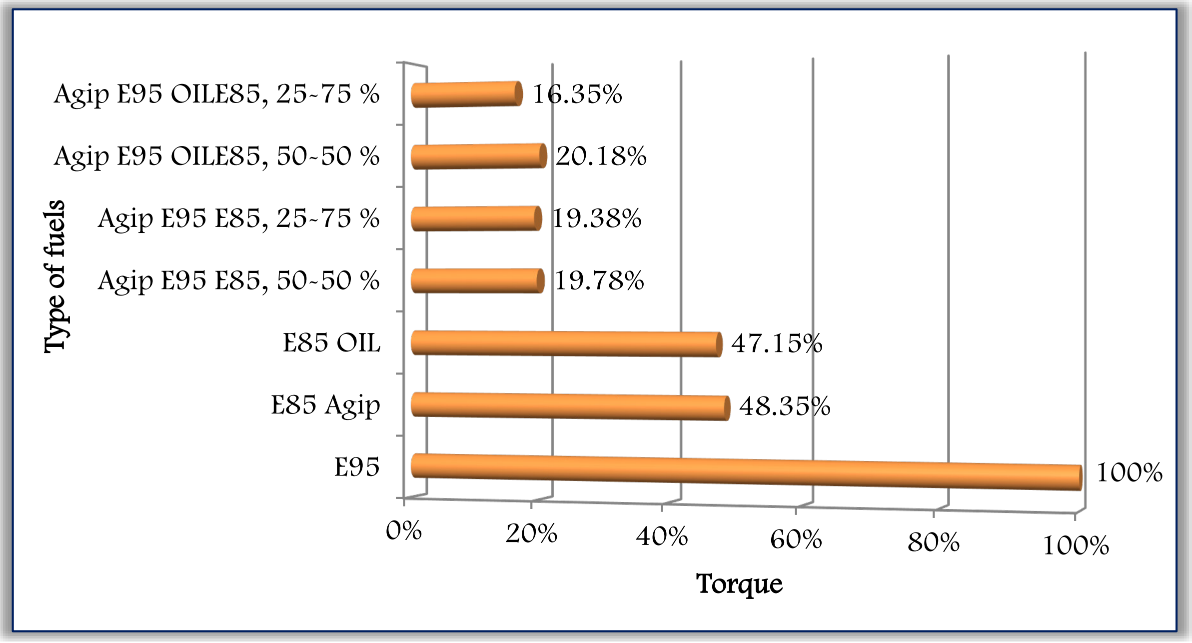

Diagram 3. Changes between torque and fuel types

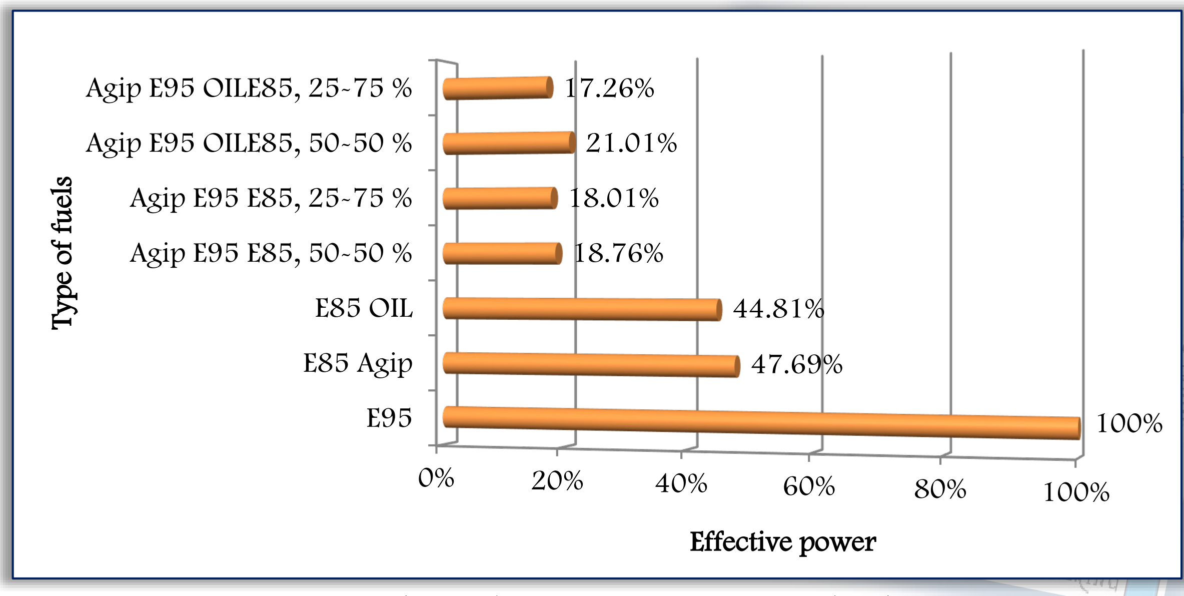

Diagram 4. Changes between effective power and fuel types

4. DISCUSSION

For this project two different manufacturer's bioethanol fuels were assessed with regard to their combustion behaviours by unchanged settings. The tests were carried out at a Honda GX 160 engine equipped electric brake. We determined that large-scale deviations of calorific value and stoichiometric ratio caused the explored very smaller torque and effective power values (less, than 50%) in case of bioethanols.

Certainly by engine settings changes (e.g. ignition timing adjustment, increasing compression ratio, spark plug) we can further improved behaviour of our engine.

5. CONCLUSIONS

Our three short-term tests were operated with commercial gasoline and two different bioethanol fuels (AGIP-E85, OIL-E85) with the aim to compare the IC engine behaviours by unchanged settings. We'd recognised more less, than 50% values in case of torque and effective power, which can explain with lower calorific value (26,7MJ/kg) and stoichiometric ratio (8,97) of bioethanols. We'd like to continue our examinations testing the further percentage distribution of several blending bioethanol fuels. In accordance with literature the effective power and the torque grows as we decrease the bioethanol content in the fuels.

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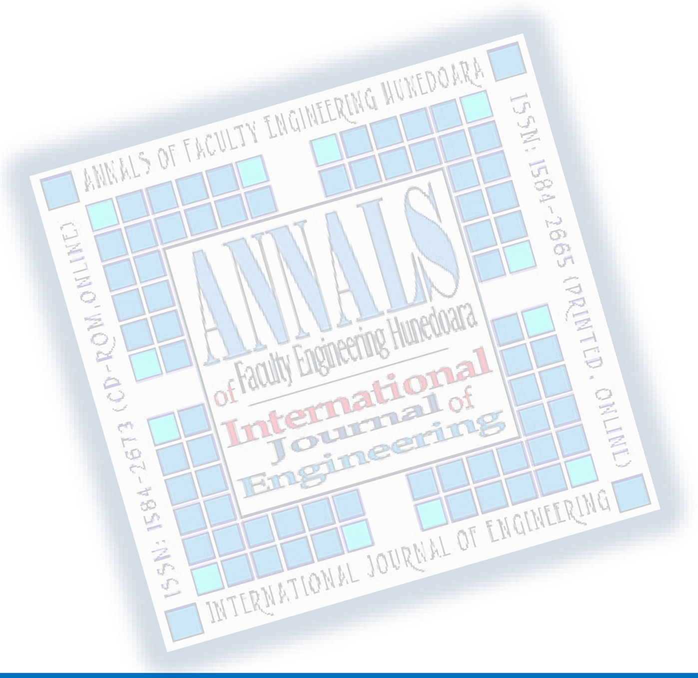

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