Reduce the emissions emitted of gasoline engine by using the magnetic field

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ABSTRACT

The combustion efficiency in most internal combustion engines are not up to 90% so the part of the fuel you will does not burn and come out with the exhaust gases, leading to increasing the fuel consumption and increasing emissions to the atmosphere. Therefore has been made several attempts to increase the combustion efficiency and reduce emissions. So which used a new way to reduce the fuel consumption by using magnetic field to complete the combustion, This leading to obtain maximum thermal efficiency and the reduction the emissions by subject of fuel by force magnetic flux of the magnet is installed at the entrance of the of fuel feeding , leading more efficient combustion. .The result which is obtained reducing the fuel consumption (L/h) up to (5.3%) . The exhaust gas emissions also showed a reduction nearly by (7.038 %) of CO, (0.314 %) of CO2 and (10.126%) of HC.

1-INTRODUCTION

Since the invent of the internal combustion engine in the late 19th century, a great number of research studies have been conducted to improve the engine performance, decrease the engine fuel consumption and reduce the unwanted exhaust emissions. Emissions and fuel consumption are two major worldwide environmental and energy challenges in the new century. Given the large number of vehicles manufactured worldwide (estimated 15-20 million road vehicles per year); transportation is one of the largest sources of emissions in the world. One major solution to decrease emissions and fuel consumption in transportation is by using a cleaner and more efficient combustion in engines. Many of experimental studies which present evidences of the benefits of magnetic treatment were occurred. For motor vehicles, much fuel economy and noticeable soot suppressions could be approached when the magnetic treatment was introduced [1] Janezak and Krensel[2] conducted an experimental test for magnetic power for treating fuel lines for more efficient combustion and less pollution. Their invention relates to the control of combustion and pollution by means of magnetic field processing of fuel lines at pre-combustion sites. Govendasamy and Dhandapani [3] studied the effect of using magnetic field on reduction of NOx emission in Bio-diesel engine with exhaust gas recirculation. They found that with the presence the magnetic field the brake efficiency increased by 5% and the values of CO and HC got reduced. Farrag A.El Fatih, Gad M.saber [4].The experiments reveal that the magnetic effect on fuel consumption reduction was up to 15%. CO reduction at all idling speed was range up to 7%. The effect on NO emission reduction at all idling speed was range up to 30%. The reduction of CH_4 at all idling speed was range up to 40%.

Al-Dossary , Rashid [5] , conducted an experimental research to study the effect of magnetic field on internal combustion engine with unleaded gasoline .Al-Dossary found that the effect of magnetic field on CO was the most significant at most engine's loads and speeds. Charles H. Sanderson [6] , in his invention , showed a method and apparatus for treating liquid fuel in an internal combustion engines by passing it through a magnetic field prior to mixing it with air in the carburetor or the fuel injector.

2- Methodology

The effect of the magnetic field on fuel (gasoline Iraqi) used in the engines and its impact on the amount of consumption, as well as emission of exhaust gases, the appropriate method was examined. We include below the description of the materials and equipment used.

2.1Magnetic devices

Magnetic devices Fig (1) used in this research were manufactured in the U.S.A. Accepted Laboratory Tested EPA. The fuel is subjected to the lines of forces from permanent magnets mounted on fuel inlet lines. The magnet for producing the magnetic field is oriented so that its (South Pole) is located adjacent the fuel line, and its (North Pole) is located spaced apart from the fuel line. Applying a magnetic field to ionizing fuel to be fed to combustion devices, one can ensure more complete combustion, obtaining a maximization of the fuel economy, improving the fuel efficiency and reducing polluting emissions.

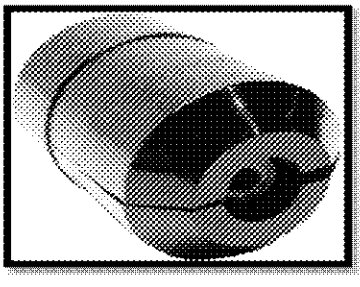

Fig (1). The Magnetic devices

2.2. Engine

The engine used in the experimental work is spark ignition engine (S.I. engine) 4 strokes, 4 cylinders, the displacement volume at this engine is (1.998L). The (S.I. engine) used with the gear box only and without using dynamometer. Figure (1) shows the experimental rig of (S.I. engine), and the table (1) gives the main technical specifications of this engine.

2.3. Fuel consumption

The glass tube, was used to measure the fuel consumption of the (S.I. engine) .This glass tube has a constant volume (400) ml, and a stop watch was used to measure the consumption of fuel for this volume.

2.4. Air consumption

The air supplied to spark ignition engine was measured by using air box, orifice and the manometer used to measure the pressure differential between the atmosphere and pressure in the air box.

2.5. Measurement of engine speed (rpm)

The measuring of the engine speed of spark ignition engine (S.I. engine) was carried out by using instrument tachometer used to measure the rotation speed of a shaft engine. This instrument usually displays the revolutions per minute (rpm). Tachometer has been fixed the shaft engine test rig by coupling.

2.6. Gas analyzer

The exhaust gas analyzer type (2000-4) was used to analyses the emissions of exhaust, as shown in Fig (3). The analyzer detects the CO-CO2-HC contents.

2.8. Calibration

To ensure that all the data read from the measuring devices are correct, a calibration was done to all measuring device.

The following equations were used in calculating engine performance parameters: [7]

1- To calculate the *fuel consumptions*

Fuel mass flow rate

$$\dot{m}_f = \frac{V_f}{time} \times \rho_f \quad {}^{kg}/_{sec} \qquad (1)$$

Where:

Vf = volume of fuel consumption

$\rho_{f\,gasoline} = 750\ {}^{kg}/_{m^3}$

(As the specification of diesel oil from ALDORA refinery).

2- To calculate the actual air consumption

$$\dot{m}_{a,act.} = 4.96Ao\sqrt{\frac{Pa.h}{Ta}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$\dot{m}_{a,act.}=$ The air mass flow consumption by the engine at atmospheric pressure (101.3) kPa and temperature (30^{C^o}).

P_a = atmospheric pressure (mbar)

T_a = Temperature (K)

A_o = Area of orifice m^2

3- To calculate the theoretical air consumption

$$\dot{m}_{theo.}=(Vs \times K) \times \frac{N}{2\times 60} \times \rho_{air} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where:

Vs = swept volume

$Vs = \frac{\pi}{4} b^2 s$

Where:

b=cylinder diameter

s= stroke

K = Number of engine cylinders = 4

$$\rho = \frac{P_{atm}}{R.\,T_{atm}}$$

RESULTS and DISCUSSIONS

To demonstrate the impact of the use the magnet experiments were conducted in two phases.

Phase I: -

Experiments were carried out without using of magnets at a different speed (N r.p.m), which used engine with the gear box only as shown the Fig (1) for the purpose of comparison with the second phase.

Phase 2: -

Experiments were carried out using the magnet as shown in Fig (2) for the same speed number in the first stage and making the calculations show that fuel consumption (L/h) will be less.

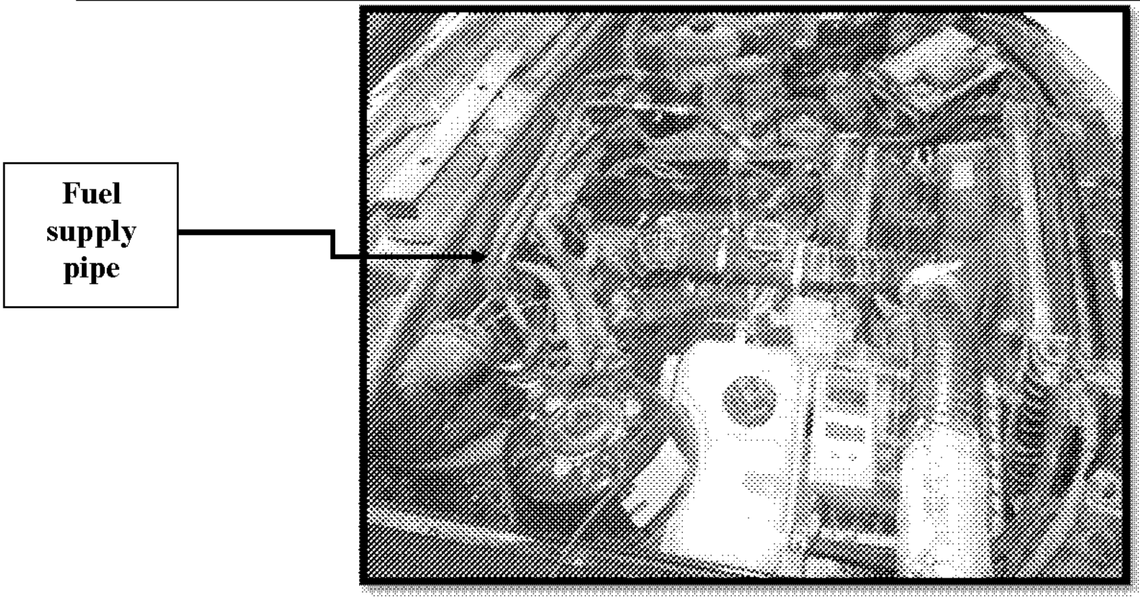

Fig (1) represents a Photograph for the engine rig

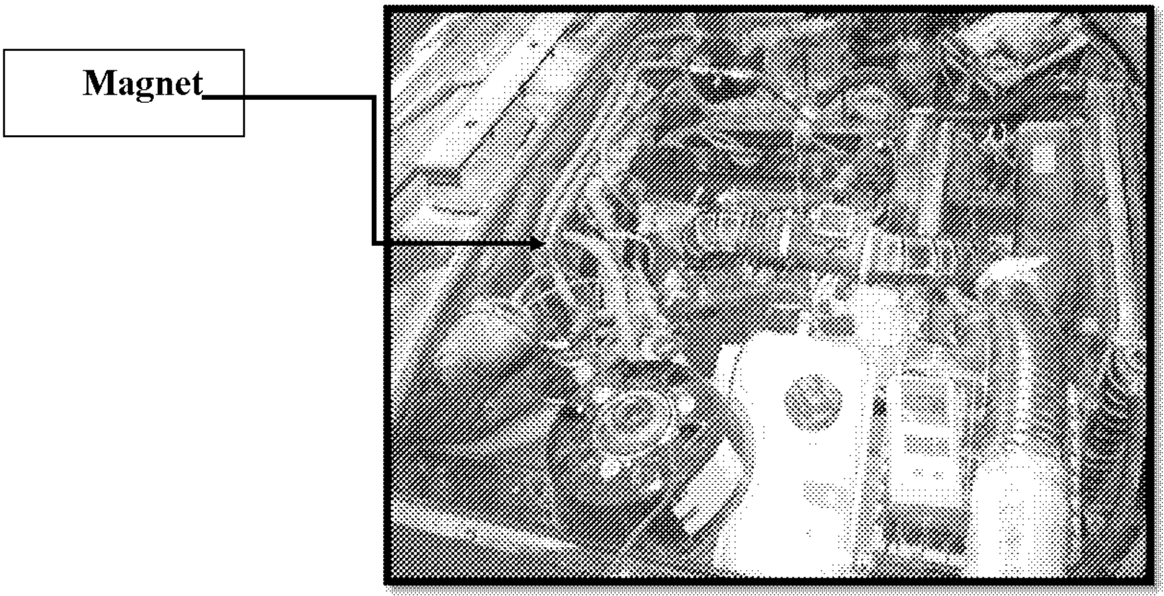

Fig (2) represents a Photograph for the engine rig

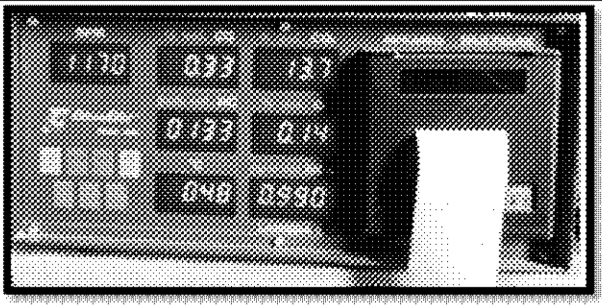

Fig (3). The exhaust gas analyzer type (mod 488)

Table (1) Main technical specifications of vehicle

Daewoo Prince	**2.0 DOHC**
Engine:	4-cylinder-inline engine (four-stroke)
Combustion type	DI, water cooled
Displacement	1998 cc
Bore x Stroke:	86 x 86 mm
Max. Power @ rpm:	100 kW (130 hp) @ 5600
Max. Torque @ rpm:	184 N·m (136 lb·ft) @ 4000
Fuel System:	Injection
Gearbox:	5-speed-manual, rear wheel drive
Compression ratio	8.8:1

Nomenclature

Symbol	**Meaning**	**Unit**
A/F	Air to fuel ratios	
CO	Carbon monoxide	
CO2	Carbon dioxide	
S.I. engine	spark ignition engine	
HC	Unburned hydrocarbons	ppm
ho	Differential manometer	cm
$\dot{m}_a$	Air mass flow rate	kg/sec
$\dot{m}_f$	Fuel mass flow rate	kg/sec

CONCLUSIONS

With a magnetic field we can

1- Increase the internal energy of the fuel, to cause specific changes at a molecular level.
2- Increasing the internal energy to obtain easier combustion. The molecules fly apart easier, join with oxygen easier and ignite easier.
3- The fuel consumption (L/h) is lower by about 5.3% as shown in fig (4) in the gasoline engine than without using of magnets.

4- Fig (5) shows the variation emissions of CO with variable engine speeds calculated experimentally from the combustion of gasoline fuel as CO decreased after the using the magnet about 7.038 %.
5- Fig (6) shows the variation emissions of (HC) with variable engine speeds calculated experimentally from the combustion of gasoline fuel as (HC) decreased after the using the magnet about10.126 %.
6- Fig (7) shows the variation emissions of CO2 with variable engine speeds calculated experimentally from the combustion of gasoline fuel as CO2 decreased after the using the magnet about 0.315 % .

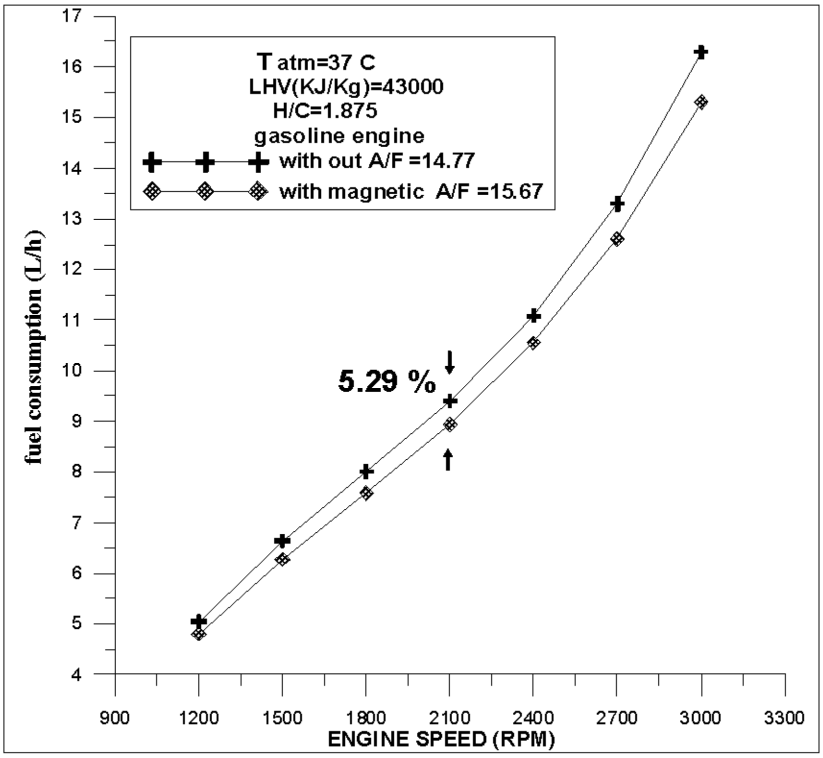

Fig (4) the relationship between fuel consumption (L/h) with engine speed

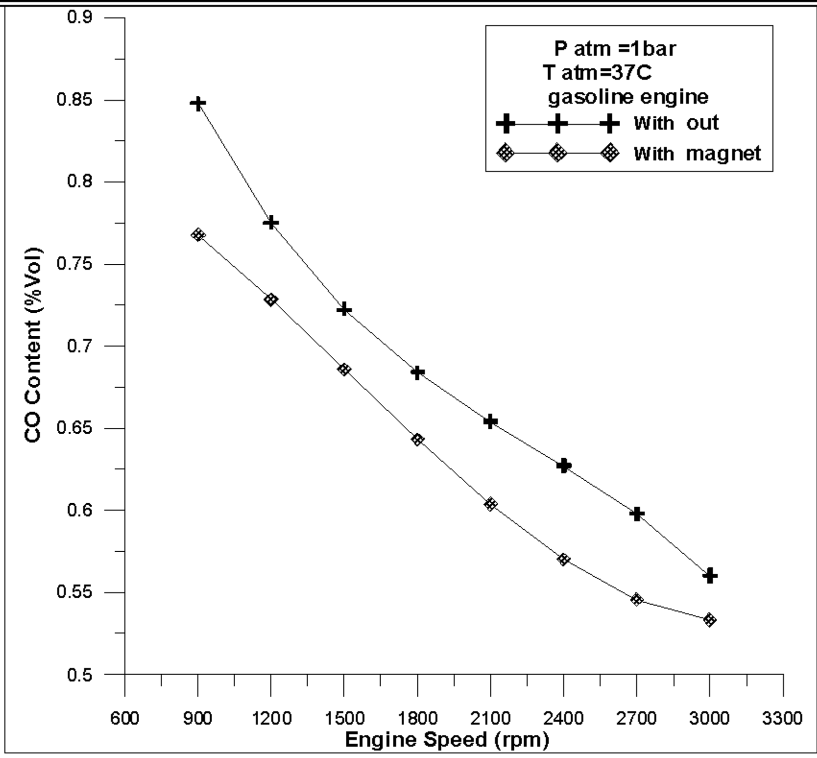

Figure (5) the relationship between concentration of carbon monoxide CO with engine speed the reduced using magnets.

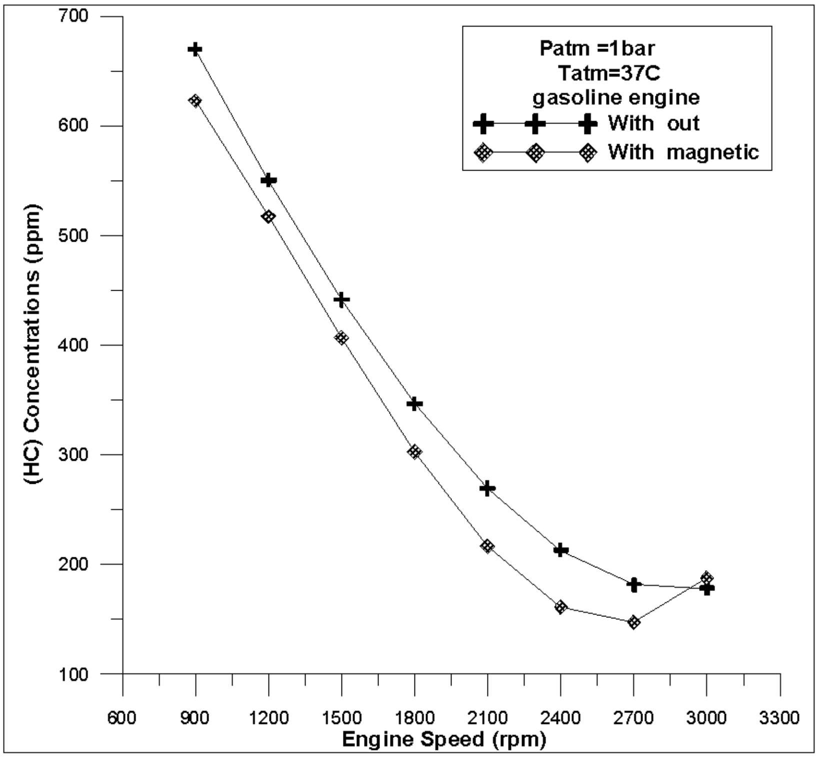

Fig (6) the relationship between concentrations of unburned total hydrocarbon (HC) with engine speed the reduced using magnets.

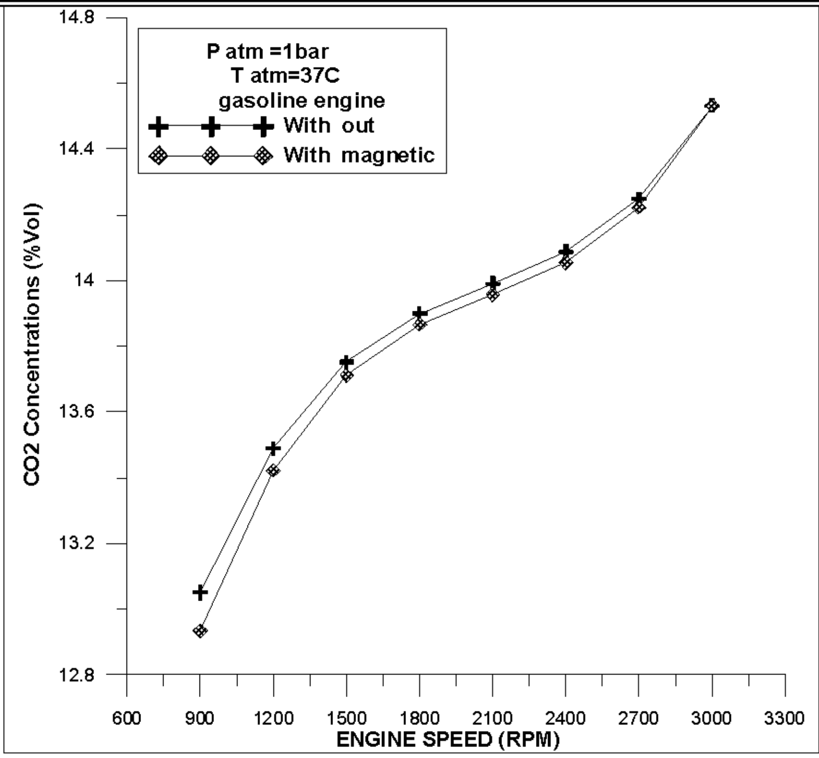

Fig (7) the relationship between concentration of carbon dioxide CO2 with engine speed the reduced using magnets

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7- ام .ال .ماثيور واربي شارما "محركات الاحتراق الداخلي" ترجمة الدكتور يونس عبد المالك الفخري, الجامعة التكنلوجية

تقليل ألملوثات المنبعثة من محرك البنزين بأستخدام مجال مغناطيس

الخلاصة

ان كفاءة الاحتراق في أغلب محركات الاحتراق الداخلي هي بحدود 90% وهذا يعني ان قسما من الوقود سوف لايحترق ويخرج مع غازات العادم مما يؤدي الى زيادة استهلاك الوقود وزيادة الملوثات في المحيط لذا أجريت عدة محاولات لزيادة كفاءة الاحتراق وتقليل نسبة الملوثات .لذا تم أستخدام طريقة جديدة لتقليل استهلاك الوقود وهي أستخدام المجال المغناطيسي لضمان الاحتراق التام مما يؤدي الى حصول على أعلى كفاءة حرارية والحد من الملوثات حيث يخضع الوقود الى قوة الفيض المغناطيسي من المغناطيس المثبت على انبوب جريان الوقود مما يؤدي الى زيادة كفاءة الاحتراق .والنتائج التي حصلنا عليها قللت استهلاك الوقود بحدود 5.3% و ملوثات غازالعادم تظهر انخفاض واضح بنسب(038. 7%) لغاز احادي اوكسيد الكاربون و (314 .0 %) لغاز ثنائي اوكسيد الكاربون و (126. 10%) للهيدروكاربونات الغير محترقة.