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Engine assembly with electrically powered compressor

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Improvements aimed at bettering the performance of the engine by reducing energy consumption. Revolutions per minute were patently lowered. A substantial reduction was achieved in the emissions of pollutants as well as in the heat generation in power unit. This also allows reduction of the cylinder capacity of the combustion engine. All of these improvements are based in the engine assembly with an electrically powered compressor. An interesting way to reduce consumption is through a novel electric application in a standard vehicle. The electrical integration proposed consists of a system applied to the intake of a combustion engine. The electric system will be sufficient to compress and cool the intake mix, so that we achieve our objectives: the pressure and cold, in order to obtain different degrees of performance optimisation. This allows the use electric energy from recharging, or from thermoelectric recovery generator in combustion vehicles, reducing the use of the alternator. If we use the compressor and cooler fully, consuming 100% of usuable electric energy, we will use very little fuel in a combustion engine. This kind of use is very recommendable in city traffic, and at the same time that this system is a type of use that allows auto-recharging in long distances.

Keywords: hybrid engine electrical supercharged

INTRODUCTION

The electrical application in the existing hybrid systems can be improved by an electrical air intake for an Internal Combustion Engine. Using an electrical supercharger obtain an new technology for air management. It is to solve, the reduction in the temperature of the intake air and how to produce the supercharging in diesel engine at low r.p.m. rates; electrically. The engine assembly with an electrically powered compressor and electric cooler in the intake is the new hybrid powertrain.

The purpose of this electric system is to be able to maintain an effective average pressure on the inlet manifold, which will make easier the charging of fresh air to the combustion chambers. That improvement in efficiency is proportional to the pressure obtained in the inlet manifold. The charge air pressure are controlled by an electronic control unit (ECU), depending on the drivers demand; the air requirements of the combustion engine are anticipate using the sensor in the inlet manifold which automates the pressure status; it is controlled by the accelerator/brake sensor and provides the ECU with data which gives the power in each case.

The power is obtained from an internal combustion engine electrically compressed, without mechanical joint; it is the mechanical independence of the compressor and the combustion engine what leads us to consider a different compression ratio.

The charge cooling is achieved with an electric cooler before/after the compressor.

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EXPERIMENT / MODELING

The electrically supercharged engine runs at under 1,000 rpm, in order to deliver the same power as one operating under atmospheric conditions.

It delivers 40Kw at approximately 2,700 rpm, while in the atmospheric mode it would have to be running at 3,770 rpm.

The compressor used was a G-40 with a 1.5 kW single-phase 220V (11Å) motor electric, coupled by means of a serrated belt, to supercharge a 1,800 c.c. Diesel engine (Peugeot XUD).

We did not consider this a good idea until we performed the tests on the roller bench.

There is a need to produce a prototypes with suitable alterations to the radiator, alternator, etc. in order to fit the new engine.

RESULTS AND DISCUSSION

The basic hybrid concept is due to the fact that the electrical energy is not applied directly to the vehicle's transmission system. In this driving system, the fuel-generated energy is combined with that applied electrically by means of a compressor, which feeds air into the combustion engine. The kW produced is of a hybrid nature; the power output achieved varies depending on the size of the application. Summing up, it is an electrical aid to the combustion engine which, by electrically supercharging it, optimises its intake cycle.

By establishing electrical supercharging, the same effect is achieved as with other systems, but with no thermal resistance, inertia, reduced power output; no discharge valve necessary.

If electric supercharging takes precedence over engine rpm, we observe the following:

- Fuller, more effective combustion

- The possibility of using an engine speed of 1,000-2,500 r.p.m., which provides the best torque.

- There is no need to increase the engine rpm in order to achieve the driving power required.

- Consumption drops by 30%.

The disadvantages of increased weight and noise may be solved, and are not a major concern, given the increase in engine performance achieved. Battery size varies according to the desired operating range; thus, a fully-charged electrical system would allow the vehicle to travel 400 or 500 km without stopping to recharge the battery. The alternator allows for a continuous operation, although with a drop in performance which makes battery recharging necessary on a regular basis.

Battery charging should be done by not using the alternator, and for this purpose we propose other systems for obtain energy without mechanical losses, such as:

- Fuel cells

- Solar cells

- Seebeck effect of low temperature (crankcase, exhaust, cooling engine)

- Rapid recharging will be used by batteries.

For Diesel cc's of 1,500-1,800, we would recommend effective power levels for the electric motor to the compressor from 1.5 kW to 3 kW.

There is a possibility of including the "economy" function in the E.C.U., which controls the activation of the electric motor; when braking, the electric motor operates as an alternator, charging up the battery; besides, it acts as a brake on the engine, throttling the engine intake down to idle (and at that point it switches off).

If the "economy" function is applied, special care must be taken to select a suitable electric motor, compressor and coupling system.

Regarding the combustion engine, any type is suitable for installation, including turbocharged engines. With the latter, the exhaust cycle could be improved electrically, but not its thermal pollution performance.

CONCLUSION

It is assumed that the electrical energy used up by the intake compresso. is less than the increase in the power delivered at low r.p.m. rates.

REFERENCES

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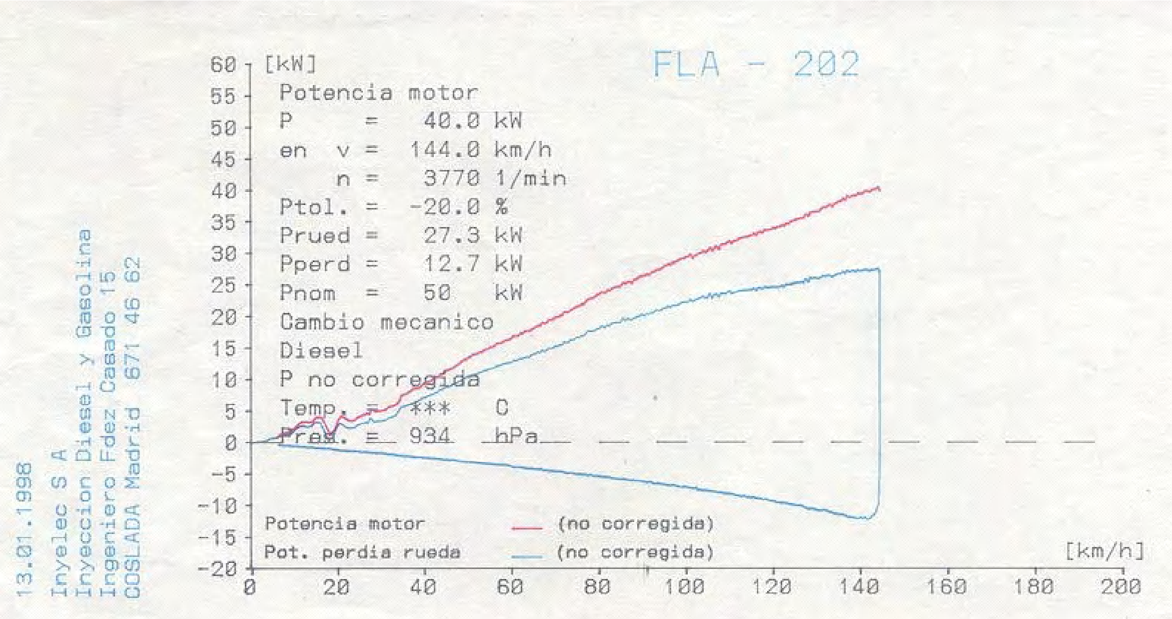
[2] Reply of the European Patent Office


FLA - 202
[kW]
Potencia motor
P = 40.0 kW
en v = 144.0 km/h
n = 3770 1/min
Ptol. = -20.0 %
Prued = 27.3 kW
Pperd = 12.7 kW
Pnom = 50 kW
Cambio mecanico
Diesel
P no corregida
Temp. = *** C
Pres. = 934 hPa
Potencia motor (no corregida)
Pot. perdia rueda (no corregida)
[km/h]
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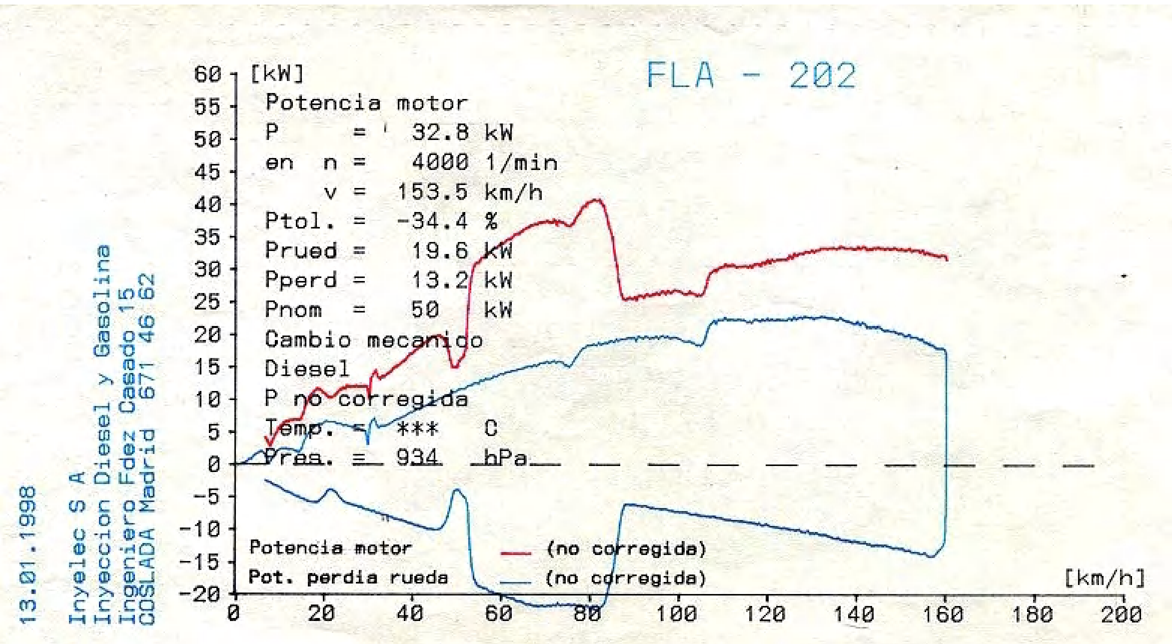
FLA - 202
[kW]
Potencia motor
P = 32.8 kW
en n = 4000 1/min
v = 153.5 km/h
Ptol. = -34.4 %
Prued = 19.6 kW
Pperd = 13.2 kW
Pnom = 50 kW
Cambio mecanico
Diesel
P no corregida
Temp. = *** C
Pres. = 934 hPa
Potencia motor (no corregida)
Pot. perdia rueda (no corregida)
[km/h]
13.01.1998
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