

# Researches referring to appreciation performances of the spark ignition engines to the use of ceramic materials in the building of the burning chambers

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## Abstract

*Studying the internal combustion engines tendencies and direction it is noticeable that the major effort must be directed towards finding new constructing and energetic solutions aimed to improve the thermal efficiency and implicitly to diminish fuel consumption. Ceramic materials in the building of the burning chambers is one solution.*

**Key Words:** *ceramic, engines, piston, torque.*

## 1. Introduction

The word ceramics comes from the Greek “keramicos” which means burn material.

The unusual performances refers to the keeping of the mechanic resistance at very high temperatures – unlike metals, even those with refractoriness and with an almost total absence of distortions , the breaking appearing suddenly at a certain value of challenge.

Another feature characteristic is a very high hardness meet at the majority of those materials, maintain with the increase in temperature, which allows very special utilizations in various branches of cars engineering, like processing through splintering, tribologic protections etc, adding also a remarkable chemical resistance, plus, some ceramics can be used in the making of friction and antifricion organs.

The disadvantages of the materials are a consequence of reduce deformities, which drives a wick resistance to shocks and vibrations.

The thermo isolated engine makes the objective through which it is been searched to obtain in the future the most advanced solution of the main desiderates in the field of internal combustion engines as: the reduction of fuel consumption, the reduction of sound and chemical pollution, the increase in lasting and viability, the reduction of the engine and auxiliary installations sizes, the cut in production costs.

There is a development in the manufacturing of pieces made from two parts: a metallic part and a ceramic part.

The metal remains at a low temperature and develops a mechanic resistance; the ceramics works at high temperatures and makes a thermo barrier.

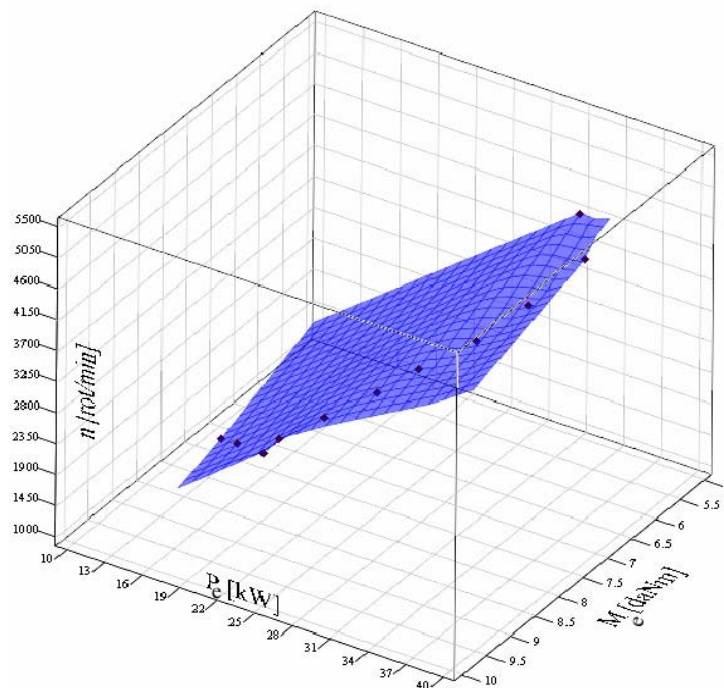
There are been used oxides with a medium thermo level under  $1200^{\circ}\text{C}$ , with a low breaking load and with a very reduce dilatation coefficient and so with an excellent conduct for the thermo shock.

In fig.1. is a piston with ceramic crown.

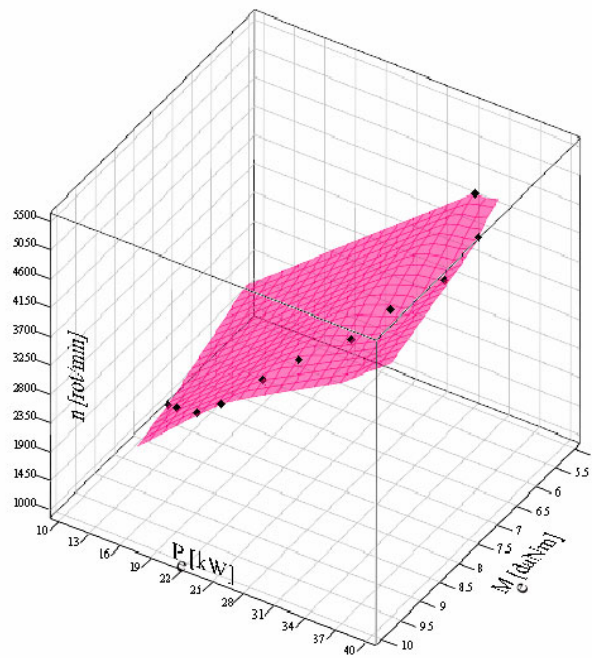


**Fig. 1.** Piston with ceramic crown

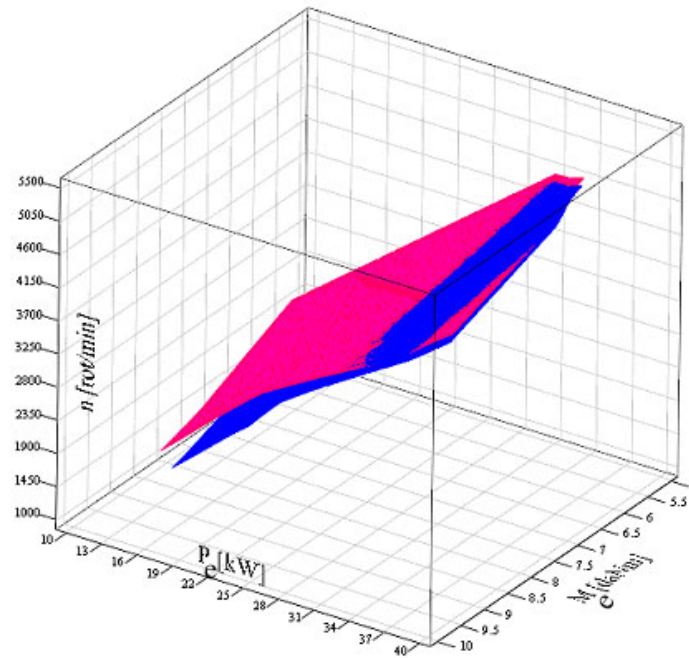
It has been accomplished two types of measurements. First type of measurements it was accomplished with the standard engine and the second with the modified engine with ceramics elements.



**Fig. 2.** Torque and force to engine speed for standard engine.



**Fig. 3.** Torque and force to engine speed for ceramic engine.



**Fig. 4.** Torque and force to engine speed for standard engine and ceramic engine.

In fig.2 is torque and force to engine speed for standard engine. In fig. 3 is torque and force to engine speed for ceramic engine. In fig. 4 is torque and force to engine speed for standard engine and ceramic engine.

## 2. Conclusions

- The present phase regarding the use of ceramic materials in the construction of internal combustion engine refers in essence to the technology of elaborating technical ceramics which will be used to isolate pistons, head cylinders, cylinders and valves.
- The application of ceramic materials seems ideal: they have a high resistance to high temperature and thermo shocks, they are lighter than the alloys used usual in the engineering of engines, they have better mechanical features in certain working conditions.
- The ceramic materials can't be universal substitutes for metals, the main deficiency being their frailty.
- In the case of covering with ceramic material of the piston's head, through the increase of covering thickness the heat stream from the head cylinder and the piston drops and the one from the cylinder remain constant to an increase in power of up to 5%.

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## Cercetări privind creșterea performanțelor motoarelor cu aprindere prin scânteie prin utilizarea materialelor ceramice în construcția camerelor de ardere

### Rezumat

*Studiul tendințelor de dezvoltare a motoarelor cu ardere internă este direcționat de găsirea a noi soluții constructive și energetice pentru mărirea eficienței termice și implicit diminuarea consumului de combustibil, creșterea puterii efective și a momentului efectiv. Utilizarea materialelor ceramice în construcția camerelor de ardere este una dintre soluții.*