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RESEARCH REGARDING CALCULATION WAYS FOR THE EFFECTIVE ENGINE MOMENT AND OF THE EFFECTIVE POWER FOR STANDARD IGNITION ENGINES WITH CERAMIC COVERING OF THE PISTON

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Abstract: *The present research has the aim to find calculation formula of the actual engine moment and of the actual power for the standard ignition engines, with ceramic covering of the piston.*
Key words: *ceramic, engines, power, piston.*

The simplified sample of calculation is based on the following hypotheses:

-the transfer of head between gas and cooling environment is done in just one direction, stationary, without differences of local temperature in gas or in the wall;

-the temperature of the surfaces in contact with the gas and the cooling spot are constant during an engine cycle;

-compression and relaxation are ,,adiabatic" processes;

-the heating takes place during the actual compression process and during the first part of the relaxation process.

As a result of the experiments, there is a graphic representation of the variation of the actual moment and of he actual power, depending on the engine speed for the particular standard engine for the modified one by using the ceramic piston.

Variation of the actual moment power in relation with the engine speed for the standard engine (blue surface) and the modified engine (red surface).

With the help of a programme there are calculation.

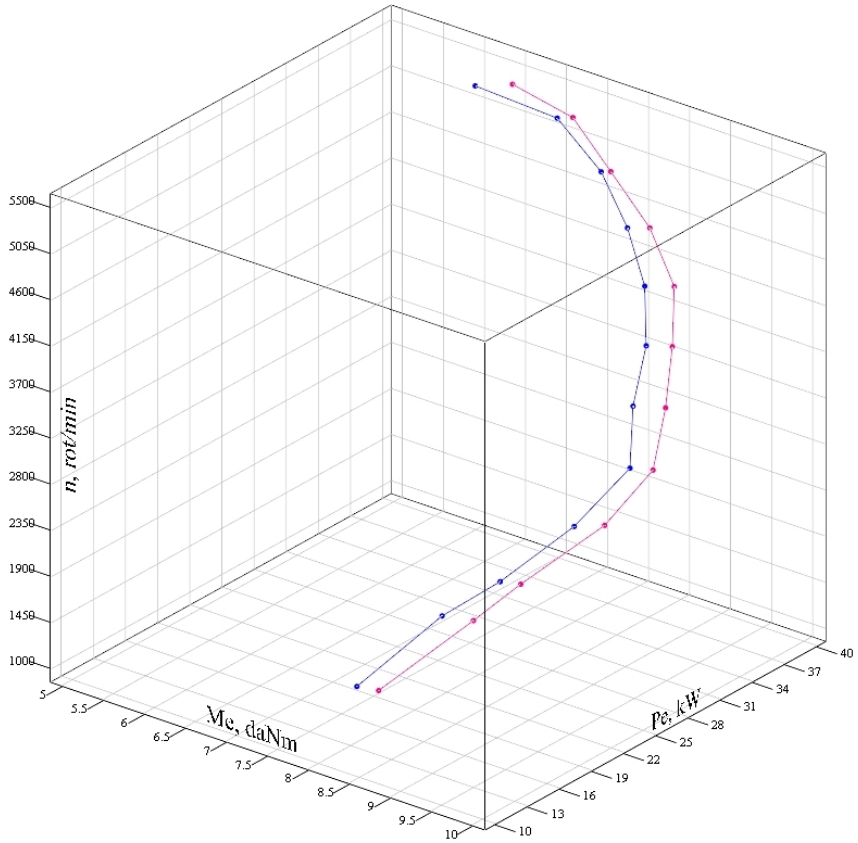

Fig.1. *Variation of the actual moment and power in relation with the engine speed for the standard engine (blue curve) and the modified engine (red curve).*

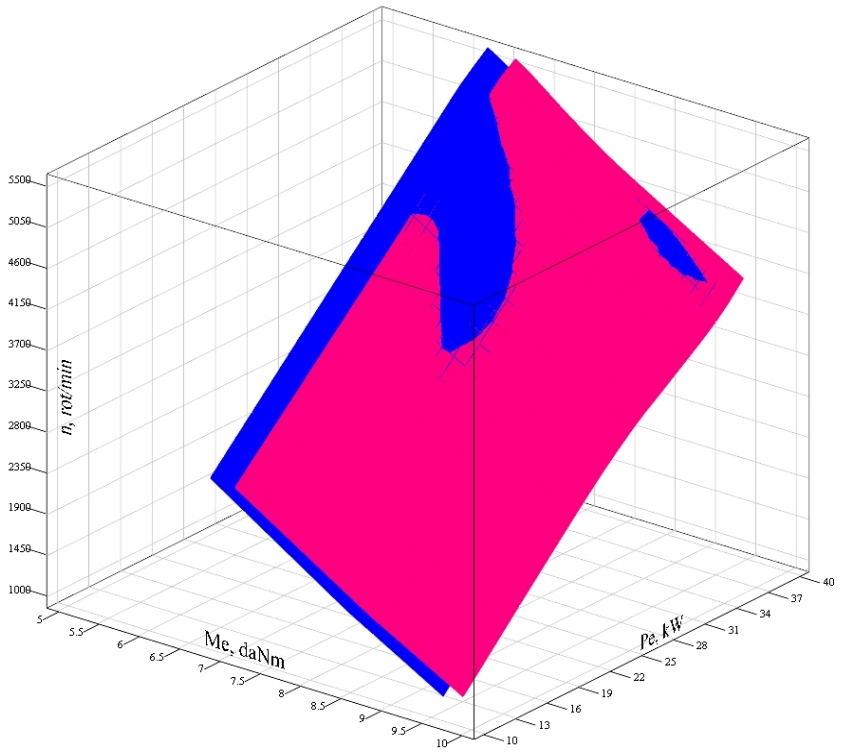

Fig.2. *Variation of the actual moment and power in relation with the engine speed for the standard engine (blue surface) and the modified engine (red surface).*

For calculation of the effective/actual moment of the Dacia 810-99 engine, the following calculation was prosped:

$$M_e = a + bn + cn^2 + \frac{d}{n} + \frac{e}{n^2}, \quad (1)$$

where: $a=35,879732; b=-0,0042698666; c=1,0750341 \cdot 10^{-7};$

$d=-56554,804; e=36175041.$

For the engine with ceramic piston, there are the following elements for the actual moment calculation:

$a=36,639608; b=-0.0040380343; c=6,6176773 \cdot 10^{-8};$

$d= -60540,864; e=40318080.$

Also, for the same type of engine, for the actual power calculation, there are the following relation and elements:

$$P_e = a + bn + cn^2 \ln(n) + dn^{2.5} + en^3 \quad (2)$$

where: $a= -20,481402; b= 0,045833932; c= -8,5807981 \cdot 10^{-6};$

$d= 1,4929514 \cdot 10^{-6}; e= -7,8626963 \cdot 10^{-9}.$

When using the ceramic pistons, the following elements are the result for power calculation:

$a= -85,673275; b= 0,13984328; c= -2,2708842 \cdot 10^{-5}$

$d= 3,6598679 \cdot 10^{-6}: e= -1,7673349 \cdot 10^{-8}.$

Mathematical models for the working processes with and without thermical isolation allow the analysis of the factors that influence the parametres of the engine cycle.

Tab.1. Values of actual moment as regards the standard engine and the modified one are obtained by using the relation 1

Nr. crt.	n, rot/min	$M_{e,st}$, daN·m	$M_{e,mod}$, daN·m
1	1600	8,107	8,259
2	1700	8,197	8,322
3	1800	8,288	8,385
4	2000	8,536	8,636
5	2200	8,774	8,888
6	2400	8,967	9,103
7	2600	9,159	9,268
8	2800	9,182	9,372
9	3000	9,205	9,419
10	3100	9,159	9,416
11	3200	9,114	9,413
12	3300	9,107	9,384
13	3400	9,100	9,356
14	3500	9,041	9,305
15	3600	8,983	9,254
16	3800	8,829	9,111
17	4000	8,642	8,929
18	4200	8,427	8,718
19	4400	8,188	8,476
20	4500	8,057	8,342
21	4600	7,927	8,209
22	4800	7,648	7,918
23	4900	7,501	7,7625
24	5000	7,354	7,607
25	5200	7,044	7,280
26	5400	6,723	6,934
27	5600	6,393	6,577
28	5800	5,755	6,205
29	5900	5,732	6,513
30	6000	5,709	6,822

Tab.2. Values of actual power for the standard engine and the modified one are obtained by using the relation 2

Nr. crt.	n, rot/min	$P_{e,st}$, kW	$P_{e,mod}$, kW
1	1400	9,769	7,589
2	1600	11,385	11,601
3	1800	12,750	14,612
4	2000	14,498	16,977
5	2200	15,934	18,788
6	2400	17,435	20,347
7	2600	18,935	21,454
8	2800	20,684	23,153
9	3000	22,399	24,549
10	3200	24,286	26,144
11	3400	26,108	27,622
12	3600	28,037	29,330
13	3800	29,950	31,283
14	4000	31,703	32,581
15	4200	33,550	34,592
16	4400	35,042	35,977
17	4600	36,456	37,563
18	4800	37,392	38,400
19	5000	37,983	38,889
20	5200	38,179	39,023
21	5400	37,691	38,126
22	5600	36,711	36,741
23	5800	34,888	34,110
24	6000	32,156	30,071

Conclusions

There where issued simplified hypotheses of the proposed model.

There have been found calculation relations of the actual moment and power, in relation with the engine speed for the 810-99 engine and for the same model equipped with ceramic pistons.

The value of the actual moment and power has been identified by experiment for the standard and the modified engines and they have been shown in a graph, with the obtained values, according the engine speed.

As a results of using ceramic materials in building the ignition spots of M.A.S. the actual effective power and moment increase with 1-3%.

The calculation that have been issued can be used for the M.A.S. that have the same engine speed.

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