REPLY
TO COMMENTS BY ANDRZEJ KOWALEWICZ

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Discussions with Prof. Andrzej Kowalewicz have their history. A year ago, after the KONES 2005, I was involved in several oral discussions with him on the subject of the referred paper. That time I have tried to respond in detail to all his questions. It appears that my explanations were not satisfactory. Though discussion with Prof. Kowalewicz is tiring and time consuming I welcome his comments if he still considers my former answers to be not conclusive.
I answer to the comments at the name of all contributing authors:

1. First comment

It is obvious that the maximum pressure indicated in Table 2 (page 156 of the KONES 2005 Proceedings) for the cases F and G is too low. In one of my former discussions with Prof. Kowalewicz I have stated that this happened by a technical error. We supplemented the data of a similar table published in the Proceedings of the KONES 2004 with the data of additional variants of the combustion chamber (case F and G) and a technician incorrectly inserted to this table the values of pressure rise Δp instead of the absolute pressure p_{max}. We agreed that the value of pressure in this table was given for cases F and G with error.

2. Second comment

We do not understand what is the scientific foundation of a statement of Prof. Kowalewicz that ignition initiated by a catalytic igniter used in our study is not autothermal. Our opinion on this question is based on detailed experimental studies of mine and other researchers such as Mr. Podfilipski, Dr. Lapucha, Dr. Mazurkiewicz and Prof. Wojcicki. We studied experimentally ignition characteristics of spiral catalytic wire and determined autothermal ignition temperature as a function of equivalence ratio, for several most frequently used combustible mixtures. For propane-air mixtures (the fuel used in our paper, which is a subject of discussion) the autothermal temperatures of ignition were in the range of 350°C ÷ 750°C depending on the equivalence ratio [1]. These values are clearly lower than those characteristic for inert hot surface ignition. The results were additionally verified many times under real engine conditions by direct comparison of engine performance with catalytic hot surface igniter and an inert one in a form of steel hot spiral wire [1, 2]. Thus autothermal ignition with the use of catalytic igniter was confirmed in experiments under engine conditions.

3. Third comment

This comment is presented not too clearly for us, but I will do my best to answer. The line 3-4 in Fig. 6 represents expansion stroke. In engines with low aspect ratio (in quite large engines with high relation of combustion chamber volume to its surface) this process is equivalent to isentropic process on the T-s diagram. Contrary to this case in engines with very high aspect ratio (small engines with low relation of combustion chamber volume to its surface) expansion process is accompanied by an intensive heat outflow from the gas to the walls equivalent to entropy decrease. Influence of the wall temperature on the entropy of a working gas is elementary problem in thermodynamics and can be found nearly in every text-book for this discipline, for instance in a book of Wisniewski [3].

Finally I would like to remark that the names of my co-workers and co-authors contributing to our paper were in the present comments badly deformed.

References

[1] Jarosinski, J., Podfilipski, J., *Influence of Catalysis on Combustion in Spark Ignition Engine*, SAE Technical Paper Series 01-1338-2001.

[2] Jarosinski, J., Lapucha, R., Mazurkiewicz, J., Wojcicki, S., *Combustion System of a Lean-Burn Piston Engine with Catalytic Prechamber*, SAE Technical Paper Series 01-1186-2001.

[3] Wisniewski, S., *Termodynamika Techniczna*, Warszawa, WNT, page 151, Fig. 4.22, 1993.