



SIMTERM

PROCEEDINGS

**17th Symposium on Thermal Science and
Engineering of Serbia**

Sokobanja, Serbia, October 20–23, 2015

University of Niš, Faculty of Mechanical Engineering in Niš
Society of Thermal Engineers of Serbia

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Engine with Alternative Otto/Diesel Processes

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Abstract: Multi-process working principle is one of the modern approaches to development of internal combustion engines. By the combination of the original features of the OTO and DIESEL working processes can be achieved improving ecological and energy characteristics of the engine. Examples for that are spark ignition engine with stratified charge and compression ignition engines with homogeneous charge (HCCI). For the implementation of basic research in this field was implemented experimental Multi-process engine and was developed its testing methodology. This paper presents the results of the combination of OTO / DIESEL working processes when the engine working with both conventional and bio-fuels. Energy and ecological characteristic of engine can be improved by choice of an appropriate working process. Results of initial tests of OTO/DIESEL engine show a high potential to reduce particulate emissions. The investigation has shown certain disadvantages of the engine and the ways for theirs overcoming.

Keywords: compression ratio, efficiency, emission, experimental engine, working process

1. Introduction

It is known that the way the engine working process realization has a dominant influence on the engine efficiency and emission. The main characteristics of the working process of IC engines are listed in Tab.1. Classical concepts of OTTO and Diesel engines are conditioned by the properties of the used fuel and they have generic advantages and disadvantages. Modern technologies of engine equipment have allowed synthesis of the good features of traditional working processes.

Table 1. The main characteristics of working processes of modern engines

Working process characteristics							
		Mixture forming	Mixture homogeneity	Global Air/Fuel ratio	Load regulation by	Mixture ignition by	Flame propagation
Working process	OTTO	out of cylinder	homogeneous	stoichiom. / rich	throttling	spark	frontal
	DIESEL	in cylinder	inhomogeneous	lean	fuel quantity	compression	diffusion
	GDI	in cylinder	inhomogeneous	lean	fuel quantity	spark	diffusion
			homogeneous	stoichiom. / rich	throttling		frontal
	HCCI	in/out of cylinder in cylinder	homogeneous inhomogeneous	lean	fuel quantity	compression	simultaneous diffusion

Thus, spark ignition of very lean inhomogeneous mixture, reduction of pump losses at low loads and increase of the compression ratio is enabled in gasoline direct injection engine (GDI) with stratified charge, thanks to the internal formation of mixture. In this way, engine efficiency at low and moderate loads is much-improved [4]. At medium and high-loads, working process is conducted according OTTO cycle. However, DIESEL attributes of the working process have brought their shortcomings: the sensitivity of the process of forming the mixture to flow in the combustion chamber (misfiring) and particulate emission.

