

Event: 14th International Conference on Engines & Vehicles

Title: Experimental Studies of Gasoline Auxiliary Fuelled Turbulent Jet Igniter at Different Speeds in Single Cylinder Engine

Technical Paper / 2019 – 24 – 0105

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Abstract

Turbulent Jet Ignition (TJI) is a pre-chamber ignition system for an otherwise standard gasoline spark ignition engine. TJI works by injecting chemically active turbulent jets to initiate combustion in a premixed fuel/air mixture. The main advantage of TJI is its ability to ignite and burn, completely, very lean fuel/air mixtures in the main chamber charge. This occurs with a very fast burn rate due to the widely distributed ignition sites that consume the main charge rapidly. Rapid combustion of lean mixtures leads to lower exhaust emissions due to more complete combustion at a lower temperature.

For this research, the effectiveness of the Mahle TJI system on combustion stability, lean limit and emissions in a single cylinder spark engine fuelled with gasoline at different speeds was investigated. The combustion and heat release process was analyzed and the exhaust emissions were measured. The results show that the effect of the Mahle TJI system on the lean-burn limit and exhaust emissions varied with engine speeds. The lean limit was extended by increasing the engine speed, to $\lambda = 1.71$ with 1,200 rpm, followed by $\lambda = 1.69$ with 1,000 rpm and then, $\lambda = 1.51$ with 800 rpm. NO_x emissions were significantly reduced with increased engine speed under stable combustion conditions, because at higher speeds it was possible to increase the lean limit and offer a lower combustion temperature.