Effect of swirl at intake manifold on engine performance using ethanol fuel blend

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ABSTRACT

Ethanol fuel is widely used as an alternative fuel in spark ignition engines. The use of ethanol reduces dependence on fuel from the fraction of hydrocarbons. As such, adding swirl generators to the intake manifold aims to make the internal airflow more turbulent. The influence of swirl on the performance, emissions, and combustion in a constant speed Spark Ignition (SI) engine was studied experimentally. Also, the effects of the addition of ethanol in the fuel on engine performance and emissions under development of the intake manifold with a swirl generator were determined. Thus, the study analyses the effects of adding a swirl generator to the intake manifold on engine performance, fuel consumption, and emissions produced. Influence of the swirl generator on the airflow and swirl pattern testing is done on the three types of swirl generators, which are the concave, flat bottom, and symmetrical with different angle positions. Engine experiment was performed at 2,000, 2,500, 3,000, 3,500, 4,000, 4,500, and 5,000 rpm engine speed at WOT using a concave swirl type generator. Response Surface method (RSM) was used to find the optimum intake manifold design according to response (flow and swirl) and independent variables (a type of swirl generators and angle positions). The concave swirl type generator at 6.53 angle position is considered to be optimum for this particular engine. The highest engine torque and BSFC were with a swirl generator intake manifold. The HC and CO emissions increased with intake manifold with a swirl generator. The CO_2 emission reduced with swirl generator intake manifold by 2%, 3%, and 5% with gasoline E10 and E20 compared to the standard intake manifold.

KEYWORDS

Ethanol; Swirl generator intake manifold; SI engine; Emission; Engine performance

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