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Effect of cooling gallery on the piston temperature in a gasoline direct injection engine

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Significant efforts have been devoted to developing gasoline direct injection (GDI) engine technologies to meet the stringent emission legislation. From the combustion point of view, combustion pressure is getting higher with higher injection pressure and boosting pressure, which enhances the combustion process and thus reduces the emissions. This issue requires reinforcement of the piston as well as improvement of cooling performance in the piston. The objective of this study was to investigate the effect of cooling gallery on the piston temperature in a GDI engine. Prior to the engine experiment, parametric study on the oil jet was performed in the test bench. In addition, oil targeting was optimized for the insurance of sufficient oil flow rate in the cooling gallery. This was realized by optical piston and modified cylinder block. Two types of pistons, which are with and without cooling gallery, were developed by Dongsuh Federal-Mogul in Korea. Furthermore, the research engine was modified to install the oil jet in the cylinder block and inject the oil into the cooling gallery in the piston. The developed pistons were applied and evaluated in a GDI engine. The piston temperature was measured by tempplug which is screw-type steel and is sensitive to temperature. It was confirmed that the cooling gallery played an important role in determining the piston temperature. The piston with the cooling gallery resulted in significantly lower temperature. It is believed that the optimization for the location and shape of cooling gallery should be needed for better cooling performance.

Biography

Sangwook Han has completed his PhD from Korea Advanced Institute of Science and Technology. He is a Senior Researcher in the Clean Engine System R&D Center of Korea Automotive Technology Institute, Korea. His research interests are in the engine combustion, vehicle thermal management system and automobile parts development for the improvement of fuel economy.

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