

Article Abstract

Title:	Flow field development in a direct injection diesel engine with different manifolds
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Journal:	<i>International Journal of Engineering, Science and Technology</i> , Vol. 2, No. 1, 2010, pp. 80-91.
Abstract:	<p>This paper reports a study on the effect of helical, spiral, and helical-spiral combination manifold configuration on air motion and turbulence inside the cylinder of a Direct Injection (DI) diesel engine motored at 3000 rpm. Three-dimensional model of the manifolds and the cylinder is created and meshed using the pre-processor GAMBIT. The flow characteristics of these engine manifolds are examined under transient conditions using Computational Fluid Dynamics (CFD) code STAR-CD. The predicted CFD results of mean swirl velocity of the engine at different locations inside the combustion chamber at the end of compression stroke are compared with experimental results available in the literature. We also compared the volumetric efficiency of the modeled helical manifold. The results obtained showed reasonably good agreement with the measured data given in the literature. Further, this paper discusses the predicted flow structure, swirl velocity and variation of turbulent energy inside the cylinder with different manifold. Comparisons of volumetric efficiency with different manifold configuration at 3000 rpm speed are also presented. The turbulence is modeled using RNG k-ϵ model. It is observed that helical-spiral manifold gives the maximum swirl ratio inside the cylinder than helical manifold. But volumetric efficiency observed is less for helical-spiral manifold engine. Swirl inside the engine is important for diesel engine. Hence, for better performance a helical-spiral inlet manifold configuration is recommended.</p>
Keywords:	Flow structure, spiral manifold, helical manifold, helical-spiral combined manifold, turbulence, swirl, CFD, Diesel engine