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Development of a Complete Single Jet Common Rail Injection System Gas Dynamic Model for Hydrogen Fueled Engine with Port Injection Feeding System

Authors : Mohammed Kamil, M. M. Rahman, Rosli A. Bakar

Abstract : Modeling of hydrogen fueled engine (H₂ICE) injection system is a very important tool that can be used for explaining or predicting the effect of advanced injection strategies on combustion and emissions. In this paper, a common rail injection system (CRIS) is proposed for 4-strokes 4-cylinders hydrogen fueled engine with port injection feeding system (PIH₂ICE). For this system, a numerical one-dimensional gas dynamic model is developed considering single injection event for each injector per a cycle. One-dimensional flow equations in conservation form are used to simulate wave propagation phenomenon throughout the CR (accumulator). Using this model, the effect of common rail on the injection system characteristics is clarified. These characteristics include: rail pressure, sound velocity, rail mass flow rate, injected mass flow rate and pressure drop across injectors. The interaction effects of operational conditions (engine speed and rail pressure) and geometrical features (injector hole diameter) are illustrated; and the required compromised solutions are highlighted. The CRIS is shown to be a promising enhancement for PIH₂ICE.

Keywords : common rail, hydrogen engine, port injection, wave propagation
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