



**GASOLINE DIRECT INJECTION –
TWO-DIMENSIONAL CFD STUDY EMPLOYING FLUENT V4.2**

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ABSTRACT

An in-cylinder gasoline direct injection (GDI) engine, incorporating novel combustion technologies has been developed. Such innovative technologies consist of the upright straight ports to generate tumble motion, the electro magnetic swirl injector to realize optimized spray dispersion and atomization and the compact piston cavity to maintain charge stratification, and in addition other highly advanced technologies to achieve desirable engine management. This new GDI engine is thus available with ultra lean stratified combustion for higher thermal efficiency under partial loads as well as homogenous combustion to realize higher performance under full load.

A comprehensive modelling and visualization study of flow and combustion is reported for a production four valve per cylinder homogenous charge four-stroke cycle spark ignite engine. Coupled port and in-cylinder computations are presented for several combination of valve deactivation, valve shrouding and cam profile. Several issues in the application of CFD to flow and combustion modelling in practical port-and-cylinder systems are addressed. These include numerical inaccuracy, elucidation of role of induction-generated flow structure and turbulence, and new insights into premixed flame

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CHAPTER I

GASOLINE DIRECT INJECTION

1.1 Introduction

In recent years, energy conservation and environmental improvement have been major issues in our society, and in particular the automotive industry which is required to achieve better fuel economy of the vehicle engine. However, higher output has always been required for automotive engines for customer satisfaction.

The in-cylinder gasoline direct injection engine developed by Mitsubishi Motors Corp., meets these two contradictory requirements and is installed on the new Gallant and Legnum, which are well accepted in the market. The GDI engine incorporates highly advanced new technologies to successfully achieve excellent performance.

The GDI engine also has such features as improved fuel control and in-cylinder air flow control, electronic exhaust gas recirculation (EGR) and high energy ignition system.