CHAPTER 3

OBJECTIVES AND SCOPE OF PRESENT INVESTIGATION

3.1 INTRODUCTION

Theoretical and experimental investigations indicate the advantages and limitations of lean combustion. Magnetically activated fuel on lean combustion has restricted to Compression Ignition (CI) engines due to its higher commercial applications (Janczak Andrew 1992). High exhaust dilution and rich mixture operation are the parameters differentiating the two-stroke SI engine from four-stroke SI engine and cause the application of the lean burn concept much more difficult in a two-stroke SI engine.

- The advantages and preference of two-stroke SI engine lie in its simple construction and low manufacturing cost (Draper 1968).

- The two-stroke SI engine operates with high exhaust dilution ratio. This higher exhaust dilution leads to lower NOx emission, which is an inherent advantage of two-stroke engines (Kuenttscher 1986).

- The exhaust blow down starts much early in expansion stroke of two-stroke SI engine compared to the four-stroke SI engine resulting in reduced time for completing the combustion (Sher 1985).
Cyclic variation of combustion has more direct effect on torque fluctuations and drivability of the two-stroke SI engine compared to the four-stroke spark ignition engine (Ohira et al 1994).

Keeping the above differences in view, the following research problem is selected and undertaken for investigation.

3.2 PROBLEM DEFINITION AND OBJECTIVES

The research problem undertaken for investigation after a thorough and critical review of the literature is to study the lean combustion stimulated by magnetic and catalytic activation and the factors affecting it in a production model of two-stroke SI engine.

The study involves:

- Comparing the performance of different gauss values of magnet on base and catalytic engines
- Studying the effect of high gauss magnet and catalytic coating on combustion parameters such as ignition delay, combustion duration, peak cylinder pressure and indicated mean effective pressure
- Heat release analysis of combustion phenomena and comparing base, magnetic and catalytic activated combustion using the heat release rates
- Cyclic variation of combustion parameters and heat release rates for base, magnetic and catalytic engines.

The present work involves both experimental and theoretical investigations to achieve the above objectives.
3.3 SALIENT FEATURES OF THE PRESENT WORK

Following are some of the salient features of the present work.

- The present investigation is carried out on a single cylinder two-stroke SI engine. This engine is selected, because of its simple design and flexibility in operation.

- Cylinder pressures for 500 continuous cycles are measured at each operating point. Average of these cycles was used for heat release analysis.

- Exhaust emissions such as CO and HC are measured at each operating point.

3.4 SCOPE OF THE PRESENT WORK

The scope of the present investigation includes,

- Operating the two-stroke engine with lean air-fuel mixtures and comparing the performance of different gauss values of magnets and catalyst.

- Study of problems associated with lean combustion.

- Heat release analysis of engine combustion

- Study of cyclic variation of combustion parameters for magnetic and catalytic engines.

To achieve the above objectives, detailed experimental works are carried out. The details of the experiments and the equipments used are explained in Chapter 4.