SYNOPSIS

Due to the shortage of conventional fuels, current national interest in alternative fuels has placed considerable emphasis on alcohols, mainly ethanol and its blends with gasoline. Experimental results have been published which suggest that significant benefits in performance and emissions are possible with ethanol - gasoline blends. The use of ethanol as an alternative fuel inspired the author to carry out an investigation to study the performance and exhaust emissions of spark ignition engine using ethanol - gasoline blends with and without surge chamber.

The Surge technique was applied to improve the engine performance and emissions. A surge chamber was connected to the engine cylinder. This chamber which was a closed chamber of a given volume was filled with air at a predetermined pressure and was separated from the cylinder by a flexible diaphragm. Maximum cylinder pressure and the rate of pressure rise in the cylinder were dependent on the air pressure in the surge chamber. When the pressure rise in the cylinder was high, the surge chamber permitted an increase in the cylinder clearance volume, resulting in a reduced rate of pressure rise. Thus the surge chamber diaphragm worked like a spring.

Experiments were conducted on a single cylinder, four stroke, air cooled, 5 h.p, spark ignition, Briggs and stratton

engine at constant speed of 1200 rpm and without any modification of the carburettor.

Gasoline was blended with 10%, 20%, 30%, 40% and 50% ethanol at compression ratios 5.3, 6 and 7.47 with and without a surge chamber. Gasoline used for the experiment were two types.

(i) Commercial leaded gasoline which is expressed as gasoline in this thesis.

(ii) Unleaded gasoline.

Addition of ethanol improves the octane rating of unleaded gasoline which has lower octane number compared with commercial gasoline.

The objects of the tests were to study the effects of ethanol addition, surge chamber and compression ratios on maximum power, brake specific fuel consumption, brake thermal efficiency, volumetric efficiency, exhaust temperature and the emissions of (i) oxides of nitrogen (ii) carbon monoxide and (iii) total hydrocarbons.

From the graphical representation of the tabulated results, the following conclusions can be drawn.

(i) Addition of ethanol with gasoline (commercial) and unleaded gasoline increases the power output, brake thermal efficiency, volumetric efficiency, brake specific fuel consumption and reduces exhaust gas temperature and emissions of carbon monoxide, oxides of nitrogen and total hydrocarbons.

(ii) The use of a surge chamber increases the maximum power output, volumetric efficiency, brake specific fuel consumption and hydrocarbon emissions but decreases exhaust gas temperature, brake thermal efficiency, carbon monoxide and oxides of nitrogen emissions.

(iii) Increasing compression ratio increases power output, volumetric efficiency, brake thermal efficiency, oxides of nitrogen and hydrocarbon emissions and reduces exhaust gas temperature, brake specific fuel consumption and carbon monoxide emissions.