COMBUSTION MONITORING SYSTEM

INVENTOR: Yuvan A/L Ramadhas
FACULTY: College Of Engineering
UNIVERSITY: Universiti Malaysia Pahang
EMAIL: yuvanse7en@gmail.com
CO-INVENTORS: Assoc. Prof. Dr. Devarajan Ramasamy

Background

- Study of combustion process in an internal combustion engine - to improve the performance of the engine,.
- Flame speed is used to study the stability of combustion process in the engine.
- A simplified setup of a non compressed air-gas(LPG) mixture is used in this project .
- The Idea is to determine the flame speed of the combustion dependent on the Fan speed
- Ion sensor is used to measure the flame speed
- The experimental result is compared with the theoretical book value

Problem Statement

- observation of an internal combustion process is a difficult issue. Due to conditions (speed of piston, pressure by compression, heat of combustion etc.) researching a full operating engine is ornate and costly

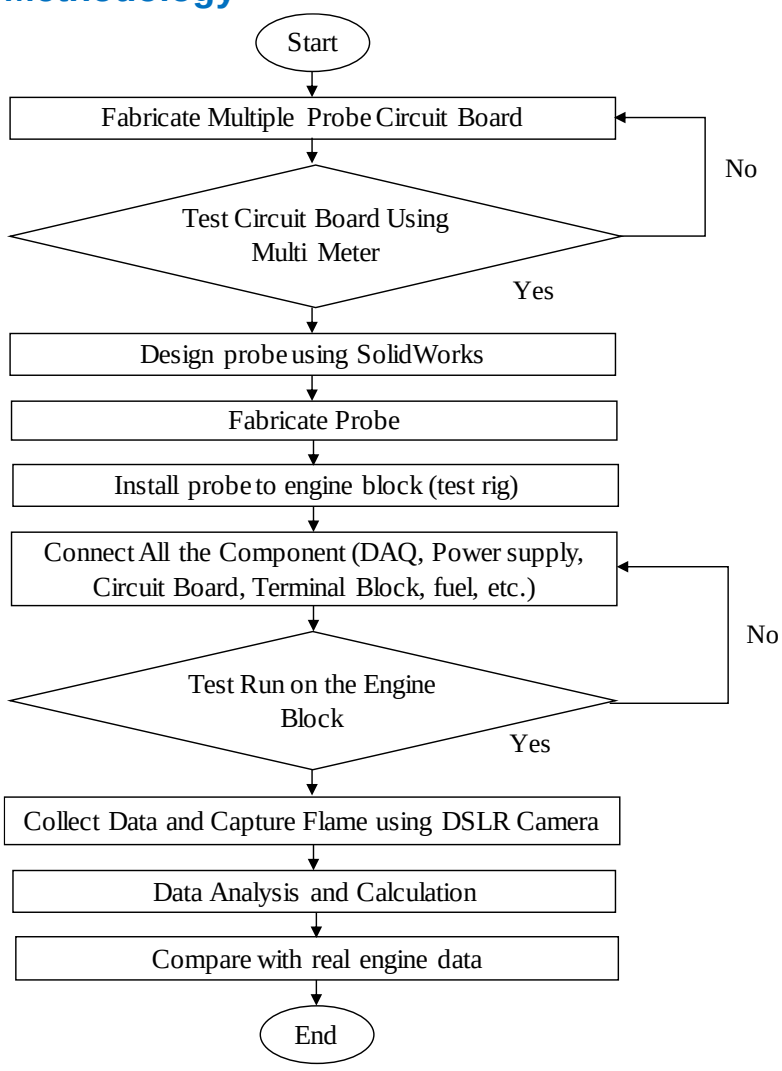
Objectives

- To design an ion probe to measure the flame speed
- To analyse multiple probes for accurate detection of flame speed and compare it with the real engine data

Project Scopes

- Understand operating system of internal combustion of an engine
- To understand how does air-fuel ratio affects the flame speed(engine performance
- Experimental study of ionization flame.
- Analyze on the result
- observation of an internal combustion process is a difficult issue. Due to conditions (speed of piston, pressure by compression, heat of combustion etc.) researching a full operating engine is ornate and costly

Methodology



Availibility in current market

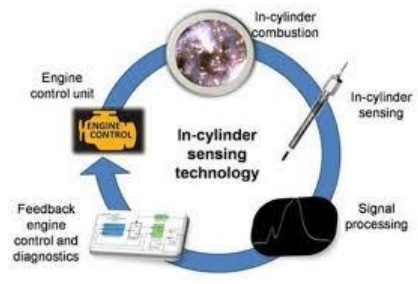
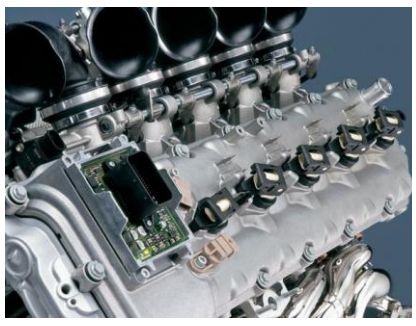
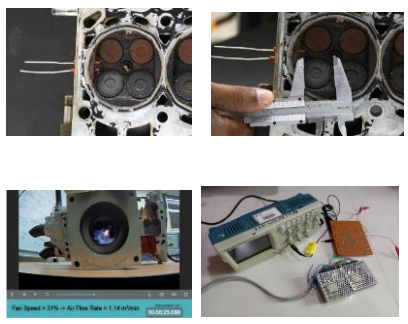


Figure 1: Working principle of the ion sensor in market

Flame study

- Real Engine
- Test rig





Turbulent flame speed obtained

Laminar flame speed obtained

Therefore, the ratio of S_T/S_L obtained compared with book value

References

- Santos, N.D.S.A., et al., *Combustion analysis of a SI engine with stratified and homogeneous pre-chamber ignition system using ethanol and hydrogen.* Applied Thermal Engineering, 2019: p. 113985
- Arcoumanis, C., *Internal combustion engines*. 2012: Elsevier.\
- Tamol Sr, R.A., *Method and apparatus to increase combustion efficiency and to reduce exhaust gas pollutants from combustion of a fuel*. 2005, Google Patents
- Poinsot, T., T. Echekki, and M. Mungal, *A study of the laminar flame tip and implications for premixed turbulent combustion.* Combustion science and technology, 1992. 81(1-3): p. 45-73.
- Bengtsson, J., *Ion sensing arrangement for small gasoline engine*. 2008, Google Patents.