

Two-wheeler Single Cylinder Engine Test Bed

An experimental arrangement consisting of Royal Enfield Classic 500cc engine was made for investigating the effects of alcohol – gasoline blend fuels (M15, M85, etc.) on its performance, combustion, emissions and particulate characteristics. Engine was mounted on the concrete test bed with mild steel structures laid over the bed. Vibration absorbers are used for dampening the vibrations from the engine to the bed. Engine is coupled with a 4 – quadrant Transient AC Dynamometer and it is controlled with the help of dynamometer controller (Control Panel). Air cooling is provided for the cooling of engine with the help of a three – phase blower.

Necessary instrumentation like laminar flow element for measuring air flow rate, mass flow meter for measuring fuel flow rate, spark plug pressure sensor for pressure measurement, encoder for crank angle position determination and thermocouples for measuring temperature are fitted as per the requirement.

In addition to above, high speed DAQ for combustion analysis, EEPS for particulate size measurement and transient emission analyser for measuring regulated species concentration are used along with the engine setup.

The engine parameters such as Ignition Timings, Mixture Lambda Aim, Advance Transient compensations, etc. can be controlled using an open ECU (M150, MoTeC Australia) for achieving optimum engine performance.

Dynamometer Specifications:

| Characteristics | Specifications |
|------------------------|---------------------------------------|
| Make | Dynomerck Controls, Pune |
| Type | Transient AC 4 – Quadrant Dynamometer |
| Rated Torque | 138 Nm @ 1500-3500 RPM |
| Rated Power | 36 kW @ 3500-10000 RPM |

Engine Details:

| Characteristics | Specifications |
|------------------------|-----------------------------|
| Engine Name | Royal Enfield Classic 500cc |
| Engine Model | C500 |
| Engine Type | Port – fuel Injection |
| Displacement | 499 cc |
| No. of strokes | 4 |
| No. of Cylinders | 1 |
| Bore/Stroke(mm) | 84 / 90 |
| Compression ratio | 8.5:1 |
| Valve train | 2 valves / cylinder |
| Rated Torque (Nm) | 41.3 Nm @ 4500 RPM |
| Rated Power (HP) | 27.2 BHP@ 5250 RPM |
| Cooling System | Air Cooled |
| Aspiration System | Naturally aspirated |

Present research and future scope:

The present research is focused upon optimizing the engine parameters using an open ECU for different alcohol – gasoline blends, specifically M85 and M15. It can be extended to other alcohol blends, mixture of two – alcohol blending with gasoline, making some changes in engine hardware and can also run on higher proportions of methanol blends by tuning electronic control module in the future. Since alcohols have higher octane number, thus engine modifications can be made to run the engine using higher compression ratios for obtaining greater power and thermal efficiency.