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Remapping of ECU Engine (KTM 390)

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ABSTRACT

Modern engines in automobile industry are controlled digitally with the help of engine management unit (EMU) which is programmed with the help of engine dyno manually to get the desired power, efficiency. Emissions Engine map of a four cylinder engine is tuned with the help of algorithm by using engine dynamometer as well as EMU, engine speed and throttle position is obtained by algorithm of air fuel ratio to obtain the required performance. Results of Preliminary automated tuning produce output curves of power which is equivalent to those of the OEM tuned EMU. At lower speed data altering is required and power outputs results are slightly less than the engine which are tuned in factory. At better performance and slight improvements in the engine efficiency can be found greater speeds. The tuning of engine to a very higher level which can be equivalent to Original Equipment Manufacturer (OEM) the engine performance can be successfully obtained which saves time and make engine tuning process consistent.

Keywords: *EMU control, automation, engine mapping, dynamometer, engine management, engine map.*

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INTRODUCTION

Engine management unit (EMU) consists of digital processors that actively control flow of fuel and timing of the ignition to make sure the engine operation is optimal and are used in the modern fuel injection which works on fuel injection. Engine tuning ensures that EMU is well programmed and engine works fine all conditions. The manufacturer-developed EMU parameters are basically developed to meet design of compromises between performance market and legislative specifications, particularly about emissions. After-market ECUs are available to replace a damaged unit, to achieve specifications different to those used by the manufacturer, to enhance the operation of an engine intended for use both on land and in a marine environment to enable the tuning and enhanced performance of a modified engine. The ratio of air–fuel is important in the combustion and tuning processes. If all the fuel is burned, causing high fuel of consumption and increased emissions of HC and CO. The Engine can be damaged with very little fuel such as burnt exhaust valves. Fuel injector pulse width and frequency is controlled by the EMU, which also controls the fuel supply rate. With the help of three inputs such as MAP, ambient temperature and volumetric efficiency correction factors (VECFs) pulse width can be calculated at steady state.

EXPERIMENTAL DETAILS

Engine Setup (Figure 1)

Specification

1. Engine: 1-cylinder 4-stroke engine.
2. Displacement: 373cc
3. Stock BHP: 43 hp at 9000 rpm
4. Max torque: 37 Nm at 7000 rpm
5. Valves per cylinder: 4

Selection of ECU

Speeduino Standalone ECU

Speeduino is a very little cost engine Standalone Management System (EMS) based on the Arduino platform Parts that will be required willing mapping. Some of them are free and some are paid since they can be borrowed or are just not needed. Speeduino V0.4 PCB board, Arduino Mega 2560, VR conditioner PCB Laptop with Arduino IDE and Tuner Studio installed, 20-22 ga multicolour wires length and soldering iron will be dependent on favorable condition (Figure 2).

Selection of Controller

Selection of Arduino Mega 2560 R3

The controller used for Speeduino is Arduino Mega 2560 R3. Arduino Mega 2560 boards both Original and clone will work properly, but 16u2 serial interface board will work better than cheaper CH340. Which Arduino chip a board uses can usually be found on the information/specification listing from most retailers, but if in doubt, ask the seller you are looking to buy from (Figure 3).

Selection of Tuning Software

Tuner Studio

Tuner studio is recommended as tuning software for Speeduino. It compiles effectively with software like Linux, Window and, 8.1 AMD CO as well as with MAC. When the compilation of firmware is finished and uploaded to the Arduino, we can set up the Tuner Studio software (Figure 4).

Fig. 1. *Engine.*

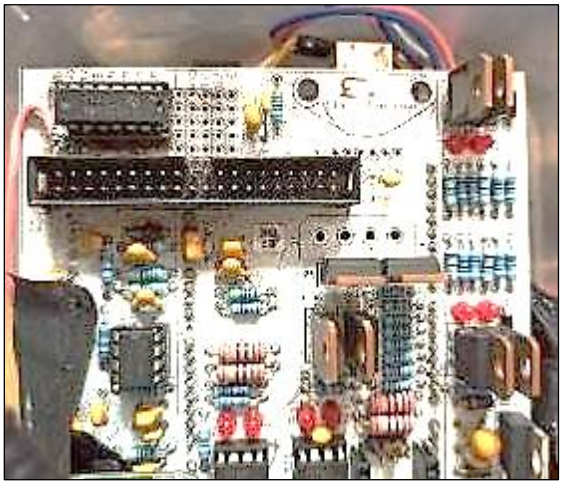

Fig. 2. *Speeduino standalone ECU.*

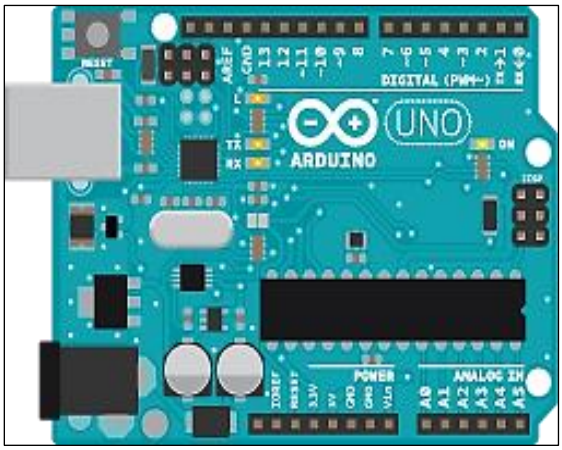

Fig. 3. *Arduino UNO.*

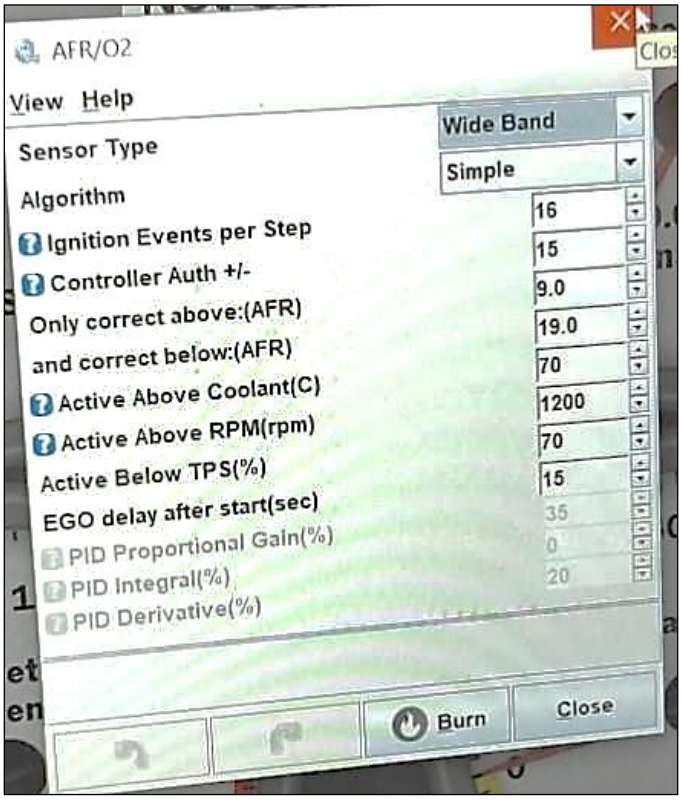

Fig. 4. *Tuner studio.*

Fig. 5. *RPM after remapping.*

CONCLUSION

After remapping maximum efficiency was obtained at 3600 rpm. At better performance and slight improvements in the engine efficiency can be found greater speeds. The tuning of engine to a very higher level which can be equivalent to Original Equipment Manufacturer (OEM) the engine performance can be successfully obtained which saves time and make engine tuning process consistent.

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