Automatic Idling Start & Stop System in an Automotive Engine

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Abstract-*All the vehicles are to be stopped during red signal at traffic junctions. This leads to idle running condition of engine which consumes high amount of fuel and results more exhaust emissions. The idle stop/start system is developed by using counters, timers and contact relay. This signal from the counter is used to switch off the ignition system and the engine stops from running in idle condition. The accelerator bar is to be twisted for 15 degree for immediate starting of the engine when the green signal at traffic junctions. This immediate starting function can be operated by using the proximity sensor2 which is placed close to the accelerator bar. The Idling Stop System automatically switches the engine off at traffic lights and other brief stops, eliminating wasteful fuel consumption. This system will also enable us to reduce exhaust emissions during idling. A scooter with an idling stop/start system was developed aiming at enhancing riding comfort and environmental protection. This results in reducing fuel consumption by 723litres and reduction in carbon monoxide emission by 35000ppm theoretically.*

Keywords- Arduino Board, Starter motor & relay, ATMega328P, Start/Stop (SS).

I. INTRODUCTION

Reduction of carbon dioxide emission from vehicles is one of the priorities in most environmental policies. An agreement to reduce C02 emissions from vehicles, limiting C02 emissions to 130g/km, with progressive implementation from 2012 to 2015. To fulfill such requirements, vehicle manufacturers have been forced to incorporate technological improvements such as weight lightening, engine size reduction, low-rolling-resistance tires, improved aerodynamics and hybridization and electrification of vehicles. The "stop/start" (S/S) technology is an easy and low-cost solution, in which the internal combustion engine is automatically powered off when the car is stopped and restarted upon driver's demand or when needed. Thus, it eliminates fuel consumption during idling, as in the case of stops at traffic lights or jams, which can account for up to 10% of total consumption. The influence of the S/S system on fuel economy and emissions has been studied mainly because of the current interest in hybrid vehicles studied the effect of start transients on fuel consumption and hydrocarbon (HC) and NOx emissions using direct-injection diesel engines.

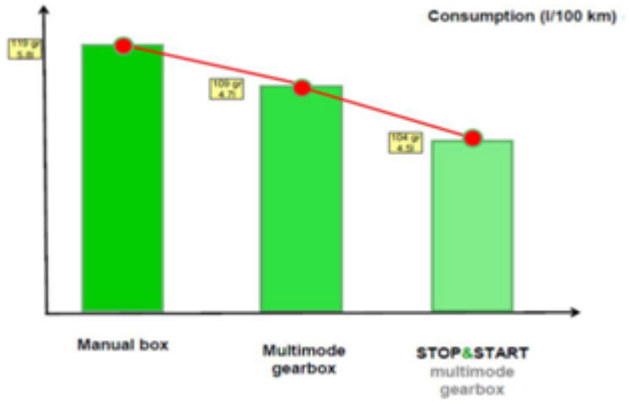

Fig. 1 Consumption of fuel lit/100 km & Emission of CO2 gram/100km

II. IMPLEMENTATION OF THE SYSTEM

In our system Arduino Board is used to control the system. The block diagram of the system is depicted in fig2.

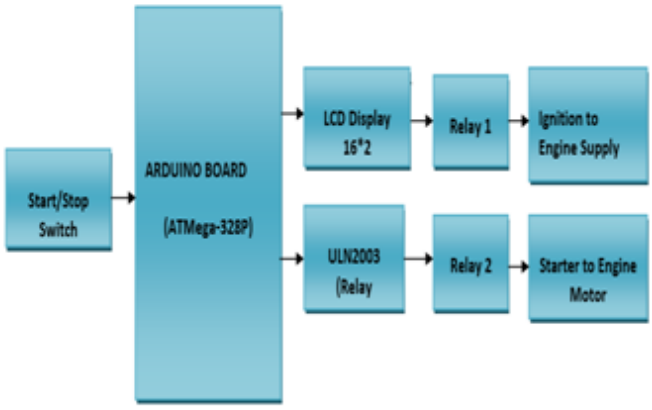

Fig. 2: Block diagram of Arduino board based start stop system

A. Hardware Setup for System

1. Arduino
2. 16x2 Liquid crystal display (LCD)
3. ULN 2003(Relay Driver IC)

4. 2 Channel Relay Module
5. 12 V Starter Relay
6. Starter Motor

Arduino Board control

We chose to use arduino board uno to handle all computations and processes needed in our system.

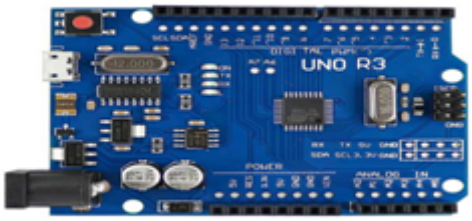

Fig. 2.1: Arduino Board-UNO

Features of the Arduino UNO:

- Microcontroller: ATmega328
- Operating Voltage: 5V
- Input Voltage (recommended): 7-12V
- Input Voltage (limits): 6-20V
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 40 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by bootloader
- SRAM: 2 KB (ATmega328)
- EEPROM: 1 KB (ATmega328)
- Clock Speed: 16 MHz

LCD Display:

It is used to display start stop message of engine

Fig.2.2: 16*2 LCD Display

- Display format : 16 characters ´ 2 lines
- Construction : TN/STN LCD panel, Bezel, Zebra and PCB.
- Optional Edge/Array LED or EL back-light.
- Controller : SED1278 or Equivalent.
- 5V single power input. (Special request for 3.3V driving, built-in DC/DC converter.)
- Normal / Extended temperature type.
- Excellent LC : VOP maintains at 5V for whole temp. range, no need extra temp. compensation circuit

ULN2003 (Relay Driver IC)

Fig.2.3: Pin Diagram ULN2003

FEATURES:

- 500mA rated collector current(Single output)
- High-voltage outputs: 50V
- Inputs compatibale with various types of logic.
- Relay driver application

Channel Relay Module (Used to Control 2 relay Ignition key & Starter motor)

Fig.2.4: 2 Channel Relay Module

Specifications:

- ability strong On-board 5V, 10A / 250VAC, 10A / 30VDC relays
- Relay long life can absorb 100000 times in a row
- Module can be directly and MCU I/O link, with the output signal indicator
- Module with diode current protection, short response time
- PCB Size: 45.8mm x 32.4mm

Pin Configuration:

1. VCC: 5V DC
2. COM: 5V DC
3. IN1: high/low output
4. IN2: high/low output
5. GND: ground

Starter Relay: Remote control switches for automotive applications available for 12V and 24V rated circuits. It is used for to control starter motor.

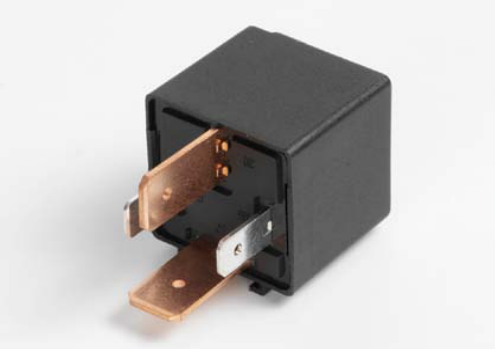

Fig.2.5: Starter Relay

Starter motor: - it is used for starting the vehicle and which is controlled by start switch and accelerator.

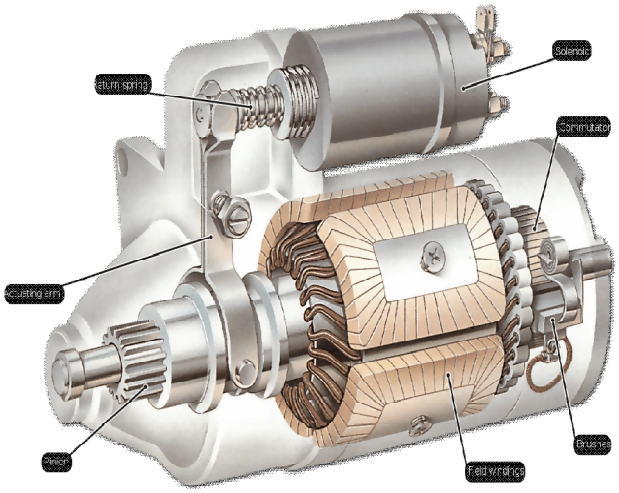

Fig.2.6: Starter Motor

B. Start/Stop System Components:

The main component in any start/stop system is the starter. This can be a conventional starter like that shown in inserts 2 and 3 of Figure 3 as well as an enhanced starter motor.12 V battery supply is given to ignition key and starter motor.

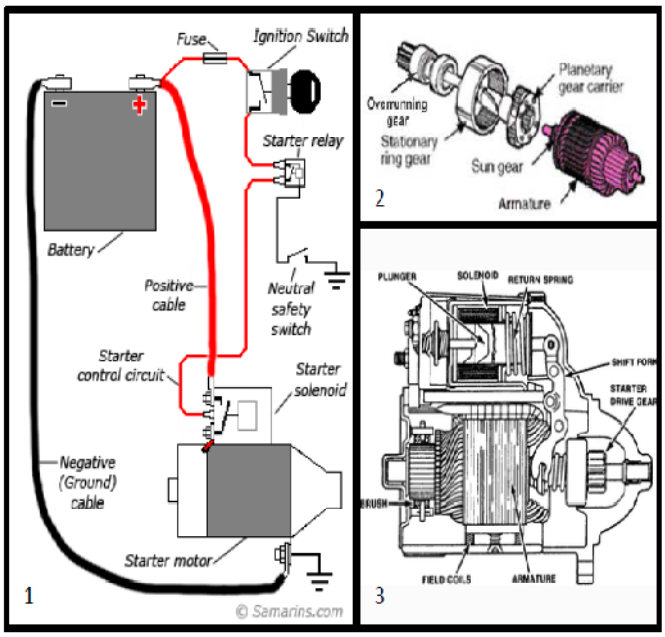

Fig 2.7: Overview of Starter System in a Vehicle

III. PROPOSED SYSTEM

A start-stop system used in automobiles automatically shuts down and restarts the internal combustion engine to reduce the amount of time the engine spends idling, thereby improving fuel economy and reducing emissions.In a typical situation the driver releases the accelerator pedal, activates the brake paddle and the vehicle comes to a halt. The driver takes the car out of the gear i.e. in neutral position. The Engine ECU checks the following:

- Engine is in idling condition and no gear is engaged.
- The wheel speed sensor is showing a zero speed.
- Electronic battery sensor is showing adequate

The Engine will **start** automatically, if all the below conditions are met:

- Engine Speed is zero.
- Vehicle Speed is zero.
- Gear Box is in Neutral.
- Bonnet remains Closed.
- Stop Start feature is selected through selection switch.
- Vehicle stopped automatically / stalled due to Auto Stop.
- Clutch Pedal is pressed fully.

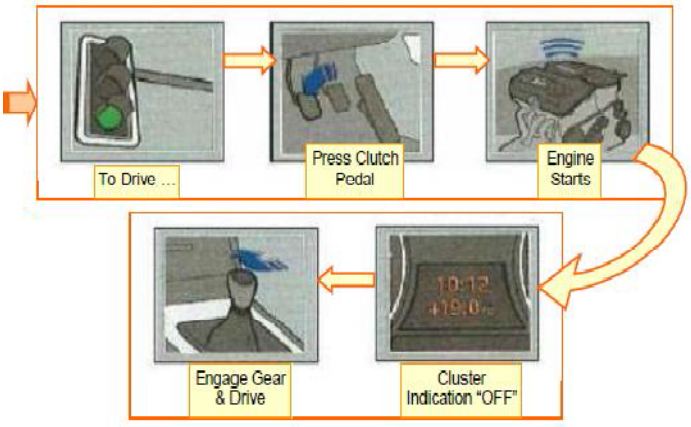

Fig.3.1 Shows conditions for Auto Restart Engine

The Engine will automatically **stop**, if all the conditions mentioned below in are met:
Engine speed in idling range.

- Accelerator Pedal Not Pressed.
- Clutch pedal not pressed.
- Vehicle speed is zero.
- Battery condition is healthy.
- Gear box in neutral.
- Bonnet remains closed.

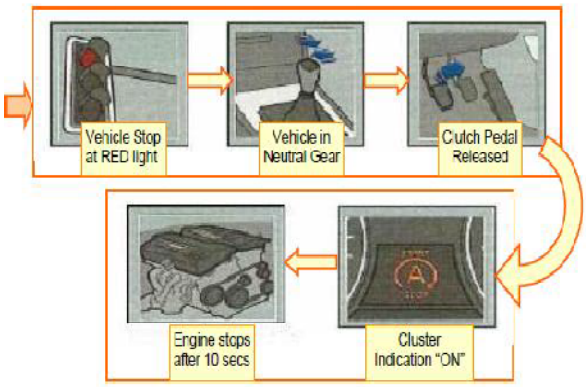

Fig.3.2: Shows conditions for Auto Switch off Engine

IV. CONCLUSION

This system raises the alarm to the society to cut CO2 emission, save fuel and preserve the nature as well as solution to the mentioned issues. This smart electronics system ensures that the driver saves fuel, cuts CO2 emission and conserves the nature without compromising to convenience. This system automatically stops and restarts the vehicle whenever engine spends time in idling at traffic jam or at traffic signal. The driver does not require efforts to start and stop the vehicle and need not compromise to Convenience .This is very cost effective system useful in two wheelers to save fuel, CO2 emission, nature and global warming.

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