

# Design and fabrication of cruise control system engineering essay

[Engineering](#)



**ASSIGN  
BUSTER**

Rex. A#1, Murugarajan. A #2#Department of Mechanical Engineering, Sri Ramakrishna Engineering CollegeCoimbatore-641022, India1rex. 028@gmail. com2murugarajan@srec. ac. inAbstract— A modern automotive cruise control is a control loop that takes over control of the throttle, which is normally controlled by the driver with the handle lever, and holds the vehicle speed at a set value. In this system throttle valve of the carburetor is operated by the manual throttle handle. The throttle valve controls the power and speed of the engine by limiting how much air the engine takes in.

**In this work we proposed a throttle valve of the carburetor is operated by both manual throttle handle and electronically automated servo motor. A servo motor is coupled with throttle valve and it is operated by a microcontroller based motor driver board. When you actuate the cruise control, the operation of the throttle valve is going to manual to automatic. It will be automatically come to manual mode when you press brake.**

Keywords— Cruise Control, Two Wheeler, Fuel Supply system.

IntroductionFuel Supply System of Petrol EngineThe fuel system of an internal combustion Engine is intended to produce a combustible mixture composed of the fuel stored in the fuel tank and atmospheric air, and then deliver both to the cylinders. Petrol engine uses light grade gasoline fuel while the Diesel Engines utilize heavy diesel fuel, therefore fuel supply systems and their differs greatly in petrol and diesel engineCarburetor is the main device in this system. It vaporizes the petrol and mixes it with air in desired proportions depending upon the requirements of operating conditions. The charge (Air + fuel mixture) now flows into the inlet valve

opens. It is ignited by a spark that occurs due to an ignition system. Throttle valve of Carburetor is used to accelerate and decelerate the engine by open and close off valve. Existing system

The current system of acceleration circuit consists of the following parts

The throttle handle  
Accelerator cable  
Bowden cable  
Throttle lever  
Idle mixture adjusting screw  
The throttle valve  
Return Spring

**Construction**

The throttle handle is linked to the throttle lever via the Bowden cable. The Bowden cable has an inner steel wire that transmits this motion the outer plastic hollow casing is attached to the ends of the handle and the throttle body. The throttle lever is soldered to the end of the throttle valve and the other end of the throttle valve is coupled to a return spring.

The initial angular position of the throttle lever is adjusted by idle mixture adjusting screw, so that the throttle valve does not shut down completely when external force is not applied thus switching off the engine.

**Operation**

To accelerate the vehicle the driver twists the handle which causes the Bowden cable to pull the throttle lever to which it is connected. The throttle lever pulls the throttle valve and this causes air flow inside the carburetor to increase. This increase in pressure causes more fuel to be pumped and the cycle of acceleration continues until a steady speed is obtained. To maintain speed the driver must continuously apply a certain amount of twisting force (torque) to the throttle handle. If the driver does not maintain the torque the return spring causes the throttle valve and lever to come to its original state along with throttle handle coming back to original position. To ensure that fuel supply to the engine is not completely shut down when throttle returns to its original position an idle speed adjusting screw is positioned so as to hold back throttle lever. This throttle is not completely closed as the idle

speed adjusting screw counteracts the force of the return spring. The idle speed can be adjusted by tightening or loosening this nut that causes the angle of the throttle valve at rest position to increase or decrease. This system is used almost universally in motorcycles. The main disadvantage as you can see is that the driver has to maintain constant torque on the throttle to get a steady speed and good mileage. This is not possible practically since the fatigue and other factors such as wind speed affect the driver's ability to maintain a constant torque on the throttle. This system also suffers inflexibility and the driver has to sit in a particular posture for long periods of time.

**Methodology**  
In proposing system throttle valve of the carburetor is operated by both manual throttle handle and electronically automated servo motor. A servo motor is coupled with throttle valve. The servo motor is fitted by using Sheet metal. A servo motor is operated by a microcontroller based motor driver board. When you actuate the cruise control, the operation of the throttle valve is going to manual to automatic. It will be automatically come to manual mode when you press brake.

**Fig. 1 Block diagram of proposed system**

**Description Of The Components**  
**Servo Motor**  
A servo motor is a motor which forms part of a servomechanism. The servo motor is paired with some type of encoder to provide position/speed feedback. A stepper motor is one type of servo motor. A stepper motor is actually built to move angular positions based upon each possible step around the entire rotation, and may include micro-steps with a resolution such as 256 micro-steps per step of the stepper motor. A servomechanism may or may not use a servo motor. For example, a household furnace controlled by a thermostat is a servomechanism, because of the feedback and resulting error signal, yet

there is no motor being controlled directly by the servomechanism. Servo Motor Specification Model Name: TGY-MG959 Control system: +pulse width control Required pulse: 3-5V peak to peak square wave Operating voltage: 4.8V Operating temperature Range: -20~+60C Operating speed: 0.2Sec / 60 degree at no load Stall torque @ 4.8V: 166 Oz/in. (12.0kg. cm) Stall torque @ 6.0V: 200 Oz/in. (15.0kg. cm) Operating angle: 45 deg. One side pulse travelling 400usec Direction: Counter clockwise/pulse travelling 1520-1900usec Motor type: Coreless motor Potentiometer drive: Indirect drive Bearing type: Dual ball bearing Gear type: All metal gears Connector wire length: 12in Dimensions: 40.2 x 20.1 x 36.8mm Weight: 2.64Oz. (75g) Servo Motor DimensionsservoDiag. gifdim. JPG Fig. 2 Servomotor dimensions Servo Motor Driver Board with Microcontroller CBE-1112-CEM1217-BlockDiagramwwithout lcd. jpg Fig. 3 Block diagram of Servo Motor Driver Board with Microcontroller PIC The microcontroller that has been used for this project is from PIC series. PIC microcontroller is the first RISC based microcontroller fabricated in CMOS (complementary metal oxide semiconductor) that uses separate buses for instruction and data allowing simultaneous access of program and data memory. The main advantage of CMOS and RISC combination is low power consumption resulting in a very small chip size with a small pin count. The main advantage of CMOS is that it has immunity to noise than other fabrication techniques. Various microcontrollers offer different kinds of memories. EEPROM, EPROM, FLASH etc. are some of the memories of which FLASH is the most recently developed. Technology that is used in pic16F877 is flash technology, so that data is retained even when the power is switched off. Easy Programming and

Erasing are other features of PIC 16F877. KeypadA numeric keypad, or NUM pad for short, is the small, palm-sized, seventeen key section of a computer keyboard, usually on the very far right. The numeric keypad features digits 0 to 9, addition (+), subtraction (-), multiplication (\*) and division (/) symbols, a decimal point (.) and Num Lock and Enter keys. Laptop keyboards often do not have a num pad, but may provide num pad input by holding a modifier key and operating keys on the standard keyboard. RelayA relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits, repeating the signal coming from one circuit and re-transmitting it to another. Relays were used extensively in telephone exchanges and early computers to perform logical operations. A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called " protective relays". Sheet MetalSheet metal is simply metal formed into thin and flat pieces. It is one of the fundamental forms used in metalworking, and can be cut and bent into a variety of

different shapes. Countless everyday objects are constructed of the material. Thicknesses can vary significantly, although extremely thin thicknesses are considered foil or leaf, and pieces thicker than 6 mm (0.25 in) are considered plate. Sheet metal is available in flat pieces or as a coiled strip. The coils are formed by running a continuous sheet of metal through a roll slitter. The thickness of the sheet metal is called its gauge. Commonly used steel sheet metal ranges from 30 gauge to about 8 gauge. The larger the gauge number, the thinner the metal. Gauge is measured in ferrous (iron based) metals while nonferrous metals such as aluminum or copper are designated differently. Sheet metal also has applications in car bodies, airplane wings, medical tables, roofs for buildings (Architectural) and many other things. Sheet metal of iron and other materials with high magnetic permeability, also known as laminated steel cores, has applications in transformers and electric machines. Historically, an important use of sheet metal was in plate armor worn by cavalry, and sheet metal continues to have many decorative uses, including horse tack. Sheet metal workers are also known as "Tin Bashers", ("Tin Knockers") which is derived from the hammering of panel seams when installing tin roofs.

**Procedure And Operation**

To accelerate the vehicle the driver twists the handle which causes the Bowden cable to pull the throttle lever to which it is connected. The throttle lever pulls the throttle valve and this causes air flow inside the carburetor to increase. This increase in pressure causes more fuel to be pumped and the cycle of acceleration continues until a steady speed is obtained. Alternatively the driver switches on the servo motor system and pushes the increase button to accelerate from rest or if the vehicle is in

motion when the system is switched on, the driver can accelerate or decelerate using the increase and decrease buttons. To maintain speed the driver need not continuously apply a certain amount of twisting force (torque) to the throttle handle. The driver can switch on the system at whatever speed the vehicle is moving and the system automatically deactivates manual speed controlhrottle. Here the safety aspect of the system is needed to be explained as it is the most crucial factor in the design of any automotive system. When the system is in active mode (i. e. The servo motor is controlling the acceleration), any input given to clutch, front brake or back brake will cause an immediate shutdown of the system and the throttle valve returns to normal position due to return spring.

Advantages Comfortable Driving Fuel efficiency Long life of carburetor Cost

analysis TABLE Cost analysis S. No Name Of The

Parts Material Quantity Amount (Rs) 1. Servo Motor TURNIGY-MG95911500. 002.

Motor driver board with Micro Controller 11750. 003. Control

Switches Plastic 1100. 004. Relay 1100. 005. Sheet Metal MS 300 mm 2100. 006.

Hylam Sheet Hylam 100 mm 250. 007. Wires and others 250. 008. Labor 500.

00 Total 4350. 00 VII. Results The design was implemented in YAMAHA FZ-S

and the following results were made. Comparison between Cruise control

Servo Rotation Angle and Speed Fig. 4 Comparison between Cruise control

Servo Rotation Angle and Speed TABLE Comparison between Cruise control

Servo Rotation Angle and Speed



## **Cruise control servo Rotation Angle (Degrees)**

### **Speed (RPM)**

50. 84300067. 79400084. 745000101. 696000110. 166500It is seen that the servo angle is linearly proportional to the speed of the vehicle. Comparison between Speed and VelocityFig. 5 Comparison between Speed and VelocityTABLEComparison between Speed and VelocitySpeed (RPM)Velocity (Kmph)Gear 4Gear 53000354340004754500058686000698265007788It is seen that the servo angle is linearly proportional to the speed of the vehicle. Comparison between Speed and VelocityFig. 6 Comparison between Speed and VelocityTABLEComparison between Speed and Velocity

### **Speed (RPM)**

### **Velocity (Kmph)**

### **Gear 4**

### **Gear 5**

3000354340004754500058686000698265007788Comparison between Time and VelocityFig. 7 Comparison between Time and VelocityTABLEComparison Between Time and Velocity

**Time (s)**

**Velocity (Kmph)**

**For 50 Kmph**

**For 60 Kmph**

**For 70 Kmph**

1545506030475263454954656050576875505969905060701055060701205  
06070135506070150506070Time for the cruise control to stabilize the speed was measured using stopwatch. It was observed that time for stabilizing the speed increases with increased speeds. ConclusionThus the design and fabrication of two wheeler cruise control were carried out. It was implemented in YAMAHA FZ-S and various tests were carried out on the system. The following conclusions were made from the observations in the tests: 1. The driver can maintain the throttle valve at a given angle constantly to get a steady speed thereby increasing performance and life of the engine. 2. The proposed system reduces the fatigue on the driver, and also gives flexibility for the driver to adjust his posture from time to time. 3. The cruise control servo motor rotation angle is directly proportional to the speed of the vehicle. The time taken for the cruise control to stabilize the speed increases at higher speeds.