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Survey of Two Wheeler's Ignition System and Fuel Economy with Embedded System

Vijay N. Supe
Department of E & TC
Pimpri Chinchwad College of Engineering, Pune, India
Email: vijay.supe@gmail.com

Sheetal S. Phapale
Department of E & TC
University of Pune

Dr. N. B. Chopade
Department of E & TC
Pimpri Chinchwad College of Engineering, Pune, India
Email: nbchopade@gmail.com

Abstract **– Several changes are taking place in the two-wheeler sector. Today, internal combustion engines in motorcycles most commonly use a four-stroke cycle. The four strokes refer to intake, compression, combustion (power), and exhaust strokes that occur during two crankshaft rotations per working cycle of the gasoline engine and diesel engine. Principle of the digital capacitive discharge Ignition (CDI) system for two wheeler. And outlines a, control, CDI with variable timing is becoming one of the most economical choices available. This variable describes the traditional CDI solution and the digital solution using microcontroller unit. Traditionally, the CDI timing for the single-cylinder two-wheeler is fixed, known as fixed-time CDI. The timing, propels the piston will be reduced, resulting in a loss of power. It is also useful in non battery type two wheelers [non-battery vehicle owner should install extra battery. It includes features like: bike immobiliser - if unauthorised person is driving away your bike, you can stop the bike within 80 to 125 feet; easy - fast installation and operation; auto arming after 15 seconds the alarm will switch off and will be reset automatically; no fear of tampering with hooter due to unique inbuilt loud hooter; engine cut off – any attempt to drive away the bike disconnects the ignition and trigger the alarm; remote operation - let you arm or disarm the knight hawk from a distance of 80 to 125 feet, locate the bike in a parking lot sending as sos in emergency to attract attention; theft detection - any attempt to drive the vehicle or seal the parts such as carburettor, battery, etc. Will trigger off alarm; blinker - signal lights blinks while locating the bike in parking lot ; it is water and heat resistant and is designed to withstand extreme environmental conditions; compact size - fits any two wheeler.**

Keywords **– Fuel Consumption, Alternating Current CDI, DC CDI, TCI**

I. INTRODUCTION

1. Four Stroke Engine

A brief overview of 4 stroke engine is given below since the heart of our system is a 4 stroke engine. Thissystem controls the engine for fuel to get the maximum efficiency. It puts the spark at the proper place in the block. The position of the spark refers in terms of degree, please see the above diagram which shows the top is at 0 degree and the bottom is at 360 degree. The graph of speed vs. position refers as MAP, profile and fuel economical curve etc. The four strokes of the cycle are:

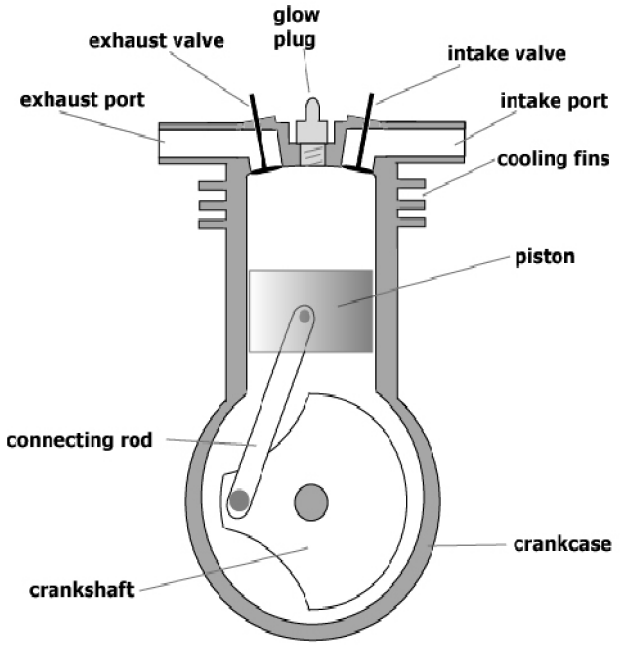

Fig.1. Four Stroke Engine

Intake: During the intake stroke, the piston moves downward, drawing a fresh charge of vaporized fuel/air mixture.

Compression: As the piston rises, the poppet valve is forced shut by the increased cylinder pressure. Flywheel momentum drives the piston upward, compressing the fuel/air mixture.

Power: At the top of the compression stroke, the spark plug fires, igniting the compressed fuel. As the fuel burns it expands, driving the piston downward.

Exhaust: At the bottom of the power stroke, the exhaust valve is opened by the cam/lifter mechanism. The upward stroke of the piston drives the exhausted fuel out of the cylinder.

2. Electromechanical Ignition System

The system shown in Fig.2 is a mechanical control ignition system. It has make and break contact pointer to discharge the coil or capacitor to get the spark by HT. Due to the disadvantage of wear and tear of contacts, the system is not durable, reliable and cost efficient.

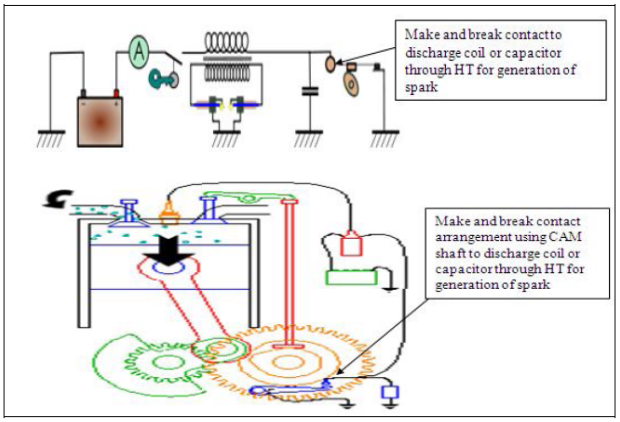

Fig.2. Electromechanical Ignition System

3. Electronic Ignition without Fuel Economy

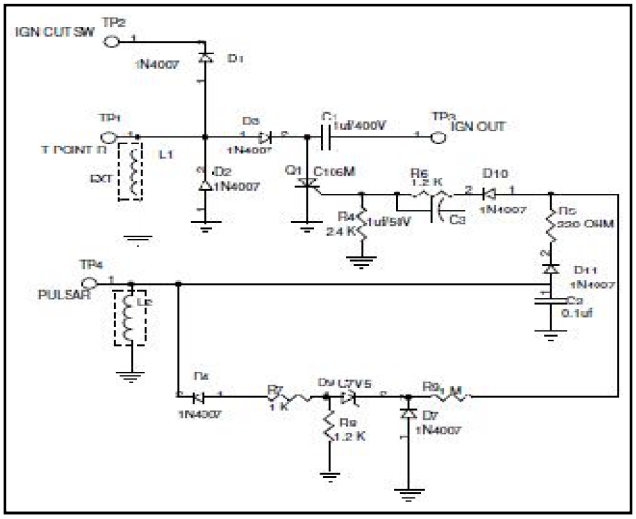

Fig.3 Electronic Ignition System with Solid-State Device (SCR- C106M)

The above system is electronic ignition system by replacing make and break contact pointer by SCR, after invention of SCR and some modification with the basic ignition system. The above system is durable but still there is no fuel economy consideration. It sparks only at fixed position in the piston block.

3.1 Digital CDI (Capacitive Discharge Ignition System

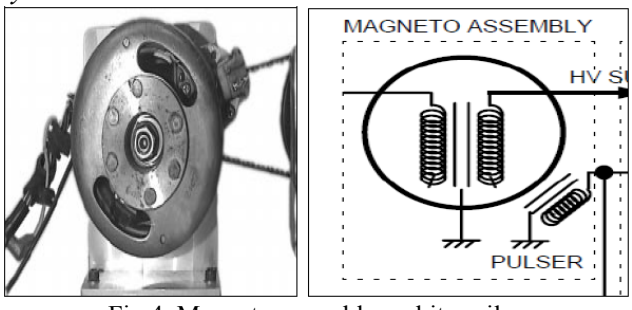

Fig.4. Magneto assembly and its coils.

- Exciter coil: It generates 300V for charging capacitor.
- Pulsar coil: It generates an alternating pulse while engine rotates, these pulses are used to calculate RPM as well as for delay reference to the ignition spark.

3.2 AC CDI (Alternating Current CDI)

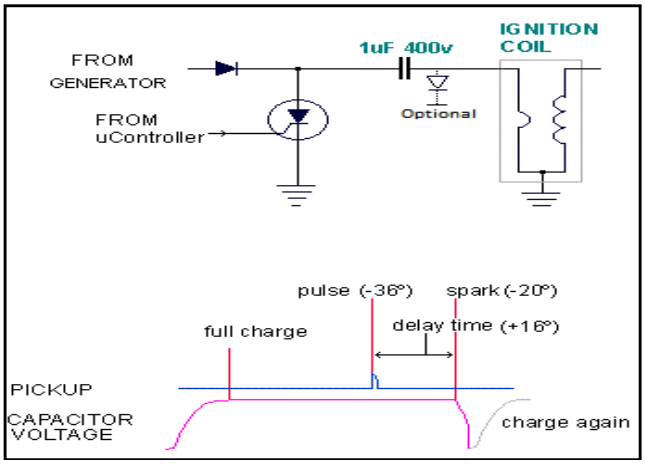

Fig.5 Element of AC CDI which shows SCR is controlled by microcontroller.

The above system is AC CDI system it takes 300V from magneto (see fig.5) to charge the capacitor and discharges the capacitor using the microcontroller which includes the fuel economical algorithm in its firmware. Triggering SCR by microcontroller through HT coil, it generate spark at proper position in the piston block system for better fuel efficiency. We will use this system in our micro-hybrid unit.

Features

- AC CDI requires typically 300V for charging the capacitors which need to be generated by magneto (generator).
- Delay time is applied directly after the pickup pulse to fix the spark position.
- AC CDI does not require maintaining battery.
- Software implementation is easy than DC-CDI.
- Microcontroller requires less I/Os than DC-CDI.
- DC CDI is cheaper.

3.3 DC CDI (Direct Current CDI)

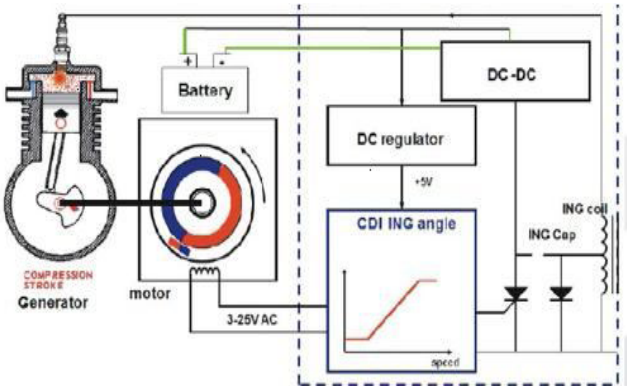

Fig.6. DC CDI (Direct Current CDI)

The above system is DC CDI system it takes 300V from DC-DC inverter to charge the capacitor. The capacitor discharges using the microcontroller which includes the fuel economy algorithm in its firmware. The DC-DC inverter generates 300V and its input is 12V battery supply. Triggering SCR by microcontroller through HT coil generates spark at proper position in the piston block system for better fuel efficiency.

Features

- DC-CDI requires 12V from battery.
- DC CDI requires inverter circuit to convert 12V to typically 300V to charge the capacitor.
- Delay time is applied directly after the pickup pulse to fix the spark position.
- DC-CDI requires battery.
- Software implementation is difficult.
- Microcontroller require more I/O than AC-CDI
- DC CDI is costly.

3.4 TCI (Transistor Control Ignition):

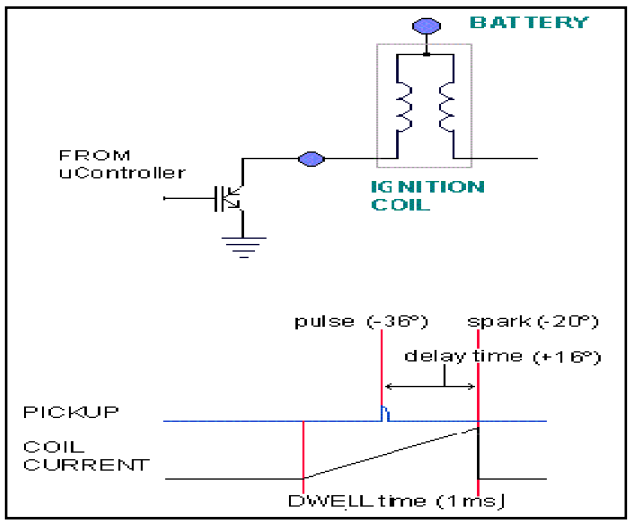

Fig.7. TCI (Transistor Control Ignition)

Features

TCI is charging the coil itself before fire the spark. Time taken to charge the coil is called dwell time. The spark is made when the current across the coil stops, and the coil collapsates and fires the spark. Delay time is applied after the pickup pulse but dwell time has to be subtracted from the total time, to fix the spark position. TCI uses a simpler design and doesn't need capacitors.

4. Fuel Injection System

In the beginning, gas powered vehicles used a carburetor to get gas into the engine. This worked well, but when fuel injection came along, things changed quickly. Fuel injection, especially electronic fuel injection produces fewer emissions and greatly increases gas mileage. The carburettor was an ingenious invention in itself. Your car's engine has 4 cycles, and one of them is a "suck" cycle. Put simply, the engine sucks (creates extreme vacuum inside the cylinder) and when it does, the carburetor was there to let the right amount of gas and air get sucked into the engine. While great, this system lacked the precision of a pressurized injection system. Enter fuel injection. Your engine still sucks, but instead of relying on the suck, fuel injection shoots exactly the right amount of fuel into the chamber. Fuel injection systems have gone through a few evolutions, adding electronics was a big step, but the idea has remained the same: an electrically activated valve (the injector) spraying a metered amount of fuel into your engine.

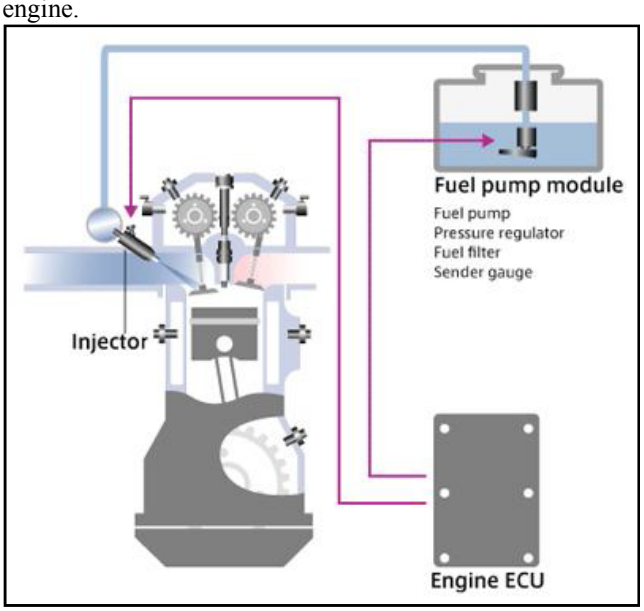

Fig.8 Fuel Injection System

Working:

Gasoline engines work by sucking a mixture of gasoline and air into a cylinder, compressing it with a piston, and igniting it with a spark; the resulting explosion drives the piston downwards, producing power. Traditional (indirect) fuel injection systems premix the gasoline and air in a chamber just outside the cylinder called the intake manifold. In a direct-injection system, the air and gasoline are not pre-mixed; air comes in via the intake manifold, while the gasoline is injected directly into the cylinder.

5. Security/Alarm System

Fig.9 Security Alarm System

It is specially designed for two wheeler security; the black cat bike security has some outstanding features:

1. Once the system is activated (armed),it automatically cuts off the vehicle's ignition circuit and prevent engine from starting.
2. Extremely sensitive to the slightest movement, jerk or tampering, it instantly responds by setting off a loud siren
3. The black cat system can also start the engine by remote control.
4. The remote's operating range is 300 feet (max).
5. Both the remote, and the module are water resistant a crucial advantage since two wheeler is exposed to rain and other vagaries of the weather.

Feature:

- Remote Arming/Disarming (range 300 ft.max)
- Silent Arming
- Ignition Cut-Off
- Remote Engine Starters
- Alarm by Ignition
- Bike Finders
- Anti Hijacking
- impact Sensor
- Sensitivity adjusted By Remote
- Arming Reminder
- Panic
- Overtaking Warning
- Speaking function (optional)
- Water Resistant Remotes & Module
- loud Siren
- Code learning
- Power Off memory

III. RESULT

The electronic control system determines basic injection quantity based upon electrical signal from the air flow meter and engine rpm. The fuel delivery system maintains a constant fuel pressure on the injector This allow the ECU to control the fuel injection duration and deliver the appropriate amount of fuel for engine operating conditions. It includes greater fuel economy, decreased emissions, and better throttle responsiveness. better fuel efficiency, better performance, and greater reliability diameter and high cost.

III. CONCLUSION

Fuel injection systems have made significant improvements in the performance of today's motor vehicles. Some of these include greater fuel economy, decreased emissions, and better throttle responsiveness. better fuel efficiency, better performance, and greater reliability diameter and high cost. DC-CDI is a type of electrical product that works to ignite and combust fuel pulled into the cylinder(s) of a motorcycle engine. It constantly captures the state of the vehicle without sacrificing drivability of motorcycles and controls engine ignition with optimum timing based on calculations from a microprocessor (CPU). Provides for instant high-voltage discharge for fast start-up to demonstrate superior engine start-up performance Can control engine ignition with generator output (can ignite even without a battery connection)control both engine ignition and vehicle load with an onboard CPU. Using our own ignition thyristor, step-up converter transistors and diodes as principal components enables high reliability and low cost.

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AUTHOR'S PROFILE

Vijay N. Supe
is an assistant manager of Research and Development at Kinetic communication ltd Pune, India. He received his B.E. degree from University of Amravati in 2004. He is currently pursuing M.E in VLSI and Embedded Systems from P.C.C.O.E, Pune His research interests in automotive Fuel Economy.

Sheetal S. Phapale
is a Jr.Engineer of Research and Development at Kinetic communication ltd Pune, India. She received her B.E. degree from University of Pune in 2013. Her interest in embedded system.

Dr. N. B. Chopade
received M.Sc (Applied Electronics) & M.E (Electronics) degrees from SGB Amravati University, Amravati in the year 1992 & 1998 respectively. Scored third merit position in Amravati University in the year 1992. His areas of research are Wavelet applications, DSP, Image processing. He has completed Ph.D from SGB Amravati University; Amravati. He has joined SSGM College of Engineering, Shegaon in 1992 and is currently working as Head of department of Electronics and Telecommunication Engineering. In PCCOE, Pune He has 21 years of Teaching Experience. He is a member of I E (INDIA), IETE, ISTE and BES (INDIA).