Pressure Monitoring and Thermal Power Generation in Bike Using Wireless Technology

C.Priya, C.Ramya, J.Siva, S.T.Nivetha, M.Poongothai, S.Sanmathi

Abstract: ***Modern vehicle, the improper tyre pressure is the safety issue where it should be noticed that the drop in the tyre pressure in reduction of mileage and its safety performance while driving. Through the conventional method, thermal energy is converted into electrical energy, due to the environmental issues and the fossil fuels, the waste heat energy can be reformed into electricity irrespective of battery usage. This may improve the overall efficiency in the energy conservation. Bike tyre pressure monitoring system providing new approach in wireless communication which will make to increase the durability of tires and maintain mileage and reduce the number of accident and inconvenience while driving. The programming is whole controlled by a PIC microcontroller with an embedded C program. The pressure and temperature is displayed on LCD screen with the help of wireless pressure sensor and an LED indication for proper electricity generation.***

Keywords: PIC microcontroller, Wireless pressure sensor, Thermoelectric power generator, LED, LCD.

I. INTRODUCTION

The demand for pressure measuring instruments increased during the steam age. When the pressure sensing technologies were first manufactured mechanically used Bowman tube gauges to more a needle and given the visual indication of the pressure. Nowadays the measurement of pressure is electrically using pressure transducer and pressure switches. The high precision wireless pressure sensor is employed which gives high accuracy and linearity as well as long term stability and fast conversion time. The advantages of pressure sensor that can monitor bike tyre pressure 24x7 via smart phone app, up to 19 wheels in one app and also it protect bike rider from risky deflected tires.

A thermoelectric generator (TEG) is also termed as see back generator, is a solid state device that can make the heat flux to convert directly as electrical energy through a phenomenon called as see back effect.

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The thermoelectric effect is the direct conversion of temperature difference to electric voltage and vice versa. At the atomic scale, an applied temperature gradient causes carrier changes in the material diffuses from the hot side to cold side. The advantage of TEG are of this is non-conventional system, Pollution free, easy maintenance and reduce transmission losses.

The tyre pressure monitoring system using wireless communication which includes ICATMEGA168 micro-controller with the RFID transmitter and Receiver for wireless communication from the tyre [1]

A new approach to tyre pressure monitoring system by wireless sensor method using CAN communication protocol with GSM system [2].Waste heat energy harvesting using thermo electric generator by thermo electric generator with FIN [3].Thermo electric generator : A review using multi-thermo couple module [4].Tyre pressure monitoring and communicating antenna in the vehicular system has the antenna on its wheel for wireless communication to the user. The proposal has the sessions of II Existing method , III Proposed method, IV Results and discussion and V Conclusion.

II. EXISTING METHOD

Block Diagram

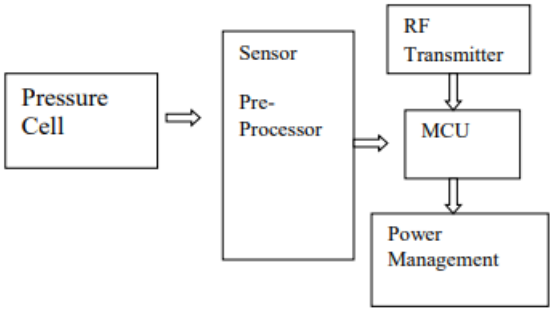

Fig. 1 Transmitter Unit

The Transmitter Unit [1]transmit the pressure value from pressure cell through RF transmitter and manipulated by pre-processor and MCU , then it transmitted to receiver.

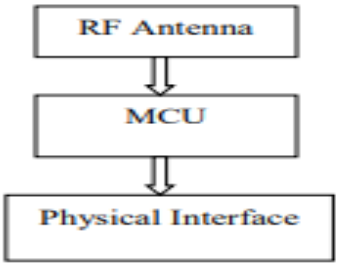

Fig. 2 Receiver Unit

The Receiver Unit [1] receives the pressure value by RF Antenna and manipulated by MCU and displayed with the physical interface.

The Existing system utilizes integration techniques to provide a solution to measure real-time tyre pressure and also alerts the driver about improperly inflated tires. The drawback in the existing system is that it alerts user by alarm which makes a vibration and cause some fluctuation to the driver.

In the proposed system, the power is utilized from heat energy as a technique of energy conservation and the alert statements has been displayed and also checks the condition of the tyre.

III. PROPOSED METHOD

Peltier TEG

Thermoelectric generators are devices that convert temperature differences into electrical energy, using a phenomenon called the "See beck effect". These are solid-state devices, and have no moving parts.This effect introduces power to the module with a resultant cooling of one side and heating of the other. These types of modules are low amp (typically in the 6 amp range, running at 12V) and are designed for low temperature exposure of no more than 70°C to 80°C hot side.

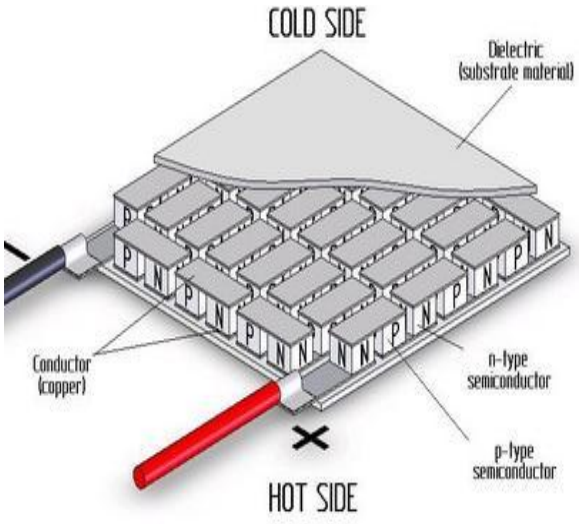

Fig. 3 Structure of Peltier TEG

Wireless Pressure Sensor

Make accurate and consistent measurements of gas pressure it combines with temperature probe, study the empirical gas laws it can be connected through Bluetooth or USB connectivity with the long-lasting rechargeable battery, it has the range of 0-400PSI(Pounds per Square Inch).It has the maxi mum range of 30metre.

Fig. 4 Wireless Pressure Sensor

Fig. 5 WTPMS fixed at bike tyre

1.Wireless Pressure Sensor
2.Peltier TEG
3.Electronic control unit
4.Display unit.

The following steps will produce the methodological flow of the electricity generation and tyre pressure value analysis.

1.Peltier TEG which is placed on the engine will convert the thermal energy to electrical energy.

2.An 7805 voltage regulator IC is used to maintain the voltage level automatically.

3.An LED is used as an indicator which indicate whether the electricity produced from the TEG.

4.Wireless pressure sensor is placed on the mouth of the tyre which measures the pressure value and transmit the data signal to PIC microcontroller.

5.PIC microcontroller receives the data signal from wireless pressure sensor and manipulate with the help of embedded C code.

6.The pressure value with the temperature is displayed on the LCD.

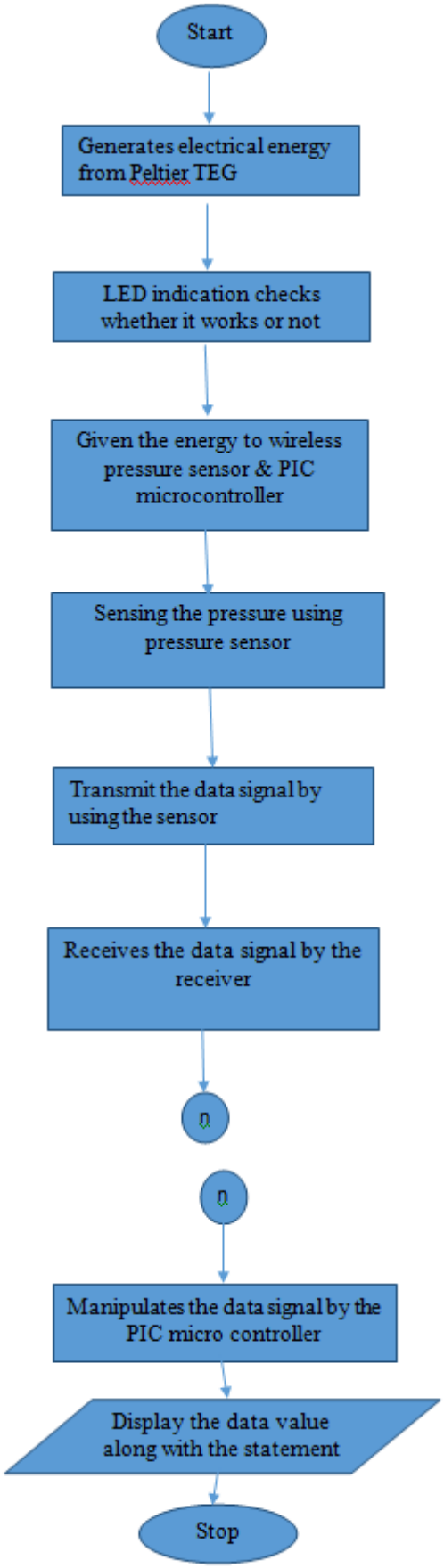

Fig. 6 Flow Chart for the proposed work

IV. RESULT AND DISCUSSION

TEC1-12706 Peltier module has made to generate electricity from the waste heat liberated on bike engine , the peltier module has been placed on the bike engine and an LED is included to indicate the current flow. The generated electricity is used as a power source to the entire system which includes tyre pressure monitoring system.

Fig. 7 Generation of electricity from TEC1-12706 Peltier module

The working principle of wireless bike tyre pressure monitoring system includes an 7805 voltage regulator IC is used to maintain the voltage level automatically from TEG to provide 5V DC supply with the help of rectifier. MPXv5050GP Pressure Sensor is mounted on the mouth of the bike tyre which periodically measure the pressure.

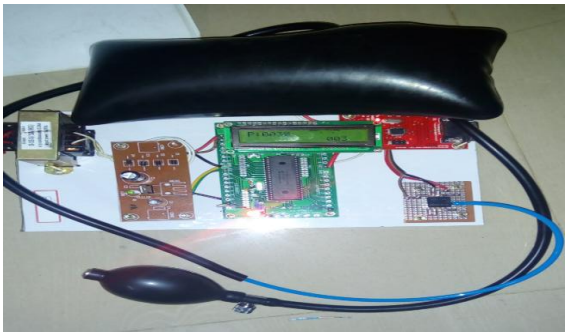

Fig. 8 Transmission of pressure value

The transmitter part consists of MPXv5050GP pressure sensor which sense the pressure value in the bike tyre through the instruction is made by the PIC microcontroller which is manipulated by C code embedded in it. The measured pressure value is send to the Zigbee for transmitting the data to the receiver.

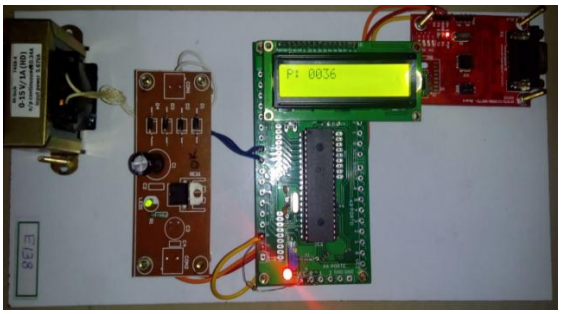

Fig. 9 Reception of Pressure value

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The receiver receives the pressure value through the Zigbee and it send to the PIC microcontroller with the help of embedded C code the received pressure value is displayed on the LCD to give knowledge about the tyre condition to the bike driver.

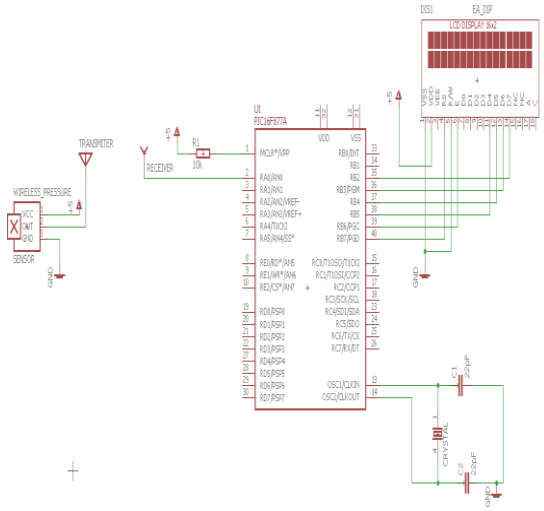

Fig. 10 Schematic Diagram of WTPM

Peltier TEG generates electricity from the waste thermal energy and it is indicated through LED connected with the regulator to provide 5V continuously.

The pressure has been sensed through wireless pressure sensor which has controlled by PIC microcontroller and display the statements.

Fig. 11a Statement for sensing the pressure

The pressure sensor which is placed on the bike tyre has started to sense the pressure level in the tube and which has been indicated as a statement in the LCD.

Fig. 11b Statement for Normal pressure range

The pressure range is produced as a condition in the microcontroller as a program ,it checks the range between P>=25 and P<=35 and displays the statement as normal pressure range.

Fig. 11c Alert Statement

If the pressure value becomes lower than 25 i.e., P<25 implies the alert statement such as Alert to refill air which has been displayed.

V. CONCLUSION AND FUTURE SCOPE

This system provide a best solution which makes the driver to check the tyre pressure periodically in real time and also reduces the number of accidents due to improper inflated tyres, increase tyre life and safety of the vehicle, durability of tyres and reduce vehicles fuel consumption. The TEG makes wastage amount of heat from the engine is converted into electrical energy for charging the bike battery automatically without any fault. It can be enhanced by producing voice alert to the driver about the tyre condition and also it can ensure the replacement of tyre when it becomes old or poor in driving quality.

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