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Energy Conservation using Biogas Fuel for Engines with Embedded Interface for Safety (ECBFEEIS)

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***Abstract*—Moving with the fast paced world has always been a great difficulty in the modern era of mankind. Every morning you step out of door and carry on your daily routines you find yourself entangled in gossamer of traffic. As a result of this we get affected by pollution. Consequently this also leads to wastage of fuel (Non-Renewable sources of energy). Thus there arises a need to save the non-renewable sources for future developments. That is there needs to be Sustainable Development.**

Bio-Fuel also known as Bio-Gas is obtained from sources of waste. By burning waste we obtain bio-gas. This process is called Bio-methanation. The main problem in this method is the transportation of the bio-gas. Thus this module will be a great life-saver of non-renewable sources of energy which needs to be preserved for the future. We look forward to solve this drawback of using bio-gas as a fuel for transportation.

Keywords-Micro-controller, sensor, Bio-methanation, LCD Display, Bio-fuel.

I. INTRODUCTION

Our venture in this paper is to design a system module which will run the engine using "Bio-fuel".. This module is designed on an embedded base so as to ensure maximum safety in the transportation of Bio-Fuel. It is also designed in such a way that maximum mileage is attained. The module consists of a micro-controller chip, sensor, container tank, LCD Display and a buzzer. It is also designed in such a way that maximum mileage is attained. By implementing this module we can reduce pollution to a great extent, save Non-Renewable sources of energy and develop an eco-friendly source of transportation. Thus we acquire a single solution for majority of the problems mentioned above.

II. PROBLEM CITED

The major disadvantage faced in using bio-gas as a fuel is the transportation of the same. The second disadvantage being combustion of biogas gives out asphyxiant that again pollutes the air.

III. SOLUTION CITED

Firstly We use a micro-controller chip with special programmed design features that ensure maximum safety to the transportation of bio-gas. Methane being a major constituent of bio-gas is an asphyxiant which may lead to death if inhaled. Our module overcomes this fatal drawback by its unique design.

IV. WORKING PRINCIPLE

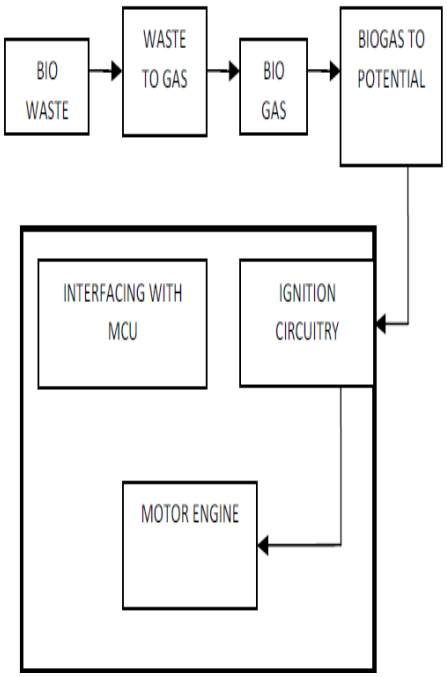
The ignition circuitry is used to start the ECBFEEIS module. Once the module is ignited, the micro-controller chip is programmed in such a way that it monitors both the bio-gas fuel tank and the speed at which the vehicle is moving. The Micro-Controller chip constantly monitors the leakage of bio-gas from the fuel tank. If there exists a leakage the chip opens the water container. For this an IR sensor is used. The water is poured or sprayed on the fuel tank. Hydrolysis of bio-gas converts methane to methanol which is not *asphyxiant*. Furthermore, the chip monitors the speed of the moving vehicle and it displays it on the LCD display board. When the speed exceeds a particular threshold, a buzzer beeps. This is done to ensure maximum fuel efficiency.

Typical composition of biogas[8]

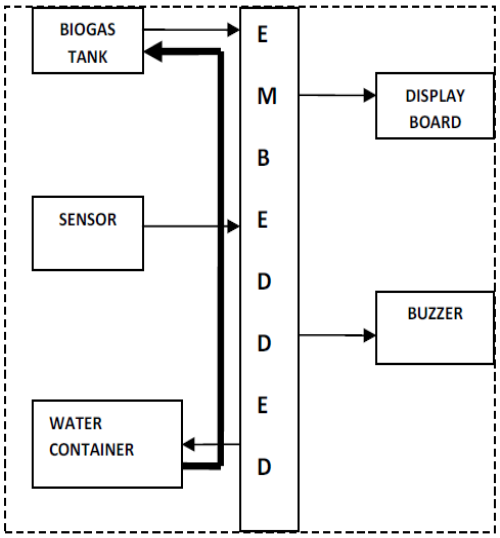
Compound	Chem	%
Methane	CH_4	50–75
Carbon dioxide	CO_2	25–50
Nitrogen	N_2	0–10
Hydrogen	H_2	0–1
Hydrogen sulphide	H_2S	0–3
Oxygen	O_2	0–2

V. BLOCK DIAGRAM

A. *Technical Architecture*



B. *Overall Embedded System Architecture*



VI. DATA FLOW

The ignition circuitry starts the ECBFEEIS module. The LCD display shows "ELECTRONIC SPEEDOMETER".

The MCU constantly monitors the gas leakage and speed of the vehicle. The sensors constantly calculate the distance travelled per revolution.

The speed is computed from the distance with respect to time by the MCU.

From the MCU the data flows to the interfaced LCD display.

The MCU constantly keeps track of the speed. If the speed exceeds the threshold level, the data flows as a sound signal from MCU to buzzer.

If there is a leakage of Biogas from the container, the MCU sends command to open the lid of water container which nullifies the effect.

VII. DATA PROCESSING

The data of the speed from the sensor is given to the MCU, processed and sent to LCD display.

The speed data is always compared with the threshold, if it is exceeded data is processed and converted as electric signal and given to activate the buzzer.

If a leakage is detected then the MCU sends an electrical signal which opens the water container.

Thus the MCU monitors three things constantly the biogas container for leakage, the sensor output for displaying the speed and comparison with threshold for activating the buzzer.

Thus in each case the data sent to the MCU is processed and corresponding actions are executed.

Thus the backbone of the ECBFEEIS module is the embedded device which executes the instructions, processes and controls flow of data in and out of the device.

VIII. TESTING PROCEDURES

After the vehicle is ignited the LCD display **SHOULD** show "ELECTRONIC SPEEDOMETER".

As the motor starts rotating and so does the vehicle the corresponding speed **SHOULD** be shown in the LCD.

Once the speed is exceeded the buzzer **SHOULD** beep.

When there is gas leakage the water container lid **SHOULD** be opened.

IX. PROGRAM CODES

A. *Program Code For Buzzer*

```
ORG    0H              ;start at origin
SETB   P1.4            ; make P1.4 an input
(initialization)
BACK:  JB P1.4, LED ON ; jump if byte = 1
CLR    P0.5
SJMP   BACK
SETB   P0.2            ; sound beeping
SJMP   BACK            ; keep doing it
END
```

B. *Program Code For Speedometer*

##########**For speed measurement**#########

;speed = 2*pi*R*3600*clk/time_count*1000*x

```
;R = radius of the wheel in cm (In this design R=25cm)
;time_count = value of timer counter in b/w
;two successive interrupts
;x = clock prescaler used (in this design x=1024)
;using this we have calculated the equivalent value of
;all the constants (except time_count all other parameters
;are constants)
;sh and sl are binary equivalent of this constant
.equ sh = $56
.equ sl = $49
.equ sht = $57 ;sht = sh + 1
;#######For distance measurement#####
;After every 100 m the registers holding distance values
;are incremented. For this we have used following
formulae
; 2*pi*R*n/100 = 100
;R = radius of the wheel in cm (In this design R=25cm)
;n is the count which signifies that 100 m has been
completed
.equ n = $40
##########temporary registers##############
.def temp=r16
.def temp1=r18
.def c1=r22 ;used for speed calculation and for
display purpose
.def c2=r4 used for speed calculation and for
display purpose
.def d1=r5 ;used for speed calculation and for
display purpose
.def d2=r6 ;used for speed calculation and for
display purpose
.def status=r7 ; holds the value of status register in
case of interrupt
;#######Registers used for timing########
.def count_1=r17 ;
.def time_1=r1
.def time_0=r2
###Registers used for speed measurement###
.def sdigit_01=r19
.def sdigit_1=r20 ;holds the binary value of speed
##Registers used for Distance measurement##
.def ddigit_01=r8 ;Holds binary value of distance (0.0 to
9.9)
.def ddigit_1=r9 ;Holds binary value of distance (10.0 to
999.9)
.def ddigit_10=r10 ;Holds binary value of distance
(1000.0 to 99999.9)
.def dist_count=r13
;######Registers used for LCD display####
.def lcd_cmd=r21
.def lcd_dat=r23
.def count=r3
;########Registers used for delays########
.def low_del=r24
.def hi_del=r25
;########Registers used for EEPROM######
.def eep_reg=r11
.def eep_addr=r12
;r14r15
main_loop:
rcall dist ;Subroutine to calculate Distance
rcall print_lcd ;Subroutine for LCD Display
rjmp main_loop
speedcal:
cp c1,time_1
brsh speed_cal
rjmp speed0
```

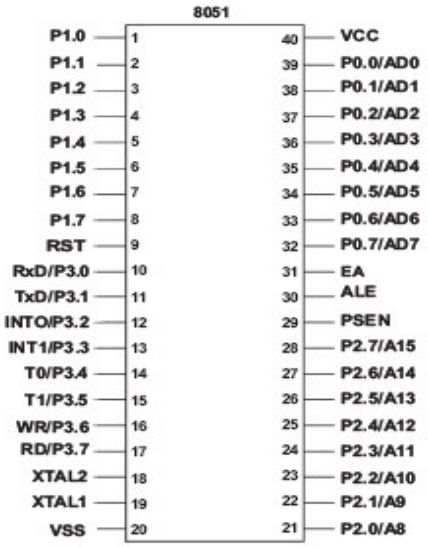
X. APPENDIX

A. Microcontroller Chip

A **microcontroller** (also microcontroller unit, MCU or µC) is a small computer on a single integrated circuit consisting of a relatively simple CPU combined with support functions such as a crystal oscillator, timers, watchdog , serial and analog I/O etc. Microcontrollers are designed for small applications.

B. Intel 8051

The **Intel 8051** is a Harvard architecture, single chip microcontroller (µC) which was developed by Intel in 1980 for use in embedded systems.



XI. CONCLUSION AND CONTRIBUTION

The bio-drive module can certainly be used as an alternative system which uses a renewable source of energy. This ensures environmental sustainability. The embedded solution also provides an excellent platform to provide enhanced features to his module. Thus in this fast moving world, our system will definitely be a crusader amongst the depleting non-renewable sources of energy. Till date, a moving biogas engine is yet to be innovated because of the various disabilities discussed in the length in the paper. We have given a solution from our strong point to this problem.

XII. FUTURE SCOPE

The bio-drive module can be more efficiently handled by improving its features like for example, designing the chip in order to monitor the fuel tank temperature and indicating it in the display. This will help to cool the fuel tank using appropriate additives.

XIII. PARALLEL CONCEPT

One more concept that we are in the process of initiating is the conversion of Biofuel to equivalent pressure by applying force to a piston kept in the container of biogas, and obtaining pressure from the phenomenon and then converting the pressure equivalent to electricity. We also use a series of amplifiers say five, out of which three work and two buffers. On the reduction of pressure and thus electricity the other two amplifiers are initiated by the microcontroller, so as to maintain constant current source. This concept is to be verified and we are under the process.

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