Modification of an Hour Meter Which Calculated the Total Running Time

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ABSTRACT

The system main benefit is that it helps you better maintenance of your equipment by eliminating the guesswork. Most of equipment must have that is maintained at manufacturer's recommended intervals generally for lasts longer uses, to runs better and to experience good performance , and is worth more than poorly maintained equipment. This system can be runs with IOT (internet of things) with the help of this company provide best service facilities to customer.The system offered the manufacturer an enhanced level of reliability and durability. The system secures the life time warranty and resale value of products. The system applications involve off-highway equipment with engines or products with electric motors.Some medical devices and recreational equipment require to track and record time and with this system it is to ensure its performance and life.

INTRODUCTION

Let's we look at what these simple yet reliable meters are, and what they can do for us. This project result will explain how to calculate the running time with the help of an hour meter, when and where you should use it. This results explain some unusual applications that could benefit by an hour meter, and how you can get the most mileage from various mechanical as well as from electronic device.

Hour meter record running time of machine in hour but it is not calculate total running life of machine and it is not useful for all kind of machine for example it is not used in AC. As we know it is a subject of tool design and we can have a grasp on the subject while learning it theoretically and practically both so we design a machine tool which calculates the **'total running time of different mechanical machines'**.

To design, develop and manufacture engine dashboards for a variety of equipment and vehicles used for rugged operations, including tractors, backhoes, and industrial equipment. A critical component of a dashboard which require safeguard to work accurately is the hour meter. The working of hour meter similar to how an odometer, which track and record the distance covered by vehicle, in similar manner hour meter tracks mileage or running time in an hour meter monitors elapsed engine operations.

For smooth and long running of hour meter system it is require that these dashboard can withstand harsh environmental factors, including dust, dirt, extreme temperatures, and intense, frequent vibration. Hour meter acts as an elapsed time measurement device which helps to determine maintenance work, track service intervals, determine resale value and measure performance against warranty. But we often use hour meter to track service time of automobile and some of industrial machine and it can be reset by some module that's why it cannot be use for any kind of device.

When the machine ran into difficulties with an unreliable hour meter it necessary to act fast and intelligently. For better experience provide instrumentation is to keep users tuned in to how their equipment is operating, so any sort of interruption to that process is extremely detrimental for the customers, some of the developer also said that when customer experienced hour meter failures, we have to develop a reliable replacement applicable to many engines, including those used in high cost-of-failure operations and could also record full life span of device. The hour meter fit the bill. The old hour meter often failed to perform under harsh environmental conditions and was unable to provide accurate runtime measurements. This heightened the potential for engine failure and potentially contributed to warranty issues. To remedy this problem, the designer chose to replace its unreliable equipment with the Quartz Plus Hour Meter. The hour meter system offered the manufacturer an enhanced level of reliability and durability for machine. We studied all kind of drawback of hour meter and what are the experiment and modification would be done previously on hour meter and design a running time calculator for all kind mechanical and electric device which record total life span of device.

LITERATURE REVIEW

John S. Fielden; Electronic kilowatt-hour **[1]:**

In a kilowatt-hour meter for measuring electrical energy consumption from an alternating electrical supply, a microprocessor includes a clock signal generator which is synchronized in phase with the incoming supply frequency. Pulse sampling means controlled by the clock generator sample the incoming voltage and current waveforms at a preselected time instant or instants in each cycle and the sampled data is utilized in the microprocessor to determine energy consumption.

James R. Hurley, **Clyde Gilker;** Solid state watt-hour meter [2]:

A watt-hour meter is disclosed which includes: a microprocessor coupled to a solid-state Hall-Effect sensor; an electrically alterable ROM coupled to the microprocessor; a power supply; a power outage timing means using the discharge characteristic of a capacitor; apparatus for supplying a 60 Hz clock signal to the microprocessor; a readout device coupled to the microprocessor to provide an indication of the power consumed; an output on the microprocessor for controlling a circuit breaker; and a switch for overriding the microprocessor controlled circuit breaker. The microprocessor and the electrically alterable ROM are connected and programmed: to sense the time of day as determined from an initial time of day and setting the 60 Hz clock signal; to sense and compute the power used by the consumer; to automatically open the circuit breaker when power demand on the electric power source is high and/or the cost per kilowatt hour is high; to automatically close the circuit breaker when the power demand on the source of electric power is low and/or the cost per kilowatt power is low; and to allow a consumer to override the microprocessor's control of the circuit breaker.

Austin G. Boldridge, Jr.; Removably attachable watt-hour meter monitor device[3] **:**

Affixed to or positioned opposite the glass housing of a watt-hour meter which has a rotating disc with an indicator mark on its periphery is a device for indicating the rate of rotation of the disc. The device has two spherical lenses disposed generally in the plane of the disc along a line which is generally perpendicular to a radius of the disc and preferably symmetrically positioned on opposite sides of the radius. A first fibre optical cable couples visible light from an incandescent source to the first spherical lens to focus light on the periphery of the disc and a second fibre optical cable couples visible light collected by the second spherical lens focused on the periphery of the disc to a photoresistor.

Alexander McEachern, William A. Moncrief; Harmonic-adjusted watt-hour meter **[4]:**

An electric power measuring system where in the watt-hour measurements are adjusted to account for the economic effects of harmonic currents and voltages. Well known techniques are used to acquire frequency spectra that represent the voltages and currents present at the measuring point. These spectra are used to calculate power flow direction and magnitude at various frequencies. Weighting functions are applied to power flows at frequencies other than the fundamental frequency. The weighted power flow is used to calculate an harmonic-adjusted watt measurement, which is then accumulated to form a harmonic-adjusted watt-hour measurement. The weighting functions can be selected to provide an economic incentive for a power consumer to consume power in a way that matches the goals of the power provider.

Gordon R. Burns, **Javier Adame**, **John T. Voisine**, **John P. Junker**, **Jeff Kotowski**, **Richard D. Davis**; Watt-hour meter with digital per-phase power factor compensation[5] **:**

A watt-hour meter employs a power factor compensation technique that inserts a delay into the digitized current or voltage sample stream. An exemplary embodiment of the present invention includes an electronic watt-hour meter comprising a voltage sensor, a current sensor, a conversion circuit, and a processing circuit: The voltage sensor generates a voltage measurement signal responsive to a voltage provided to a load. Similarly, the current sensor generates a current measurement signal responsive to a current provided to a load. The conversion circuit further comprises: a first converter connected to the voltage sensor for generating sampled voltage data stream based on said voltage measurement signal; a second converter connected to the current sensor for generating a sampled current data stream based on said current measurement signal, and a phase correction circuit. The phase correction circuit is connected to one of the first and second converters and inserts a delay into one of the sampled voltage data stream or the sampled current data stream. The processing circuit is operably connected to the first and second converters, and receives information indicative of the sampled voltage data stream and sampled current data stream subject to any delay inserted by the phase correction circuit. The processing circuit then generates power consumption data from the sampled voltage data and sampled current data.

Jerry M. Kennon; Watt-hour meter with fiber optics tamper detector[6] **:**

A watt-hour meter tamper detector characterized by a fiber optic link that extends between a microprocessor of a load management terminal and mounting means for maintaining a watt-hour meter cover intact, and which fiber optic link signals an attempted opening of the mounting ring to the microprocessor when the fiber optic link is severed.

Warren T.Martin, William james Watson, Gregory A. Grisham, Michael K. Anderson, Randal K. Bond ; Watt-hour meter with communication on diagnostic error detection[7] **:**

An electrical utility meter includes measurement error diagnostic capabilities with intelligent communication capabilities. In an exemplary embodiment, the present invention includes an electrical utility meter for measuring energy consumption by a load. The electrical utility meter includes, sensor circuitry, a conversion circuit, a communication circuit, and a controller. The sensor circuitry connects to a meter socket. The meter socket connects to a plurality of power lines that, in turn, connect the load to a source of electrical power. The source of electrical power provides power to the load in a plurality of phases. The sensor circuitry generates voltage and current measurement signals representative of the voltage and current waveforms on the plurality of power lines. The conversion circuit is connected to the sensor circuitry and generates a power consumption measurement, as well as measured phase angle data for the plurality of phases, all of which are generated based on the voltage and current measurement signals. The communication circuit is connected to a remotely located control device. The controller is connected to the memory, the communication circuit, and the conversion circuit. The controller is operable to receive measured phase angle data for the plurality of phases, periodically perform a plurality of diagnostic tests using the measured phase angle data to determine whether a measurement error is present, and provide an alert signal to the communication circuit if a measurement error is present. The communication circuit, upon receiving the alert signal, is operable to obtain information identifying the measurement error and transmit an error signal containing information identifying the measurement error to remotely located control device.

METHODOLOGY

Its basic working is based on the concept of hour meter in which RTC (Real time clock) is used to count the running time of any device such as TV, AC, motor, lathe where ever we want to use it. For this we use microcontroller as main control unit and it connect with RTC and EEPROM (Erasable Electronic Programmable Read Only Memory) to count and store the data and displayed it on LCD as ON and OFF Time.

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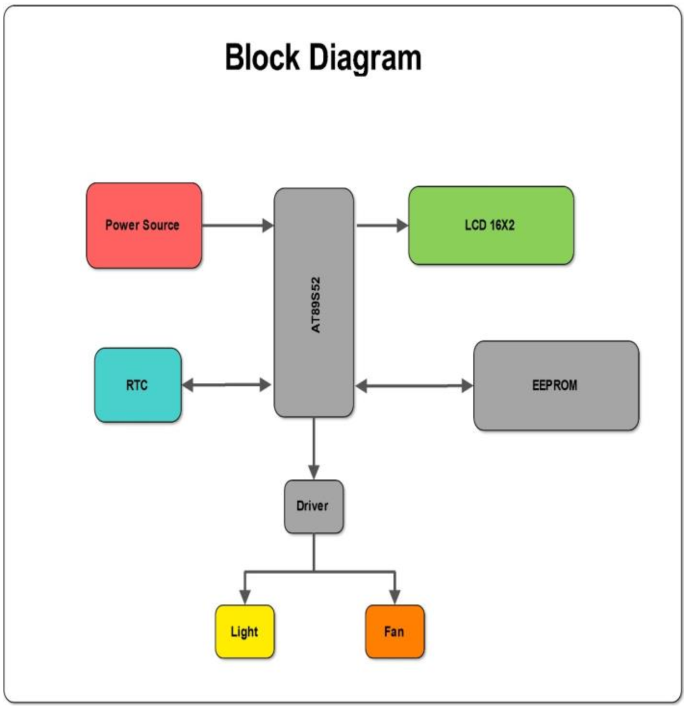

Methodology

It is explicitly visible from the schematic that the microcontroller here is acting as the centre of the functioning and controlling unit. The whole apparatus is capable of running at a DC supply of 12V with a tolerance of +/- 2V. The complete methodology of this device can be very well classified into three broad categories. They are :-

1. Triggering of the device.
2. Calculation and storage of the concerned parameter.
3. Displaying the calculated value.

1. Triggering of the device :-

This part of the operation is concerned with turning on the device in order to enable further operations. The participating components here are the power supply and a click switch which can be used to RESET the state of the device whenever necessary.

2. Calculation and storage of the concerned parameter :-

As stated earlier, our primary concern here is to calculate the duration for which a particular appliance is active(On time) and the total duration for which the appliance remains inactive(Off-time). For this, we first need to choose an appliance for which we wish to calculate the concerned parameters. The appliance will be connected to the device using a relay and an ADC(Analog to Digital Convertor). The function of the relay here would be to act as a switch and thus indicating the proper connection of the appliance. After the appliance has been connected, the device will start receiving data regarding the state of the appliance in the form of an analog signal. In order to make this information detectable

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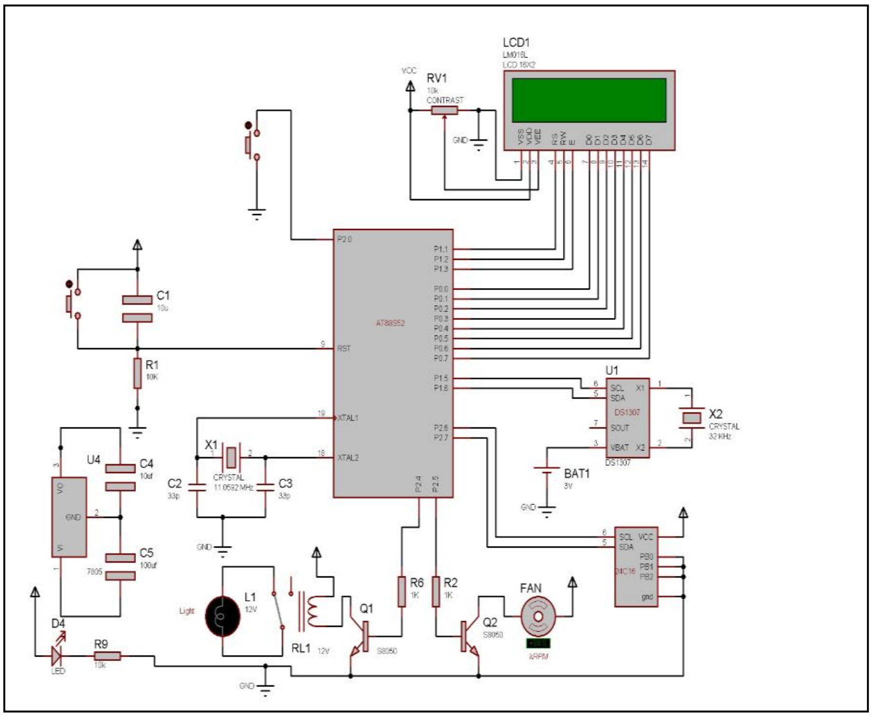
for the microcontroller, we have used an ADC for the purpose. The data thus received is first sent to the microcontroller and then to the Real Time Clock(RTC) which acts as a counter. The RTC here exhibits a two way communication with the microcontroller i.e. it can also send data to the microcontroller. Now, for the storage part, we have used a 16x2 Erasable Electronic Programmable ROM(EEPROM). Since it serves as a memory, it is bound to access a two way communication channel with the microcontroller as well. The stored data can thus be used by the microcontroller whenever required.

3. Displaying the calculated value :-

For the output operation, we have used an LCD display incorporated with contrast adjustment through a potentiometer. The value to be displayed in the output is first sent by the RTC to the microcontroller and then to the EEPROM for storage. This value needs to be accessed from the EEPROM by the microcontroller first and then, it is the job of the microcontroller alone to allow this accessed data to flow further towards the output end.

The intensity or brightness of the LCD display acting as the output panel can be adjusted according to ease with the help of the potentiometer thus provided. The final output will show the real time data for both the total On-time and the total Off-time for the connected appliance.



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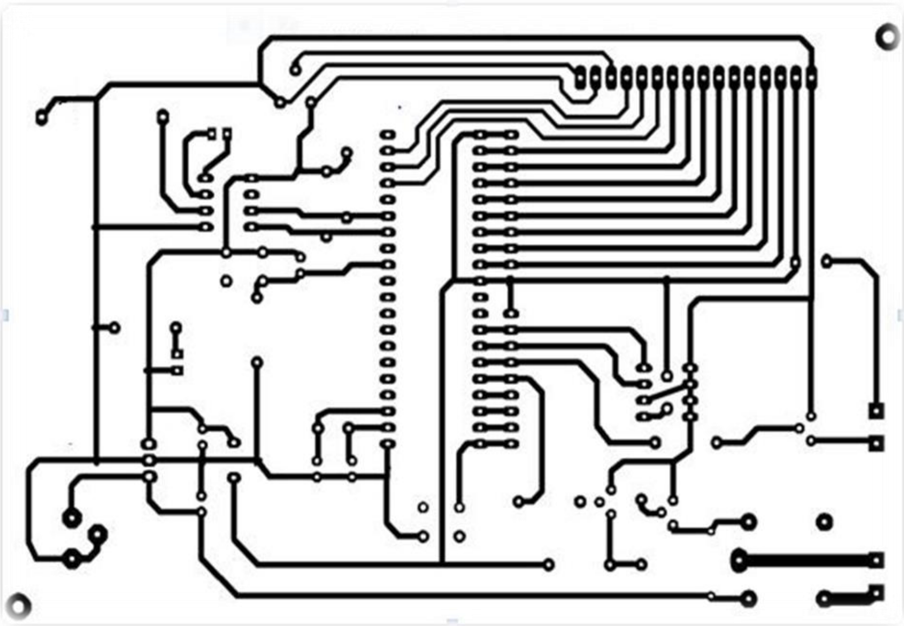

RESULTS

Our aim is that modify hour meter to a machine tool which calculate total life span of any machine. The key to performing optimal maintenance is knowing when to perform it. Yes, this system won't perform the task for you, but at least you have a record showing the hours or minutes of running time.

Equipment Service:

- Track running time between scheduled service

Equipment Warranty:

- Monitor elapsed hours

Equipment Resale:

- Record actual running hours

Equipment Rental:

- Track elapsed time

Analysis we have done:-

As we discuss drawbacks of hour meter above that it can be reset by some module and it cannot track and record total running life span of equipment. To remedy of these drawbacks we design a circuit based on RTC which track and record total life span of most of mechanical as well as electrical equipment.

We made this system in small scale which has a microprocessor controlled motherboard, RTC to count running time, EEPROM to store data which displayed on LCD and other small component to perform task.

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We tested it first on 60 rpm and 12 volt motor for 10 min., then 500 rpm and 380 volt motor for 10 min. and then 3000 rpm and 200 volt DC motor for 10 min.

After first motor we seen that it shows 10 min on LCD display and after second and third motor it shows 20 min. and 30 min. on display board.

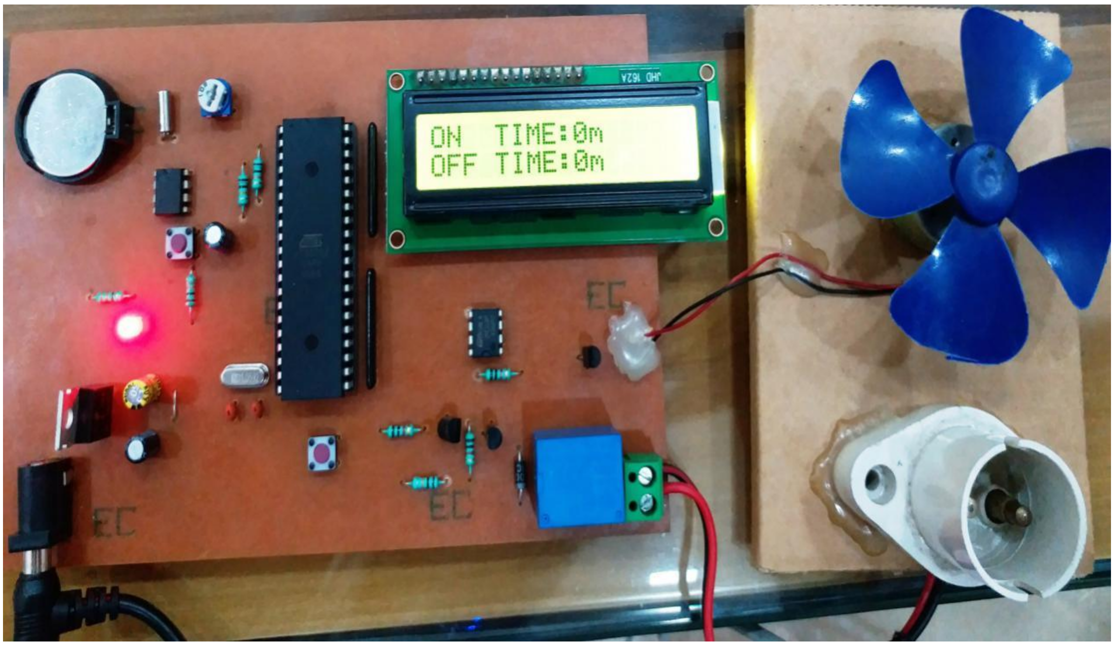
It ensure that system precisely perform the all the task and it shows that system runs successfully.

Another test we have done is analysis of same motor for different time interval. For this we have use 600 rpm and 12 volt motor. First run the motor for 10 min. and off it for next 5min. and then again run the motor for 10 min. and off it again for 10 min. We analyses three sample of this test and conclude that system shows accurate on and off time of motor.

It ensure that system shows accurate time for all working interval.

Working of our model

1. Initial Stage



2. After 15 min. (Fan is on)

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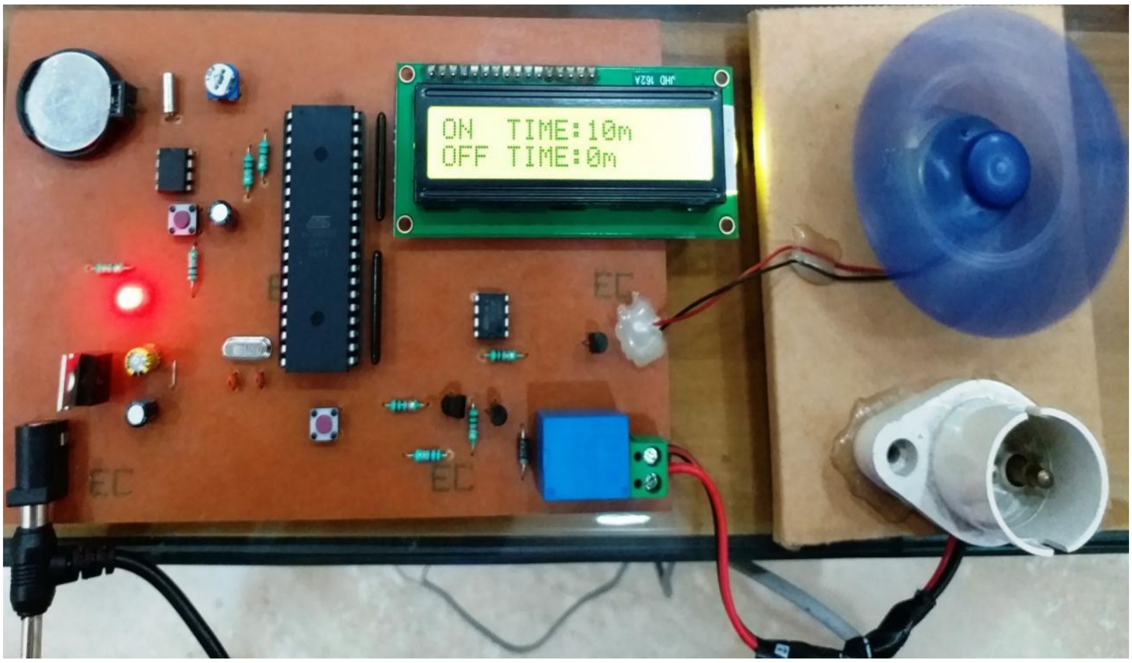
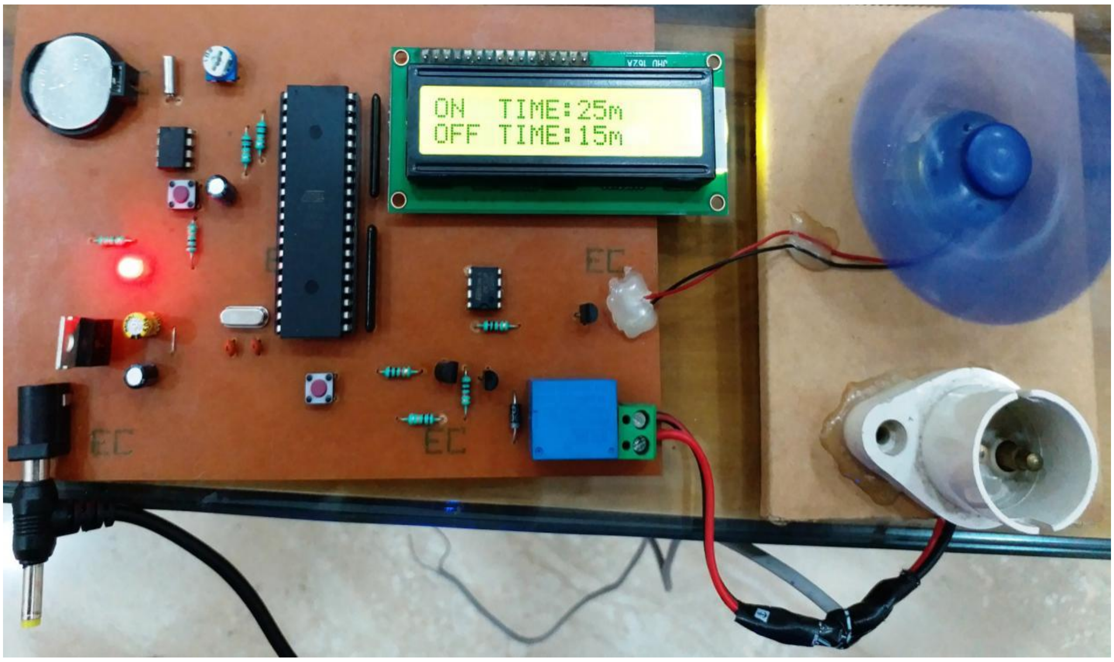


3. After additional 10 mint. (Fan is on)



4- After Additional 10 mint. (Fan is on)

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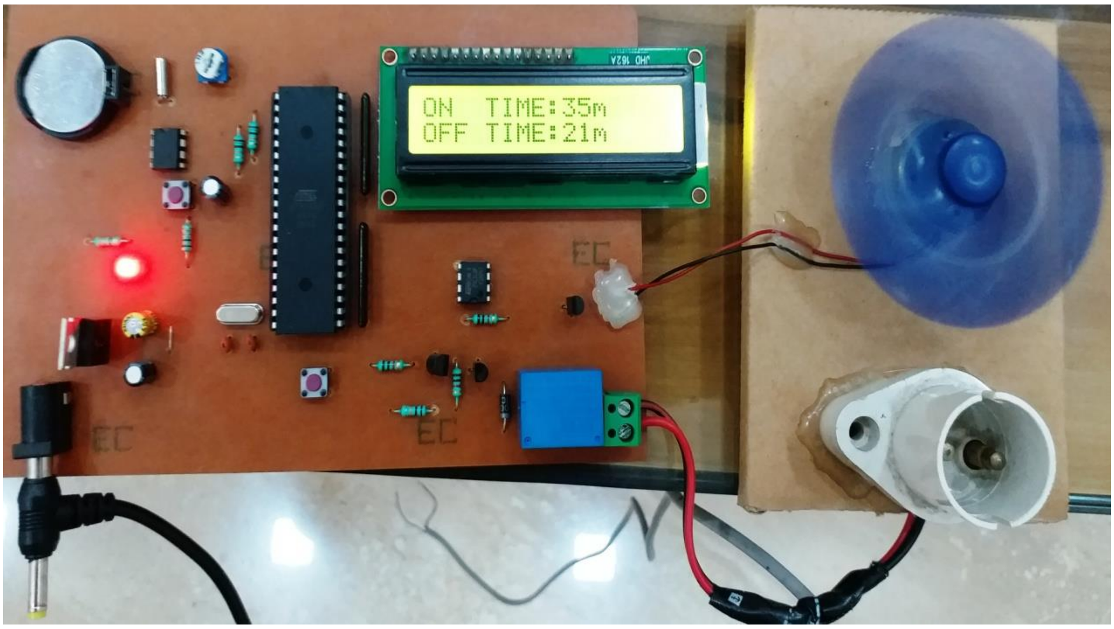

Stage	On	Off
1.	0 M.	0 M.
2.	10 M.	0 M.
3.	25 M.	15 M.
4.	35 M.	21 M.
Total	**70 M.**	**36 M.**

CONCLUSION

Following are the conclusion of using total running time calculator in any mechanical or electrical equipment:

- The system main benefit is that it helps you better maintenance of your equipment by eliminating the guesswork.
- Most of equipment must have that is maintained at manufacturer's recommended intervals generally for lasts longer uses, to runs better and to experience good performance , and is worth more than poorly maintained equipment. This system can be runs with IOT (internet of things) with the help of this company provide best service facilities to customer.
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- Some medical devices and recreational equipment require to track and record time and with this system it is to ensure its performance and life. Its most of applications involve engines and motors.

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