HYBRID POWER HARVESTER USING ENGINE SOURCE

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Abstract- In mainly we present a compact, multisource and battery-free energy harvesting from engine source. This battery free generator captures energy from its environment transient thermal gradients as a main source, and vibration as a secondary source allowing early biasing of the generator and stores this energy in ultra-capacitors .In this way, this multi-source architecture benefits from the synergy between energy scavenging and harvesting.

Index terms*:* Multi-source, Ultra-capacitors, Thermal energy, Vibrations.

I. INTRODUCTION

Energy harvesting is the process of capturing tiny amounts of energy from one or more innate energy sources, accumulating the collected energy and storing it for future use. Batteries are not really practical because the lifetime of a battery is limited, its replacement and recharging could become major bottlenecks. Therefore, energy harvesting is playing a more and more vital role in the supply of energy to real life applications, such as wireless sensor networks and health care monitoring [1].Thermal energy is one of the most eco-friendly sources, this form of energy is primarily handy for biomedical applications because of its high dependability, compactness, zero emissions, low noise, clean fabrication and zero fuel utilization6. Thermal energy can generate a voltage proportional to the temperature difference applied to each side based on the set back effect, which was described in the 1820s7. In the setback effect, heat is directly converted the temperature difference into electrical energy by a thermoelectric generator (TEG) device [2].A vibration powered generator is a type of electric generator that converts the kinetic energy from vibration into electrical energy. The vibration may be from sound pressure waves or other ambient sources. Vibration powered generators usually consist of a resonator which is used to amplify the vibration source, and a transducer mechanism which converts the energy from the vibrations into electrical energy. The transducer usually consists of a magnet and coil or a piezoelectric crystal [3].In the existing system the vibrations as an auxiliary source permitting early biasing of the generator and store this vitality in ultra-capacitors. Along these lines, this multi-source engineering profits by the collaboration between vitality rummaging and collecting: vibrations bring low however early and lasting vitality. They likewise add to vitality collecting amid journey while warm inclinations have vanished. It is likewise demonstrated that enough vitality could be conveyed to control the elements of a remote sensor hub. But for every invention there will be a side of drawbacks. The main drawback in the existing system is the wastage of power taking place while engine gets started. If the engine gets started it got vibrates first. So here we lost the vibrations producing. Inoded to attain the heat there is lot of time laps get wasted. The construction cost will be very high for the existing one. For power generation power storage should be very important. So the power storage is low for this module. Inoded to overcome these strategies we proposed a new system with hybrid combination of thermal and vibration sources of energy.

II. Hybrid power generation consists of 6 step process

1. Conversion of vibration energy
2. Switching from one main source to another
3. Conversion of thermal energy
4. Prioritized charge conversion
5. Digital output to analog conversion
6. Energy stored in the battery

III. Architecture for Hybrid Power Generator

In the proposed framework we outline a crossover blend utilizing microcontroller AT89S52. The AT89S52 [Fig1] is a low-control, superior CMOS 8-bit microcontroller with 8K bytes of in-framework programmable Flash memory.

Fig1.AT89S52 microcontroller

The on-chip Flash permits the program memory to be reconstructed in-framework or by a routine non unpredictable memory software engineer. By consolidating an adaptable 8-bit CPU with in-framework programmable Flash on a solid chip, the Atmel AT89S52 is a capable microcontroller which gives a very adaptable and savvy answer for some inserted control applications. The AT89S52 gives the accompanying standard components: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog clock, two information pointers, three 16-bit clock/counters, a six-vector two-level intrude on design, a full duplex serial port, on-chip oscillator, and clock hardware. Furthermore, the AT89S52 is planned with static rationale for operation down to zero recurrence and backings two programming selectable power sparing modes.The Idle Mode stops the CPU while permitting the RAM, clock/counters, serial port, and intrudes on framework to keep working. The Power-down mode spares the RAM substance yet solidifies the oscillator, crippling

all other chip capacities until the following hinder or equipment reset[4].The given module is splitted into two sections .The Main source Energy Thermal Electrical Generator and Secondary Source of the Vibration Energy to MEMS.

3.1. Conversion of Thermal Energy

At first when a motor gets on it will begin to vibrate. So at first we can change over the warm vitality into charge which will have a cut off range till the vitality source gets heat. So MEMS unit will be utilized as a transducer and change over mechanical vibrations to charge. In 20 years, MEMS (small scale electro-mechanical systems) technology has gone from an intriguing scholarly practice to an essential piece of numerous regular items. Be that as it may, as with most new advances, the functional usage of MEMS innovation has taken a while to happen. The outline challenges required in planning an effective MEMS item (the ADXL2O2E) are depicted in this article by Harvey Weinberg from analog Devices.The most recent era ADXL2O2E is the after effect of just about a decade's worth of experience building incorporated MEMS accelerometers. It is the world's littlest mass-created, low cost, integrated MEMS double hub accelerometer.Polysilicon springs suspend the MEMS structure over the substrate to such an extent that the body of the sensor (otherwise called the verification mass) can move in the X and Y tomahawks. Speeding up cause's avoidance of the evidence mass from its middle position. Around the four sides of the square confirmation mass are 32 sets of outspread fingers. These fingers are situated between plates that are settled to the substrate. Each finger and combine of repaired plates makes a differential capacitor, and the diversion of the verification mass is controlled by measuring the differential capacitance. This detecting strategy has the capacity of detecting both element speeding up (i.e. stun or vibration) and static acceleration (i.e. slant or gravity).The differential capacitance is measured utilizing synchronous modulation/demodulation systems. After enhancement, the X and Y hub speeding up signs each experience a 32KOhm resistor to a yield stick (C x and C y) and an obligation cycle modulator (the general engineering can be found in the square graph in (Figure 3). The client may restrain the data transmission, and along these lines bring down the commotion floor, by including a capacitor at the C x and C y stick [5].

The yield signs are voltage relative to quickening and heartbeat width-tweak (PWM) corresponding to acceleration. Using the PWM yields, the client can interface the ADXL2O2 straightforwardly to the advanced contributions of a microcontroller utilizing a counter to decipher the PWM. The yield of MEMS is given to the ADC for simple to computerized transformation and afterward to smaller scale controller keeping in mind the end goal to screen the estimation of vitality created. The ADC0808 [Fig2], ADC0809 information procurement part is a solid CMOS gadget with a 8-bit simple to-computerized converter, 8-channel multiplexer and chip perfect control rationale.

Fig2.ADC0809CCN

The ADC0809 information obtaining part is a solid CMOS gadget with a 8-bit simple to-computerized converter, 8-channel multiplexer and chip perfect control rationale. The 8-bit A/D converter utilizes progressive estimate as the transformation technique. The converter includes a high impedance chopper balanced out comparator; a 256R voltage divider with simple switch tree and a progressive guess enlist. The 8-channel multiplexer can specifically get to any of 8-single-finished simple signals. The gadget dispenses with the requirement for outer zero and full-scale alterations. Simple interfacing to microchips is given by the hooked and decoded multiplexer address inputs and locked TTL TRI-STATE® outputs. The outline of the ADC0808, ADC0809 has been streamlined by fusing the most alluring parts of a few A/D change procedures. The ADC0808, ADC0809 offers rapid, high exactness, insignificant temperature reliance, fabulous long haul precision and repeatability, and expends negligible power. These highlights make this gadget in a perfect world suited to applications from process and machine control to customer and car applications. For 16-channel multiplexer with normal yield (test/hold port) see ADC0816 information sheet [6].

In ADC change prepare the info simple esteem is quantized and each quantized simple esteem will have a novel parallel proportional. The quantization venture in ADC0809/ADC0808 is given by,

$$Q_{step} = \frac{V_{REF}}{2^8} = \frac{V_{REF}(+) - V_{REF}(-)}{256_{10}}$$

The digital data corresponding to an analog input (V_{in}) is given by,

$$\text{Digital data} = \left(\frac{V_{in}}{Q_{step}} - 1 \right)_{10}$$

----------(1)

3.2. Conversion of Thermal Energy

The auxiliary source that we are utilizing here is transformation of warm vitality into electrical energy. Here we utilizes Peltier sensor which changes over warm to electric vitality. In 1834, a French watchmaker and low maintenance physicist, Jean Peltier [Fig3 &Fig4] found that an electrical current would deliver a temperature angle at the intersection of two unique metals [7].

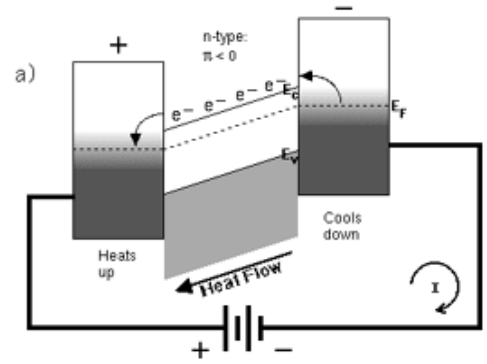

Fig3. Π<0 ; Negative Peltier coefficient

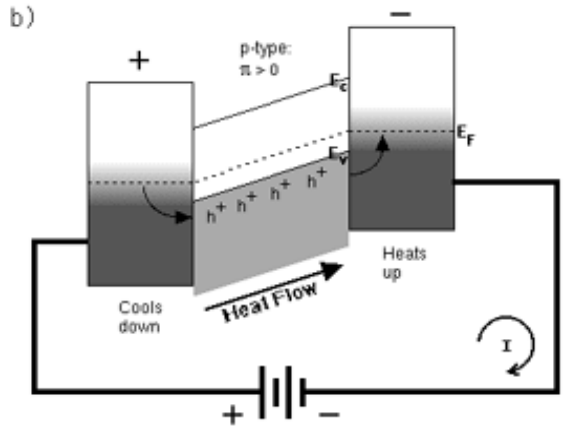

Fig4.Π>0; Positive Peltier coefficient

3.3. Switching From One Main Source to Another

After the motor gets warmed to its limit voltage there will be a changing from the era of vibration vitality to warm vitality conversion. Here we utilize a ultra-low power converter. The power switch was the way to down to earth exchanging controllers. Before the innovation of the Vertical Metal Oxide Semiconductor (VMOS) control switch, exchanging supplies were for the most part not practical. The inductor's principle capacity is to constrain the present slew rate through the power switch. This activity restricts the generally high-top current that would be constrained by the switch resistance alone. The key preferred standpoint for utilizing an inductor in exchanging controllers is that an inductor stores vitality. This vitality can be communicated in Joules as a component of the current by:

$E = ½ \times L \times I^2$----------(2)

A direct controller utilizes a resistive voltage drop to manage the voltage, losing power (voltage drop times the current) as warmth. An exchanging regulator ‘sit with inductor has a voltage drop and a related current however the current is 90 degrees out of stage with the voltage. Along these lines, the vitality is put away and can be recuperated in the release period of the exchanging cycle. These outcomes in a considerably higher effectiveness and a great deal less heat. Finally Producing Dc vitality to Ultra Low Power Converter Using Connected with Micro controller. For changing starting with one source then onto the next we a need a program code so we require a UART to interface mind the microcontroller. An all-inclusive on current beneficiary/transmitter is a kind of "offbeat recipient/transmitter", a bit of PC equipment that deciphers information amongst parallel and serial structures. UARTs are regularly utilized as a part of conjunction with other correspondence gauges, for example, EIA RS-232.A UART is typically an individual (or some portion of an) incorporated circuit utilized for serial interchanges over a PC or fringe gadget serial port. UARTs are presently generally incorporated into microcontrollers. A double UART or DUART joins two UARTs into a solitary chip. Numerous cutting edge ICs now accompany a UART that can likewise convey synchronously; these gadgets are called USARTs [8].

3.4. Prioritized Charge Conversion

In the organized charge transformation we utilize ultra-capacitors which can change as indicated by organized charging. Capacitors utilize electricity produced via friction (electrostatics) as opposed to science to store vitality. Inside a capacitor, there are two leading metal plates with a protecting material called a dielectric in the middle of them—it's a dielectric sandwich, in the event that you incline toward! Charging a capacitor [Fig5] is somewhat similar to rubbing an inflatable on your jumper to make it stick. Positive and negative electrical energizes expand on the plates and the division between them, which anticipates them coming into contact, is the thing that stores the vitality. The dielectric permits a capacitor of a specific size to store more charge at a similar voltage, so you could state it makes the capacitor more productive as a charge-putting away gadget.

Fig5.Capacitor

Ultra capacitor used to Highly Discharging in the Dc control bank .The yields of transducers are additionally given to lift controller. The acquired vitality is helped up utilizing Booster Ultra Low Power Converter .The yield of the Ultra-Low Power Converter is given to the Relay for the changing unit to store vitality. A hand-off is an electrically worked switch. Current coursing through the loop of the hand-off makes an attractive field which pulls in a lever and changes the switch contacts. The loop current can be on or off so transfers have two switch positions and they are twofold toss (changeover) switches. Relays permit one circuit to switch a moment circuit which can be totally separate from the first. For instance a low voltage battery circuit can utilize a transfer to switch a 230V AC mains circuit. There is no electrical association inside the transfer between the two circuits; the connection is attractive and mechanical. The loop of a transfer passes a moderately substantial current, ordinarily 30mA for a 12V hand-off, however it can be

as much as 100mA for transfers intended to work from lower voltages. Most ICs (chips) can't give this current and a transistor is typically used to enhance the little IC current to the bigger esteem required for the transfer curl. The greatest yield current for the well-known 555 clock IC is 200mA so these gadgets can supply hand-off loops specifically without enhancement. Transfers are normally SPDT or DPDT however they can have numerous more arrangements of switch contacts, for instance transfers with 4 sets of changeover contacts are promptly accessible. For additional data about switch contacts and the terms used to depict them please observe the page on switches. Most transfers are intended for PCB mounting however you can bind wires straightforwardly to the pins giving you take care to abstain from softening the plastic instance of the hand-off [9].

3.5. Digital to Analog Conversion

In advanced to simple transformation we utilize inverters. An inverter is an electrical gadget that proselytes coordinate current (DC) to substituting current (AC); the changed over AC can be at any required voltage and recurrence with the utilization of proper, exchanging, and control circuits. Strong state inverters have no moving parts and are utilized as a part of an extensive variety of uses, from little exchanging power supplies in PCs, to expansive electric utility direct current applications that vehicle mass power. Inverters are normally used to supply AC control from DC sources, for example, sun based boards or batteries. An inverter changes over the DC power from sources such a batteries, sun based boards, or energy components to AC power. The power can be at any required voltage; specifically it can work AC hardware intended for mains operation, or corrected to deliver DC at any coveted voltage.

3.6. Energy Stored In Battery

We can't generally produce electricity where and when it is required so batteries, gadgets that store electrical vitality in concoction shape, are essential. A wide range of sorts of batteries are delivered for a wide assortment of uses, from putting away sunlight based power for satellites in space to controlling heart pacemakers fitted inside individuals' chests. The put away vitality is upset to AC voltage and used for different purposes for instance lighting lights and Mini Home Appliances for DC FAN, 5W Bulb and so on.

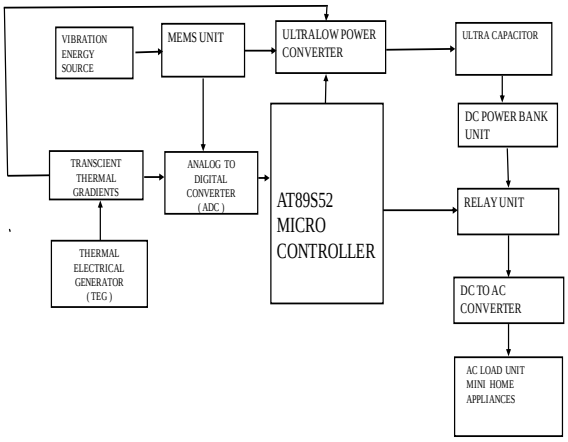

Fig6.Block diagram of hybrid power converter

IV. Analysis of Power Harvester

Simulation performance of energy harvester system using vibration energy: Although this review concentrate on most extreme condition which is both data sources exist, the recreation framework is additionally tried utilizing solitary information. Warm vitality gives an information voltage as low as 0.2 V. The Figure 6 demonstrates the re-enactment result for vitality collector circuit utilizing warm vitality input as it were. The contribution of warm vitality has been helped to 1.5V. The voltage is settled by a voltage controller circuit that gives yield around 1V.

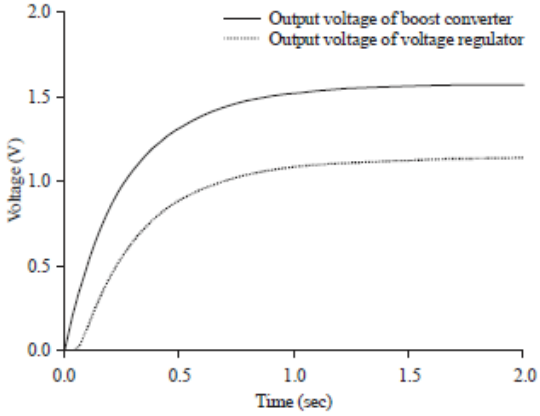

Fig6.Performance of harvester using thermal energy

Performance of energy harvester circuit using thermal energy

Simulation performance of energy harvester system using vibration energy-Despite the fact that this review concentrate on most extreme condition which is both sources of info exist, the recreation framework is likewise tried utilizing a solitary information. Vibration vitality gives an info voltage as low as 0.02 V. In Figure 7 demonstrates the reenactment result for vitality collector circuit utilizing warm vitality input as it were. The contribution of warm vitality has

been helped to 0.7V. The voltage is balanced out by a voltage controller circuit that gives yield around 0.4 V

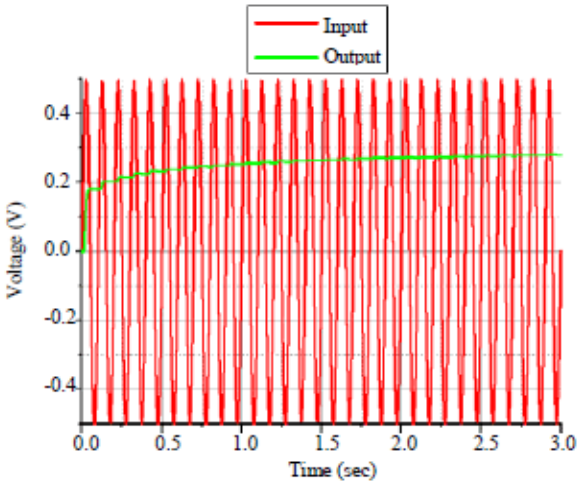

Fig7.Performance of energy harvester vibration energy

V. Conclusion

This review principally centered on the outline of the engineering of a consolidated half and half contribution of warm and vibration vitality in light of continuous application with motor source. Warm and vibration information sources are spoken to by voltages of 0.02 and 0.5 V, separately, while working at 10 Hz. The objective of our venture is to consolidate both contributions to a solitary framework with the end goal that the sources of info all the while work in light of the fact that the vibration information is low. The base and greatest information allude to the warm source and the mix of both data sources (warm and vibration), individually. The HMEH design comprises of warm and vibration components as info, a to change over AC voltage to DC, low control converter for exchanging operation and utilizations a battery to store the yield power. After the examination we got yield from warm as 5.4V and vibration as 1 V.

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