

Power Generation with the Help of Speed Breaker

Saad Ahmed*, Hasnain Riaz, and Hamza Bajwa

Abstract— Energy drives the economy; thus, seeking progress takes a lot of energy. According to statistics, burning fossil fuels produces the most energy and pollutes our environment. This study aims to create an automotive-speed-breaker power generator that uses two activation strokes to operate. It transforms the transport drive and brings direct gestures of the rack gear into the revolution of the immobilized gear keyed on the shaft and generator. The machine is motivated by the compression and release of the springs, which raises the machine's output. A stable frame, a dome-shaped prime, a shaft, and flywheel mechanism, a cable and sprocket system, glides, springs, a flywheel, rods, a generator, and a profound series of the battery-operated brand up this device. Utilizing engineering principles, the style was completed considering cost, utility, simplicity of use, durability, and performance. It was created with a model rated at 100kg in mind and is intended to be motivated by vehicles weighing 1,600kg (400kg each wheel).

Index Terms— Energy, Drivers, Generator, Alternator, Flywheel, Spring, and Welding.

I. INTRODUCTION

THE research presents the general background theory and fundamental concepts associated with the ability generation and energy. Ranging from the discussion of the essential procedure of generating power, the working of a generator, induction of flux, and calculation of RPMs and coils conduction are elaborated. This extensive literature review led to the proposed problem statement that gives the motivations and inspirations for this thesis. After discussing the thesis objective and proposed system and methodology, the chapter is windup with a brief outline of the remainder of the paper.

An electrical device's ability to produce work by initiating action is known as electrical energy. Many other types of activity, including thermal, electromagnetic, mechanical, and electrical, can be involved [1]. Voltage is typically generated by batteries, generators, dynamos, and photovoltaics, among other things, and stored for future use by energy cells, sets, capacitors, or attractive fields, among other things. As a result, the current is regularly produced or stored.

Because of the same difficulties, it is necessary to check other energy sources. Although significant progress has been made in renewable energy systems, they are still unpredictable (wind)

and unavailable 24/7 (solar) (2012, State Impact Pennsylvania) [3][4]. An interesting technique is using machine-powered speed switches and electric generators to generate power from the movement of a vehicle. The linear to rotational motion conversion mechanism converts the power from the transmission motion into the rotation of the generator, while the gear shift assembly absorbs the energy. The device works best on roads that need calm traffic and have heavy traffic [3] [4].

Mechanical speed-breakers that use various linear-rotary motion transformation techniques try to capture the energy from moving vehicles. Some are shaft and flywheel mechanisms and roller and shaft mechanisms [4].

The remaining article is organized as follows—section 2 related work followed by the proposed method in section 3. Experimentation is presented in Section 4. Section 5 provides the results of this paper, and finally, section 6 is the conclusion and future work.

II. LITERATURE REVIEW

Electricity is defined as an electric current that only flows in one direction. Electricity is handled via short circuits with fixed polarities, such as those powered by batteries. Another potential source of electrical energy is small generators. The fact that voltage cannot be adjusted easily in such circuits means that the system must run at the voltage at which this is produced. Ohm's law often describes the relationship between voltage and current, which says that the constant current I flowing through a conductor is proportional to the voltage E between its ends.

$$E = IR \quad (1)$$

R is the resistance that, when raised, necessitates a higher voltage to produce the same current. The ability P created by the flow of an electrical current is sufficient for the voltage and current merchandise.

$$P = EI \quad (2)$$

According to these equations, the facility is also determined by the square of the current multiplied by the resistance.

$$P = I^2 R \quad (3)$$

Due to relevant power losses in various circuits, this is significant. A slight but significant decrease in current can significantly lower power losses. Voltage and Current are combined to generate electrical power, describing how quickly energy is used when doing tasks. As previously stated, it

currently represents the charge's rate of movement (or flow rate), while voltage gives the work in Joules needed to transport one Coulomb of charge from point A to point B. How do these two definitions relate to one another [5] [6]. Electric power (P) may be defined as the sum of voltage and amperes if voltage = joules per Coulomb and amperes equals charge per second, respectively. This is frequently because electric power may equal voltage times amperes, or: Considering that 1 watt Equals 1 joule per second, it follows that: One watt equals one joule of energy, or as follows: Power multiplied by time equals work (joules). Thus, power (the amount of work done) is calculated by multiplying power by the number of seconds that the charge—in the form of a current—has been flowing. The units used for electrical power and time impact the units of voltage. In this case, the current used equals kilowatts times hours, or just kilowatt-hours, if we measure electric power in kW and time in h. (kWh) [7].

All species in the cosmos need the energy to survive. Everything inside the encircling area represents energy flow in a particular form. However, the population is growing faster than ever in our fast-paced world, which reduces the use of conventional energy sources. Over the past few decades, energy has been scarce due to excessive energy use. Therefore, to solve this issue, we need to practice energy conservation approaches that make the best use of available conventional sources. In this work, I propose a method for repurposing the energy that automobiles lose when they miss a speed limiter. When a car drives over it, a lot of energy is created. A speed breaker may be employed as a power production device by harnessing and producing electricity. The KE of moving vehicles is frequently turned into shaft energy via the shaft and flywheel system. The energy will then be transformed into electricity by a generator, which the use of a battery will conserve. The point we save throughout the day is frequently used to illuminate street lights after nightfall. Hence employing this design, we hold a significant amount of energy that may be used to meet future demands.

III. PROPOSED METHODOLOGIES

For the generation of power from the speed breaker, we proposed a flywheel shaft mechanism model which works on the principle of stored energy in the equally distributed spring system and harnesses the power from the generator or the dynamo, which involves the principle of induction and electromagnetism (see Fig.1).

By keeping visible, the core objective of the thesis, the non-conventional way of harnessing the power from the speed breaker can be a hit. The work and research done and recorded were successfully achieved. The system uses the energy to maneuver the alternator's rotor to assemble the wattage (see Fig.2).

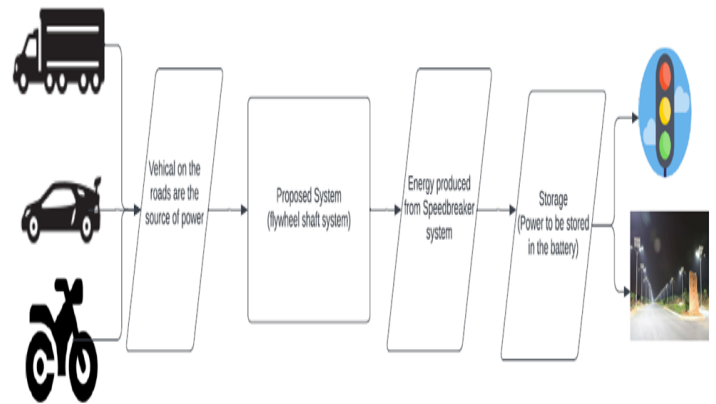


Fig. 1: Proposed system

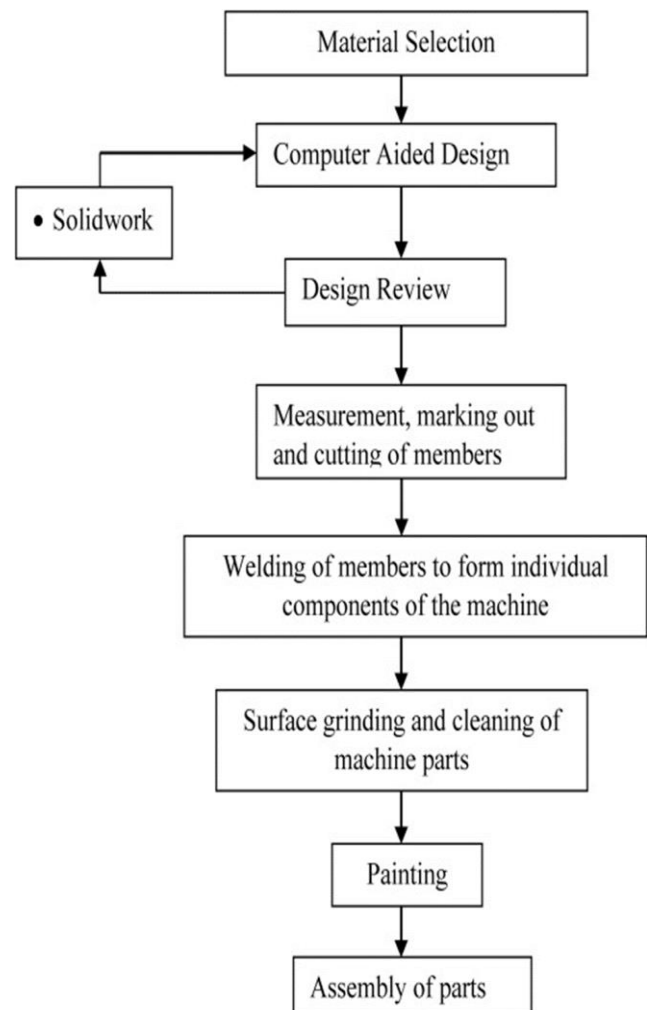


Fig. 2: Implementation methodology

Excellent material selection was used and undertaken to scale back noise and wear simple maintenance, improve the system's service life and reduce the effect of corrosion: shaft and dome-shaped top – (Mild Steel), Machine frame. Mild steel is highly malleable and can be used for various construction purposes.

- Carbon constituents range from 0.1 to 0.3%, and iron constituents from 99.7 to 99.9%.
- Offers awful weldability.
- It has a natural balance of continuity, strength, and severity.
- We have advanced machining characteristics.
- Springs – (Oil Tempered Carbon Steel).
- They are contented and impoverished to boost firmness and tractability.
- Shaft structure – (Cast iron) and flywheel.
- Good depreciation resistance.
- Hindrance to corrosion

IV. PROPOSED CAD DESIGN

AutoCAD is a computer-aided drawing tool used for a wide range of design procedures. Its primary application is drawing with computerized versions of traditional drafting equipment. The addition of digital accuracy aids in measurements and computations, 3D components, and data exchange (see Fig. 3 and 4).

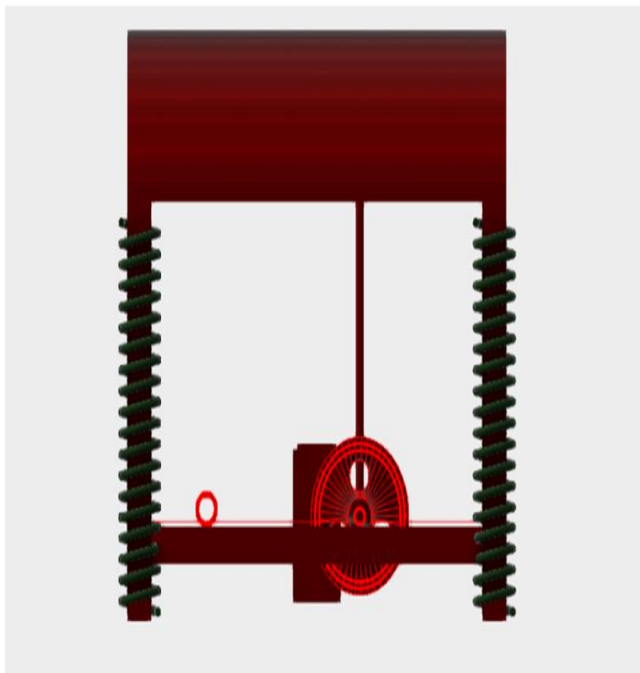


Fig. 3: CAD design (Left view of the design).

V. HARDWARE IMPLEMENTATION

To construct the power-generating speed breaker, we have to first work on implementing and building the hardware Fig. 4. Here, we are making the speed breaker. The rack, which is attached to the bottom of the dome and slides downward in a reciprocating motion, is forced downward whenever the vehicle is permitted to pass over the dome. This causes the springs linked to the crown to contract. Since the rack is connected to

the gears by teeth, the reciprocating action of the rack may be converted to the rotational motion of the bags, but the two gears revolve counterclockwise.

On the shaft is a flywheel, which controls energy fluctuation and makes the energy uniform. As a result, the poles will turn at a specific rpm. These shafts are connected to the dynamos through a belt drive, which transforms mechanical energy into electrical energy. The conversion will follow a linear relationship with traffic density. Dimensions of speed breakers are Height: 27-inch, Width: 18-inch, and Length: 36 inches The material used in the construction of speed breakers is steel. [8].



Fig. 4: CAD design (Right view of the design).

An electromotive force (EMF) is induced in an armature as it spins between the magnetic fields of the south and north poles. So, to generate this EMF, the armature coil must spin, and this armature is attached to a long shaft. The kinetic energy of moving vehicles is used for this rotation. Because power is created in both directions, a specific component known as a Zener diode is needed for continuous supply to transform this power into one direction. The electrical output may be increased by connecting these power humps in series. Utilizing numerous electrical equipment, this created power may be magnified and stored. The block diagram (see Fig.5) depicts the entire procedure [9].

It is a machine that transforms mechanical energy into electrical energy. Through "faraday's law of electromagnetic induction," the dynamo employs spinning wire coils and magnetic fields to convert mechanical rotation into a pulsed direct electric current. A dynamo machine comprises a fixed structure known as the stator, which generates a constant magnetic field, and a collection of spinning windings known as the armature, which rotates within that field [9] [10-11] (see Fig.6).

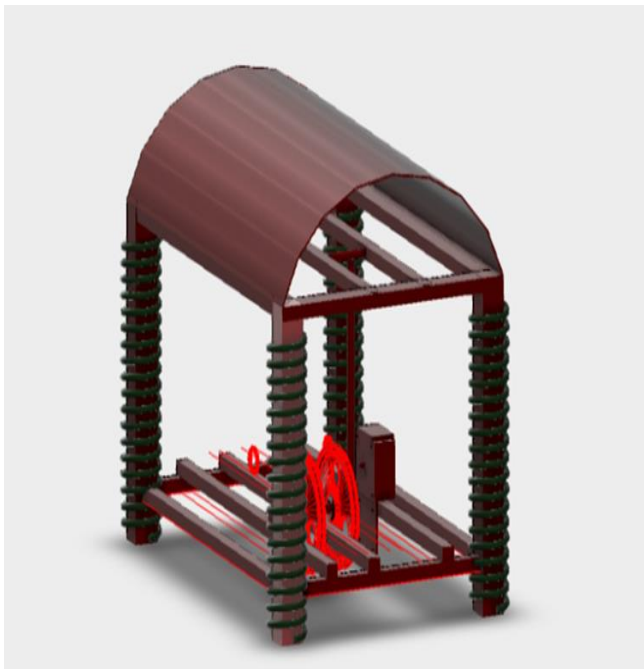


Fig. 5: Hardware implementation.



Fig. 6: Actual image of the generator.

Dynamo is an old word for a generator that generates direct current electricity. DC electricity only transfers electrons in one direction. The issue with a basic creator is that the rotor finally flips around as it revolves, reversing the current. Previously, innovators had no idea what to do with interspersing current; interspersing current is more difficult to manage and build motors and lights for. Previously, innovators had to figure out a means to solely collect the creator's positive energy, so they made a commutator. The commutator is a switch that permits the current to flow only one way.

A tiny dynamo that uses an infinite magnet may create a dazzling field using the stator, a stationary structure. Electromagnets on large fireballs are present.

The stator creates a glittering field that the armature, which is constructed of coils of bull windings, rotates within. The

windings slice through the lines of a dazzling area as they travel. Electric beats result from this.

The commutator must produce a direct current. The spinning armature of a dynamo causes the current to reverse every half turn, which creates difficulty because natural current power can only travel in one direction down the line. As a result, the commutator acts as a rotary switch to cut off power during the retrograde current portion of the cycle (see Fig.7).

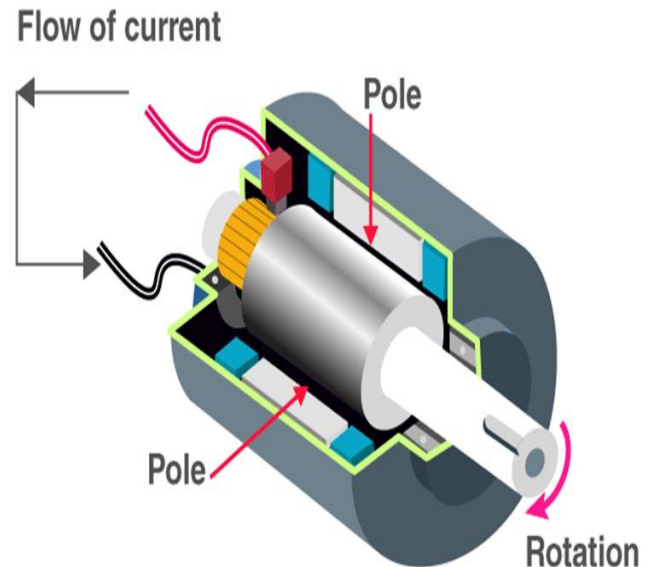


Fig. 7: Generator/alternator block

The role of a flywheel is primarily that of an energy storage device. It lessens the speed variations. When demand is low, it captures the energy and releases it when it is needed [9] [11].

A flywheel is a large indirect slice-like object attached to the machine's main shaft. When we talk about automobiles, it seems common. It is also thought to be a component of the clutch medium. Using a flywheel allows a machine to function smoothly without causing any changes in the rotational motion of the transmission system (see Fig.8).

In other terms, it is a hefty mechanical device utilized to store rotational energy and force it to the transmission system as needed, promoting smooth vehicle handling. The flywheel's inactivity decreases or reduces oscillations in the transmission system's speed (see Fig.9).



Fig. 8: Actual flywheel picture.

VI. RESULTS AND DISCUSSION

The system developed is a cost-effective autonomous system that does not require any fuel to work or produce power. It has clean and green energy and is easy to install. The system can make about 15.16 W power in a second if cars of mass of 400kg pass over it in an hour, which equals about 54 KW in an hour. As the design is just a prototype and not yet matured, enough improvements can be made in the design and the working mechanism and structure. It can be upgraded by connecting it with the charging instrument and carried and used as a security barrier.



Fig. 9. Spring mechanism attached to the system.

VII. CONCLUSION

In this proposed framework a prepaid vitality meter which takes the benefits of GSM module and can access to every home and every region. GSM is not only used for communication of electricity but also utilizing our energy meter to facilitate the use of electricity theft. The electricity theft information is directly sent to the main authorities and takes action against the control of the supply of electricity. Whenever consumers use illegal electricity, the system will automatically detect electricity theft and cut the electricity.

GSM is used for sending information from consumption to the comparing unit but during testing GSM operating voltage is 4.7 volts and the voltages available are in standard volts like 5 volts and 12 volts. This is the main problems for GSM. To avoid this problem, Buck Converter is used to supply fix operating voltage to GSM. Many times, the GSM signal weak. Therefore, use the best Network SIM card. For sending data, another module should be used.

For advancement internet of thing can also be used in the project, it will facilitate the consumer easily their consumed unit will send to it and show the electricity theft. Do

not use the WI-FI module because it will send your data but not receive it.

REFERENCES

- [1] A. R. Devidas and M. V. Ramesh, "Wireless smart grid design for monitoring and optimizing electric transmission in India," *Proc. - 4th Int. Conf. Sens. Technol. Appl. SENSORCOMM 2010*, pp. 637–640, 2010.
- [2] J. B. Faheem, "Energy Crisis in Pakistan," *IRA- International J. Technol. Eng.* (ISSN 2455-4480), vol. 3, no. 1, 2016.
- [3] Azam, A., M. A. Aslam, S. Ali, and F. Q. Yousef-Zai. "138. Speed Breaker Power Generator." *Environ. Sustain. Dev* 2016.
- [4] Muhammad Nasir Khan, Syed K. Hasnain, Mohsin Jamil, Sameeh Ullah, "Electronic Signals and Systems Analysis, Design and Applications International Edition," in *Electronic Signals and Systems Analysis, Design and Applications: International Edition*, River Publishers, 2020
- [5] Khan, Muhammad Nasir, Hasnain Kashif, and Abdul Rafay. "Performance and optimization of hybrid FSO/RF communication system in varying weather." *Photonic Network Communications* vol. 41, no. 1, pp. 47- 56, 2021.
- [6] Jamil, Mohsin, Muhammad Nasir Khan, Saqib Jamshed Rind, Qasim Awais, and Muhammad Uzair. "Neural network predictive control of vibrations in tall structure: An experimental controlled vision." *Computers & Electrical Engineering*, vol. 89, pp. 106940, 2021.
- [7] Khan, Muhammad Nasir, Mohsin Jamil, Syed Omer Gilani, Ishtiaq Ahmad, Muhammad Uzair, and H. Omer. "Photo detector-based indoor positioning systems variants: A new look." *Computers & Electrical Engineering*, vol. 83, pp. 106607, 2020.
- [8] Kashif, Hasnain, Muhammad Nasir Khan, and Ali Altalbe. "Hybrid optical-radio transmission system link quality: link budget analysis." *IEEE Access*, vol. 8, pp. 65983-65992, 2020.
- [9] Khan, Muhammad Nasir, and Fawad Naseer. "IoT based university garbage monitoring system for healthy environment for students." In *2020 IEEE 14th International Conference on Semantic Computing (ICSC)*, pp. 354-358. IEEE, 2020.
- [10] R. Kumar, S. Arora, S. Singh, and A. Tomar, "Design of Intelligent Electricity-Theft Monitoring System Using Matlab," *Int. J. Sci. Eng. Res.*, no. August, pp. 139–142, 2017.
- [11] Rokonzaman, Md, and Md Hossam-E-Haider. "Analysis of speed breaker mechanism for more effective electricity generation." In *International conference on mechanical, industrial and materials engineering*. 2015.