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Power Generation through Speed Breakers

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***Abstract*: In the present scenario power becomes major need for human life. Due to day-to-day increase in population and lessen of the conventional sources, it becomes necessary that we must depend on non-conventional sources for power generation. While moving, the vehicles possess some kinetic energy and it is being wasted. This kinetic energy can be utilized to produce power by using a special arrangement called "POWER HUMP". The Kinetic energy of moving vehicles can be converted into mechanical energy of the shaft through rack and pinion mechanism. This shaft is connected to the electric dynamo and it produces electrical energy proportional to traffic density. This generated power can be regulated by using Zener diode for continuous supply. All this mechanism can be housed under the dome like speed breaker, which is called hump. The generated power can be used for general purpose like streetlights, traffic signals. The electrical output can be improved by arranging these power humps in series this generated power can be amplified and stored by using different electric devices. The maintenance cost of hump is almost nullified. By adopting this arrangement, we can satisfy the future demands to some extent.**

***Keywords*: Roller, magnetic field and flywheels**

1. Introduction

Next time on the roads, don't scoff at the speed breakers. They could actually light up small villages off the highway. The rotor (rotating shaft) is directly connected to the prime mover and rotates as the prime mover turns the rotor contains a magnet that, when turned, produces a moving or rotating magnetic field. The rotor is surrounded by a stationary casing called the stator, which contains the wound copper coils or windings. When the moving magnetic field passes by these windings, electricity is produced in them. By controlling the speed at which the rotor is turned, a steady flow of electricity is produced in the windings. These windings are connected to the electricity network via transmission lines. A vehicle weighing 1,000 kg going up a height of 10 cm on such a rumble strip produces approximately 0.98 kilowatt power. So one such speed-breaker on a busy highway, where about 100 vehicles pass every minute, about one kilo watt of electricity can be produced every single minute.

2. Components

A. *Required components*

- Roller
- Fly Wheel
- Rack & Pinion
- Bearings
- Generator
- Chain Drives
- Step Up Transformer
- Battery
- Street Light

B. *Roller*

Suited for where heavy loads must be moved in confined spaces without loss of precision or rigidity, Tschudin and Heid linear roll cages and guides allows displacement of moving parts in axial direction via use of parallel shafts and sleeves; no radial movement is possible. Rollers offer line contact with guide, enabling low pre-load at assembly to be maintained. Rollers are arranged within plastic or metallic cage in spiral fashion, spread over entire surface area of shaft and sleeve. Tschudin & Heid linear roller cages and guides are components for machine, instrument, tool and fixture applications. The novel design of the rollers and cages allows the displacement of moving parts in an axial direction through the use of parallel shafts and sleeves. No radial movement is possible. This novel construction is particularly appropriate in cases where heavy loads must be moved in confined spaces without loss of precision or rigidity. The use of special "rollers" instead of balls results in line contact with the guide rather than point contact as with ball-type guides. Because of this line contact, pre-load at assembly can be kept low, which produces a low surface pressure between the rollers and guides. In spite of this, the bearing is rigid, accurate and can be heavily loaded.

Fig. 1. Roller

The rollers are arranged within a plastic or metallic cage in spiral fashion, spread over the entire surface area of the shaft and sleeve, leading to a longer service life of the guide unit.

This is also a low maintenance unit, requiring only a thin lubricating film for normal operation. Complete cylinder linear guides, comprising shaft and sleeve with matched roller cage can be supplied ready for fitting to customer's specification. Advanced Machine & Engineering Co., is a manufacturer located in Rockford, Ill., serving the Machine Tool Industry with precision components and accessories, including spindle interface components, work holding devices, and, through our sister company, Henning, machine enclosures, chip removal and filtration systems. The Fluid Power – Safety markets are served with cylinder rod locks and safety catcher devices; and the Production Saw market with our Am Saw carbide saw machines and Speed cut blade products. AME has manufacturing partners and customers around the world.

C. Fly wheel

The primary function of flywheel is to act as an energy accumulator. It reduces the fluctuations in speed. It absorbs the energy when demand is less and releases the same when it is required. A flywheel is a mechanical device specifically designed to efficiently store rotational energy. Flywheels resist changes in rotational speed by their moment of inertia. The amount of energy stored in a flywheel is proportional to the square of its rotational speed. The way to change a flywheel's stored energy is by increasing or decreasing its rotational speed by applying a torque aligned with its axis of symmetry,
Common uses of a flywheel include:

- Smoothing the power output of an energy source. For example, flywheels are used in reciprocating engine because the active torque from the individual pistons is intermittent
- Delivering energy at rates beyond the ability of an energy source. This is achieved by collecting energy in a flywheel over time and then releasing it quickly, at rates that exceed the abilities of the energy source.
- Controlling the orientation of a mechanical system gyroscope are reaction wheel

Fig. 2. Fly wheel

Flywheels are typically made of steel and rotate on conventional bearings; these are generally limited to a maximum revolution rate of a few thousand RPM. High energy density flywheels can be made of carbon fiber composites and employ magnetic bearings, enabling them to revolve at speeds up to 60,000 RPM.

D. Rack & Pinion

Speed breaker POWER GENERATOR Converters basically new concept of non-conventional energy generation. It is electro-mechanical energy generating machine. This machine converts reciprocating motion in to rotary motion. The rotational power is stored in flywheel & flywheel rotates dynamo, which generates electricity. Here first important point is how we get reciprocating motion, which is prime input in the system. For that we use weight of Moving vehicle on the Speed breaker. We put our machine underneath the Sped breaker installing different units.

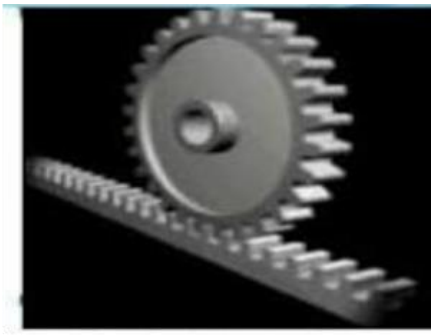

Fig. 3. Rack & Pinion

All the units are connected to the common shaft using chain and sprocket drive. The head of rack is brought up to level beneath the speed breaker surface. When vehicle moves on the speed breaker, the rack it will be pushed down. The rack is attached with free wheel type pinion that rotates in one direction only. The rack & pinion arrangement convert reciprocating motion in to rotary motion. This rotary motion is further magnified using reciprocating motion in to rotary motion-belt & pulley drive. The output of pulley is attached with flywheel which stores kinetic energy and transfer to dynamo which generate electricity with zero cost. A "generator" and "motor" is essentially the same thing: what you call it depends on whether electricity is going into the unit or coming out of it. A generator produces electricity. In a generator, something causes the shaft and armature to spin. This generated power is used for various application required by different users.

E. Bearings

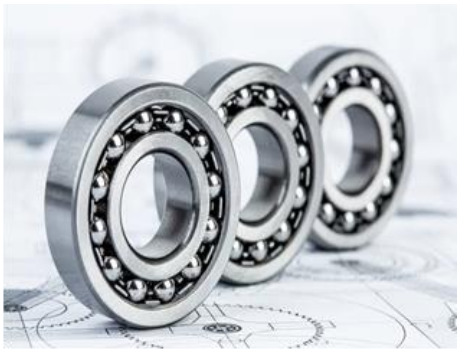

Fig. 4. Bearings

Bearing is used to mount the shaft used in power generation unit. The purpose of it is to reduce the friction between shaft and the casing. Thus, they reduce the friction and transmit the motion effectively.

F. Generator

It is a device, which converts mechanical energy into electrical energy. The dynamo uses rotating coils of wire and magnetic fields to convert mechanical rotation into a pulsing direct electric current through "Faraday's Law of Electromagnetic Induction". A dynamo machine consists of a stationary structure, called stator, which provides a constant magnetic field, and a set of rotating winding called the armature which turns within that field.

Fig. 5. Generator

G. Chain Drive

Fig. 5. Chain Drive

Chain drive is a way of transmitting mechanical power from one place to another. It is often used to convey power to the wheels of a vehicle, Roller chain and sprocket particularly bicycles and motorcycles. It is also used in a wide variety of machines besides vehicles. Most often, the power is conveyed by a roller chain, known as the drive chain or transmission chain, passing over a sprocket gear, with the teeth of the gear meshing with the holes in the links of the chain. The gear is turned, and this pulls the chain putting mechanical force into the system. Another type of drive chain is the Morse chain, invented by the Morse Chain Company of Ithaca, New York, United States. This has inverted teeth. Sometimes the power is output by simply rotating the chain, which can be used to lift or drag objects. In other situations, a second gear is placed and the power is recovered by attaching shafts or hubs to this gear. Though drive chains are often simple oval loops, they can also go around corners by placing more than two gears along the chain; gears that do not put power into the system or transmit it out are generally known as idler-wheels. By varying the diameter of the input and output gears with respect to each other, the gear ratio can be altered. For example, when the bicycle pedals' gear rotates once, it causes the gear that drives the wheels to rotate more than one revolution.

H. Step up transformer

When power systems are put into operation or when faults occur, it becomes necessary to check the instrument transformers to make sure that they are providing test instruments and protective relay equipment with the correct outputs.

Fig. 6. MAGNUS

MAGNUS™ permits you to prepare excitation curves for instrument transformers quickly and easily. MAGNUS is also used to demagnetize current transformer cores and to conduct turn-ratio tests on voltage transformers. Even though it weighs only 16 kg (35lbs), it provides 1 A at 2.2 kV. Two-hand control enhances personal safety.

I. Battery

A battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices such as flashlights, smart phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load, a redox reaction converts high-energy reactants to lower-energy products, and the free energy difference is delivered to the external circuit as electrical energy. Historically the term "battery" specifically referred to a device composed of multiple cells, however the usage has evolved to include devices composed of a single cell. Battery Various cells and batteries (top-left to bottom-right): two AA, one D, one handheld ham radio battery, two 9-volt (PP3), two AAA, one C, one camcorder battery, one cordless phone battery Type Power source Working principle Electrochemical reactions, Electromotive force First production 1800s Electronic symbol Primary (single-use or "disposable") batteries are used once and discarded; the electrode materials are irreversibly changed during discharge. Common examples are the alkaline battery used for flashlights and a multitude of portable electronic devices. Secondary (rechargeable) batteries can be discharged and recharged multiple times using an applied electric current; the original composition of the symbol for a battery in a circuit diagram.

Fig. 7. Battery

It originated as a schematic drawing of the earliest type of battery, a voltaic pile. electrodes can be restored by reverse current. Examples include the lead-acid batteries used in vehicles and lithium ion batteries used for portable electronics such as laptops and smart phones. Batteries come in many shapes and sizes, from miniature cells used to power hearing aids and wristwatches to small, thin cells used in smart phones, to large lead acid batteries or lithium-ion batteries in vehicles, and at the largest extreme, huge battery banks the size of rooms that provide standby or emergency power for telephone exchanges and computer data centers. According to a 2005 estimate, the battery industry generates US$48 billion in sales each year, with 6% annual growth. Batteries have much lower specific energy (energy per unit mass) than common fuels such as gasoline. In automobiles, this is somewhat offset by the higher efficiency of electric motors in converting chemical energy to mechanical work, compared to combustion engines.

J. Street light

Lighting columns and fittings make a major impact on the appearance of the scheme and should be planned as part of the overall design concept. It is especially important that in historic towns and conservation areas particular attention should be paid to the aesthetic quality of the street lighting installation. At the same time care should be taken to avoid light pollution, particularly in rural areas.

- Lighting has an important role to play in:
- Reducing risks of night time accidents
- Assisting in the protection of property
- Discouraging crime and vandalism
- Making residents feel secure
- Enhancing the appearance of the area after dark.

Fig. 8. Street light

3. Working

One rod with the dynamo is placed like a speed breaker. Dynamo means a generator that produces direct current with the use of a commutator. The dynamo uses rotating coils of wire and magnetic fields to convert mechanical rotation into a pulsing direct electric current through Faraday's law. A dynamo machine consists of a stationary structure, called the stator, which provides a constant magnetic field, and a set of rotating windings called the armature which turn within that field. movement of vehicle just rotates the dynamo shaft and electricity is generated.

Fig. 9. Experimental setup

4. Result

The "POWER GENERATION THROUGH SPEED BREAKERS" performance is successfully verified. We have tested this equipment in our college atmosphere. We successfully studied the characteristics and plotted the graph.

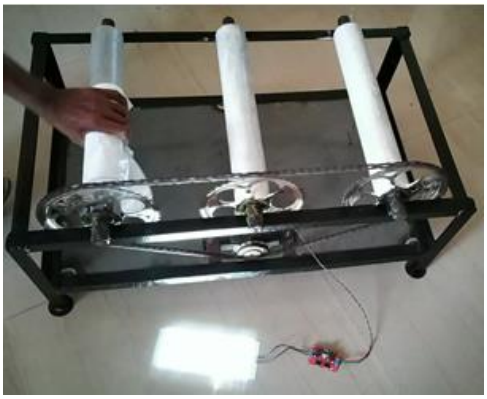

Fig. 10. Final output

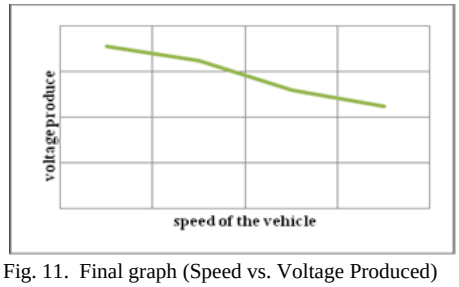

Fig. 11. Final graph (Speed vs. Voltage Produced)

5. Conclusion

In coming days, this will prove a great boon to the world, since it will save a lot of electricity of power plants that gets wasted in illuminating the street lights. As the conventional sources are depleting very fast, then it's time to think of alternatives. We got to save the power gained from the conventional sources for efficient use. So this idea not only provides alternative but also adds to the economy of the country. Now, vehicular traffic in big cities is more, causing a problem to human being. But this vehicular traffic can be utilized for power generation by means of new technique called "power hump". It has advantage that it does not utilize any external source. Now the time has come to put forte these types of innovative ideas, and researches should be done to upgrade their implication.

References

[1] Automobile Engineering: Kirpal Singh
[2] Automobile Engineering: G.B.S. Narang
[3] Automobile Engineering: S.M. Pandey & K.K. Shah
[4] Basic Automobile Engineering: C.P. Nakra
[5] A Text Book of Machine Design: R.S Khurmi & J.K. Gupta
[6] Digital Systems Principles & Applications: Ronald Ltocci.
[7] Digital Design: Morris Manu.
[8] Mukherjee D, Chakrabarti S, 2005, Fundamentals of renewable energy systems, New Age International Limited publishers, New Delhi. Sharma P.C., "Non-conventional power plants", 2005
[9] P. M. Anderson and A.A. Fouad, 'Power System Control and Stability', Galgotia Publications.
[10] Aswathaman. V and Priyadharshini. M, "Every speed breaker is now a source of power," in 2010 International Conference on Biology, Environment and Chemistry, IPCBEE, vol. 1, 2011.
[11] Noor Fatima, and Jiyaul Mustafa, "Production of electricity by the method of road power generation," in International Journal of Advances in Electrical and Electronics Engineering, September 2014.