ISSN: 2277-3754
ISO 9001:2008 Certified
International Journal of Engineering and Innovative Technology (IJEIT)
Volume 6, Issue 5, November 2016

Self powered locomotives

Gowri Ganesh K
#UG Scholar & Electronics and Communication Engineering, Panimalar Engineering College India

Abstract: ***We all know about the Network of Railways and they are using a very large amount of Electricity to operate trains each and every day, they are using many kilowatt and megawatt everyday our concept implies if the trains replaces solar panel and a dynamos and Peltier sensors for operation of trains, Hence a large amount of energy can be reduced and the energy can be given for the human conception***

Our project comprises of Dynamo generators, Solar panel and Peltier sensors that can regenerate the current and can be used as many times as we want hence we can run or operate the trains with the minimum amount of energy and that also can be regenerated Initially Electricity lines should be present from one station to the next station till the required energy is gained to start the trains by the dynamos after that the electric tracks may not be required and the trains can produce and use the same energy hence the electricity can be saved .The dynamos are attached at the every coaches and engine while the train is in motion the dynamo can generate electricity and can be stored in the large batteries that are available in the engine part and all the dynamos are connected in a series and the power line is attached to the locomotive. And the coaches may not require the power from the engine part because at the top of the coaches Solar panel is present that can be used as a power source and the energy can also be stored in a Batteries and the power can be used at Nights, The Peltier sensor are also present under the seats of the passengers in the train the passengers are maximum seated, the Peltier sensor is capable of turning the humans body heat in to Electricity and that also collected from all the passengers in a coach and used as a additional power source to the solar panel. The Solar panel and the Peltier Sensor is used as power source for the coaches. Hence by implementing the Dynamos, solar panel and the Peltier Sensor the power used in the Indian railways can be reduced in a larger amount and the Electricity can be used for the welfare of the people

Keywords**—Energy Regeneration;Dynamos; Solar pannel; Peltier Sensors modules;**

I. INTRODUCTION

Now a day's most of the people use electric locomotive as their mode of transport because it is considered as one of the fastest cheapest mode of transport. This electric locomotive use electric AC current instead of fuel sources like oil. The basic idea behind this project is to save the electric current resource by using dynamo, solar and Peltier modules energy so that current can be supplied to the public. The idea is brought out using solar panels and dynamo generator. Dynamo generatorand Peltier modules is used for the movement of train and solar panels are used to provide supply to the electrical components in the train.

We propose a new way in the field of railway transportation, thus the trains use the regenerative energy system. Once the batteries in the train are fully charged and it is used for running and it is regenerated while running and it is stored in a batteries and it is used again and again. Once it is charged and can be used many no of times. Same time it regenerates the energy that is used as a starting power from the next station. The compartments uses the energy from the solar panel can be stored in batteries and can be used for the later purpose The power that is generated from the compartment is used as power source for the same compartment .By using this technique more energy can be saved and that can be used for public consumption. And the power used for running purpose is generated from Dynamos and Peltier sensors. The dynamos and peltier sensors are present in every compartment and are connected to a central powerline and is transmitted from the compartments to the engine area where it is stored and used for running purpose.

II. EXISTING SYSTEM

The electric locomotive absorbs the AC power from an overhead line. The current collected from the overhead is used through an axle brush. All trains are provided with a battery to provide a start-up current and for supplying essential circuits. An electric train is always provided with some sort of circuit breaker to isolate the power supply when there is a fault, or for maintenance. The single phase AC from the overhead line is converted to the 3-phase required for the motors by rectifying it to DC and then used for fans lights etc. A grid is used to absorb excess electrical energy during motor or braking power control often seen on the roof of locomotive where they are used to dissipate heat during dynamic braking. A set of windings with a magnetic core is used to step up or step down the voltage from one levelanother level.

A.Direct and Alternating Current

The most fundamental difference lies in the choice of AC or DC. The earliest systems used DC as AC was not well understood and insulation material for high voltage lines was not available. DC locomotives typically run at relatively low voltage (600 to 3,000 volts); the equipment is therefore relatively massive because the currents involved are large in order to transmit sufficient power. Power must be supplied at frequent intervals as the high currents result in large transmission system losses. As AC motors were developed, they became the predominant type, particularly on longer routes. High voltages are used because this allows the use of low currents; transmission losses are proportional to the square of the current. Thus, high power can be conducted over long distances on lighter and cheaper wires. Transformers in the locomotives transform this power to a low voltage and high current for the motors. A similar high voltage, low current system could not be employed with direct current locomotives because there is no easy way to do the voltage/current transformation for DC so efficiently as achieved by AC transformers.

ISSN: 2277-3754
ISO 9001:2008 Certified
International Journal of Engineering and Innovative Technology (IJEIT)
Volume 6, Issue 5, November 2016

AC traction still occasionally uses dual overhead wires instead of single phase lines. The resulting three-phase current drives induction motors, which do not have sensitive commutators and permit easy realization of a regenerative brake. Speed is controlled by changing the number of pole pairs in the stator circuit, with acceleration controlled by switching additional resistors in, or out, of the rotor circuit. The two-phase lines are heavy and complicated near switches, where the phases have to cross each other. The system was widely used in northern Italy until 1976 and is still in use on some Swiss rack railways. The simple feasibility of a fail-safe electric brake is an advantage of the system, while speed control and the two-phase lines are problematic. The Swedish Rc locomotive was the first series locomotive that used thyristors with DC motors.

Rectifier locomotives, which used AC power transmission and DC motors, were common, though DC commutators had problems both in starting and at low velocities.[further explanation needed] Today's advanced electric locomotives use brushless three-phase AC induction motors. These polyphase machines are powered from GTO-, IGCT- or IGBT-based inverters. The cost of electronic devices in a modern locomotive can be up to 50% of the cost of the vehicle. Electric traction allows the use of regenerative braking, in which the motors are used as brakes and become generators that transforms the motion of the train into electrical power that is then fed back into the lines. This system is particularly advantageous in mountainous operations, as descending locomotives can produce a large portion of the power required for ascending trains. Most systems have a characteristic voltage and, in the case of AC power, a system frequency. Many locomotives have been equipped to handle multiple voltages and frequencies as systems came to overlap or were upgraded. American FL9 locomotives were equipped to handle power from two different electrical systems and could also operate as diesel-electrics. While recently designed systems operate on AC, many DC systems are still in use – e.g. in South Africa and the United Kingdom (750 V and 1,500 V); Netherlands, Japan, Mumbai, Ireland (1,500 V); Slovenia, Belgium, Italy, Poland, Russia, Spain (3,000 V) and Washington DC (750 V)

B. Power Transmission

Electrical circuits require two connections (or for three phase AC, three connections). From the beginning, the track was used for one side of the circuit. Unlike model railroads the track normally supplies only one side, the other side(s) of the circuit being provided separately. The original Baltimore and Ohio Railroad electrification used a sliding shoe in an overhead channel, a system quickly found to be unsatisfactory. It was replaced by a third rail, in which a pickup (the "shoe") rode underneath or on top of a smaller rail parallel to the main track, above ground level. There were multiple pickups on both sides of the locomotive in order to accommodate the breaks in the third rail required by track work. This system is preferred in subways because of the close clearances it affords.Railways generally tend to prefer overhead lines, often called "catenaries" after the support system used to hold the wire parallel to the ground. Three collection methods are possible:

Trolley pole: a long flexible pole, which engages the line with a wheel or shoe.

Bow collector: a frame that holds a long collecting rod against the wire.

Pantograph: a hinged frame that holds the collecting shoes against the wire in a fixed geometry.

Of the three, the pantograph method is best suited for high-speed operation. Some locomotives use both overhead and third rail collection

C. Wheel Arrangement

During the initial development of railroad electrical propulsion, a number of drive systems were devised to couple the output of the traction motors to the wheels. Early locomotives used often jackshaft drives. In this arrangement, the traction motor is mounted within the body of the locomotive and drives the jackshaft through a set of gears. This system was employed because the first traction motors were too large and heavy to mount directly on the axles. Due to the number of mechanical parts involved, frequent maintenance was necessary. The jackshaft drive was abandoned for all but the smallest units when smaller and lighter motors were developed,

Several other systems were devised as the electric locomotive matured. The Buchli drive was a fully spring-loaded system, in which the weight of the driving motors was completely disconnected from the driving wheels. First used in electric locomotives from the 1920s, the Buchli drive was mainly used by the French SNCF and Swiss Federal Railways. The quill drive was also developed about this time and mounted the traction motor above or to the side of the axle and coupled to the axle through a reduction gear and a hollow shaft - the quill - flexibly connected to the driving axle. The Pennsylvania Railroad GG1 locomotive used a quill drive. Again, as traction motors continued to shrink in size and weight, quill drives gradually fell out of favour.

Another drive was the "bi-polar" system, in which the motor armature was the axle itself, the frame and field assembly of the motor being attached to the truck (bogie) in a fixed position. The motor had two field poles, which allowed a limited amount of vertical movement of the armature. This system was of limited value since the power output of each motor was limited. The EP-2 bi-polar electrics used by the Milwaukee Road compensated for this problem by using a large number of powered axles.

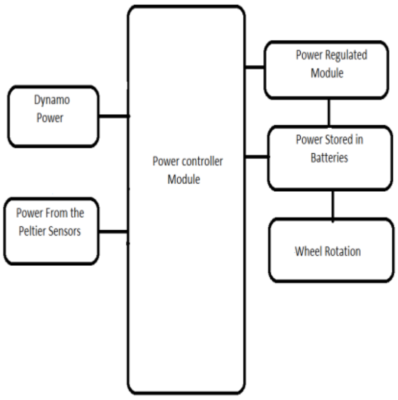
Modern electric locomotives, like their Diesel-electric counterparts, almost universally use axle-hung traction motors, with one motor for each powered axle. In this arrangement, one side of the motor housing is supported by plain bearings riding on a ground and polished journal

ISSN: 2277-3754
ISO 9001:2008 Certified
International Journal of Engineering and Innovative Technology (IJEIT)
Volume 6, Issue 5, November 2016

that is integral to the axle. The other side of the housing has a tongue-shaped protuberance that engages a matching slot in the truck (bogie) bolster, its purpose being to act as a torque reaction device, as well as a support. Power transfer from motor to axle is affected by spur gearing, in which a pinion on the motor shaft engages a bull gear on the axle. Both gears are enclosed in a liquid-tight housing containing lubricating oil. The type of service in which the locomotive is used dictates the gear ratio employed. Numerically high ratios are commonly found on freight units, whereas numerically low ratios are typical of passenger engines

III. PROPOSED SYSTEM

The proposed system is is shown in the complete block diagram Architecture .The proposed system says that the power obtained from the Dynamos and the peltier Sensors, The peltier are capable of converting the human body heat energy into electricity a single sensor has the capable of producing power of 30 W and a has maximum current of 8.5Amps. A single peltier Sensor has the capability of producing the power of 30W and 8.5Amps. If a seat full contains many peltier Sensors with additional to that Dynamo generators are used as a additional power source and the each compartment is provided with a solar panel. The power from the solar panel is used to power the compartments in the train. The power obtained from the dynamos and the peltier sensor are used drive the engine with other locomotives and the solar panel is used to power the compartments .The complete Architecture is shown below



A. Dynamos & Batteries

A dynamo is an electrical generator that produces direct current with the use of a commutator. Dynamos were the first electrical generators capable of delivering power for industry, and the foundation upon which many other later electric-power conversion devices were based, including the electric motor, the alternating-current alternator, and the rotary converter. Today, the simpler alternator dominates large scale power generation, for efficiency, reliability and cost reasons. A dynamo has the disadvantages of a mechanical commutator. Also, converting alternating to direct current using power rectification devices (vacuum tube or more recently solid state) is effective and usually economical. The energy that is produced from the dynamo Is stored in a Lead-acid battery which as a low energy to weight ratio and a low energy to voltage ratio. To supply high current means these batteries must have more power to weight ratio. These energy that are collected during the running of the vehicle is stored in a lead acid batteries that can be used I Nights.

Fig.5 Dynamo The current ratings of a dynamo is given below

Brand Name: ---------------MEISHENGLONG

Model Number: -------------XWS Series

Output Type: --------------AC Three Phase

Speed: --------------------1500/1800RPM

Frequency: ----------------50/60Hz

Rated Power: --------------6.5kw-750kw

RatedVoltage: ------------ 400V/380V/240V/230V/220V Rated Current: ------------11.7-361A

Type: ---------------------alternator for car 48v

Bearing: ------------------Single/Double bearing Insulation: ---------------H class Protection

Class: ---------IP23 adjusting rate of stable

Voltage:--±0.5%

B. Peltier Sensors

The idea of converting the human body's energy into electricity has tantalized scientists for years. A resting male can put out between 100 and 120 watts of energy, in theory enough to power many of the electronics you use, such as your Nintendo Wii (14 watts), your cellphone (about 1 watt) and your laptop (45 watts). Eighty percent of body power is given off as excess heat. But only in sci-fi fantasies such as the Matrix film series do you see complete capture of this reliable power source. Current technology for converting body heat into electricity is capable of producing only a few mill watts (one thousandth of a Watt), which is enough for small things such as heart rate monitors and watches. Some people fondly remember Seiko's Thermic watch, which runs continuously off body heat on 1 microwatt (one-millionth of a watt). It debuted in 1998 to rave reviews, but Seiko produced only 500 units before discontinuing it. If you own a Seiko Thermic, you never have to worry about

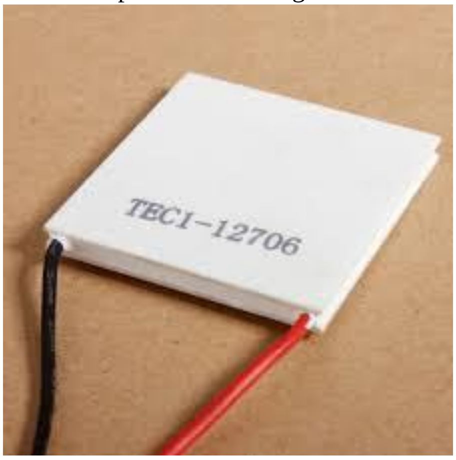
ISSN: 2277-3754
ISO 9001:2008 Certified
International Journal of Engineering and Innovative Technology (IJEIT)
Volume 6, Issue 5, November 2016

changing batteries as long as your environment is cooler than your body.

Recent developments in nanotechnology engineering promise to usher in lots more body-powered devices. The basic technology behind the concept of turning body heat into electricity is a thermoelectric device. It is usually a thin conductive material that exploits the temperature difference between its two sides to generate electricity, known as the See beck effect. Such devices can work in reverse, meaning if you were to apply electricity to the device, one side would get extremely cold and the other extremely hot. If you own a USB-powered drink chiller, you probably own a thermoelectric generator–only working in reverse. The same idea is also used in cooling some computers.

A thermoelectric device placed on skin will generate power as long as the ambient air is at a lower temperature than the body. A patch of material one square centimeter in area can produce up to 30 microwatts. Place these generators side by side to multiply the amount of power being harvested.

In 2006 Vladimir Leonov and Ruud J.M. Vullers from Belgium built a working prototype of a blood oxygen sensor, or pulse oxymeter, powered with body heat. It was about the size of a watch and was successfully tested on patients. It generated about 100 microwatts while the patient was asleep and up to 600 microwatts when awake and active. The group had to design the device so it could work with a record low power of 62 microwatts vs. commercially available 10-milliwatt pulse oxymeters**.**The peltier sensor has the capability of converting the human body heat into electricity the specification of the peltier sensor is given below



Peltier Sensor

C. Solar Pannel

Solar panel is collection of solar cells that converts the heat radiation into a electrical energy, the amount of light hits the cell the amount of electricity produced The price of solar power, together with batteries for storage, has continued to fall so that in many countries it is cheaper than ordinary fossil fuel electricity from the grid The efficiency of a module determines the area of a module given the same rated output – an 8% efficient 230 watt module will have twice the area of a 16% efficient 230 watt module A photovoltaic (in short PV cells) module is a packaged, connected assembly of typically 6×10 solar cells. Solar Photovoltaic panels constitute the solar array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications. Each module is rated by its DC output power under standard test conditions, and typically ranges from 100 to 365 watts. The solar panel ratings are given below

Fig.6 Solar Panel (NBJ-270M)

Module Type NBJ-240M ------------------ -------NBJ-270M

Maximum Power at STC (Pmax) ---------------270Wp

Maximum Power Voltage (Vmp) ---------------48.70V

Maximum Power Current (Imp) ----------------5.55A

Open-circuit Voltage (Voc) ----------------------58.50V

Short-circuit Current (Isc) -----------------------5.93A

Cell Efficiency (%) -------------------------------18%

Module Efficiency (%) --------------------------16.1%

Operating Temperature (℃) --------------40℃～+90℃

Maximum System Voltage (V)---DC1000V(TUV)/DC600V

Maximum Rated Current Series (A) ------------15A

Power Tolerance-------------------------------------0～+3%

Temperature Coefficients of Pmax---------(-0.45±0.05)%/℃

Temperature Coefficients of Voc----------- (0.05±0.01) %/℃

ISSN: 2277-3754
ISO 9001:2008 Certified
International Journal of Engineering and Innovative Technology (IJEIT)
Volume 6, Issue 5, November 2016

Temperature Coefficients of Isc ------------(-0.35±0.02)%/℃

NOTC(℃)-------------------------------------- (47±2) ℃

V. ADVANTAGES OVER EXISTING SYSTEM

1. Most of the power source that are used now a days can be reduced and can be given to the consumer use
2. While traveling we can use our own energy and a regenerative energy
3. The trains will be in less weight and can travel at high speed than now a days

VI. RESULT

Thus by using the regenerative source of energy the majority of the power used by the Indian railways. The trains uses the Dynamos as the regenerative Energy souse for the movement of trains. The major Advantage of the regenerative trains is once it is fully charged there is no need of frequent charge and it can itself regenerate the Energy.

VII.CONCLUSION

Thus by means of our project the majority of our energy or electricity resource can be minimized and can used for the public consumption by using these regenerative Energies pollution also can be reduced.

REFERENCES

[1] http://www2.hesston.edu/Physics/electricloco/eleclocop.Html .

[2] Electric locomotives Direct google Search.

[3] Arsie I, Rizzo G, Sorrentino M “A Model for the Optimal Design of a Hybrid Solar Vehicle”, Review of Automotive Engineering, Society of Automotive Engineers of Japan (JSAE), 2008, ISSN 1349-4724. 29-3: 439-447.

[4] http://www.popsci.com/technology/article/2011-06/new-alloy-can-convert-heat-directly-electricity.

[5] Egiziano L., Giustiniani A., Lisi G.,Petrone G., Spagnuolo G. , Vitelli M., “Experimental characterization of the photovoltaic generator for hybrid solar vehicle”. Proc of 2007 IEEE International Symposium on Industrial Electronics, June 4-7 2007 Vigo (Spain), pp 329-334.

[6] Gowri Ganesh K, Solar Activated Hi-Techvehiclespublished in Volume-33 Number- 4 March 2016 issue.inInternational Journal of Emerging Trend and Engineering DOI number: 10.14445/22315381/IJETT-V33P235.

[7] Amjad S., Neelakrishnan, S. ,Rudramoorthy R.; Review of design considerations and technological challenges for successful development and deployment of plug-in hybrid electric vehicles, Renewable and Sustainable Energy Review, 14(2010) pp 1102- 1110.

[8] Direct search- Peltier sensors and its specifications southern Railway technical web portal.

[9] http://www.alternative-energy-news.info/technology/humanpowered/pedalpower/.

[10] http://www.lowtechmagazine.com/2011/05/biek/powered-electricitygenerators.html.

[11] Rizzo, G. (2010), Automotive Applications of Solar Energy, IFAC Symposium Advances in Automotive Control, July 12 - 14 2010, Munich, Germany.

[12] Amjad S., Neelakrishnan, S. ,Rudramoorthy R.; Review of design considerations and technological challenges for successful development and deployment of plug-in hybrid electric vehicles, Renewable and Sustainable Energy Review, 14(2010) pp 1102- 1110.

[13] Preitl Z., Bauer P., Kulcsar B., Rizzo G., Bokor,J. ,Control Solutions for Hybrid Solar Vehicle Fuel Consumption Minimization In: Proceedings of the 2007 IEEE Intelligent Vehicles Symposium, Istanbul, Turkey, June 13-15, 2007.

[14] Railways in Sweden –Direct Google Search. working of Peltier sensors- Direct Search.