

# Power Generation through Weightlifting Machine

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**Abstract** - We hereby make use of an energy harvester system that moves in response to movement of the motion of multiple exercise machines for converting kinetic energy of the exercise equipment into electrical power. Our system makes use of the gripping rod connected to rear based motorized mechanism having rack pinion arrangement and multiple motors to power the system and generate power. The system aims to provide resistance to reciprocating motion movement while generating power from the same thus serving dual purpose. The machine makes use of motor arrangement to provide generation capability. The machine aims to generate electricity through horizontal motion created while working our exercise. The spring based mechanism allows for efficient resistance settings in the machine as needed. Increased resistance leads to increased power generation in the machine.

**Key Words:** By simply pull up & pull down, non conventional, converting mechanical energy into electrical energy, human-powered electricity generation

## 1. INTRODUCTION

In today's growing word pull up pull down power is the transfer of energy from a human source through the use of rack and pinion system. This technology is most commonly used for gym Centre or house .less commonly gym power is used to power agricultural and hand tools and even to generate electricity. Some application include battery charge home appliance.

The articles on this page are about the many wonderful application for power generation by gym technology. Whenever the person is allowed to pass over the gym pull up pull down. As the spring are attached to gym equipment's, they get compressed and the rack, which is attached to, the bottom of the rod moves down reciprocating motion of rack in to rotary with certain RPM these shafts are connected through a chain drive to the dynamos, which converts the mechanical energy into electrical energy. Man has needed and used energy at an increasing rate for his sustenance and well-being ever since he came on earth for few million years ago. Due to this lot of energy resources have been exhausted and wasted. Proposal for the utilization of waste energy of power generation by gym is very much relevant and important for highly populated countries like India and china the people are crazy about gym. In this project we are generating electrical power as nonconventional method by

simply pull up and pull down. Nonconventional energy system is very essential at this time to our nation. Non-conventional energy using pull up pull down is converting mechanical energy into electrical energy. In this project the conversion of force energy into electrical energy.

The use of human-power in more efficient manner for generation has been possible due to modern technology. Pull up pull down power is an excellent source of energy, 95 percentage of the exertion put into pull up pull down power converted into energy. A human-powered electricity generation has been unveiled by company. In this apparatus, the user has to pull up pull down the gym equipment for generating power.

## 1.1 Purpose of Project

The 'Power generation through forearm machine' Project has developed an enhanced exercise system focused on improving the efficiency of current energy-harvesting equipment. This report has been created for the purpose of presenting all information regarding the research, design, processes, materials, work schedule, and completed model of the project. The central concept involves harnessing energy from an exercise machine through the use of a generator.

## 1.2 Health & Safety

The Center for Disease Control and Prevention has monitored obesity as it has steadily increased over the past 20 years. The National Health and Nutrition Examination Survey reveal that 32.7 percent of Indian adults 20 years and older are overweight while 34.3 percent are obese. The introduction of energy harvesting exercise machines may motivate people to exercise and maintain a healthy lifestyle.

The Doctors suggests that adults take part in at least 2 hours and 30 minutes of aerobic activity each week. This recommended amount of exercise could amount up to 250Wh of energy a week. The retrofitted exercise machines will undoubtedly provide a positive health benefit for many individuals. For some, being able to relate calories burned to electricity produced will provide continual motivation and incentives to work out.

A main concern for the new machines is their safety. The retrofitted exercise machines should be functionally equivalent to its OEM counterpart. The public should be able to easily operate the energy harvesting machines without

injuring themselves or damaging the machines. The exercise machines should also be properly installed into the building's infrastructure to avoid electrical interruptions. This includes concealing all electrical equipment from public access to avoid misuse and injury. The machines and associated equipment should be manufactured and fitted to anticipate conditions of use in the Rack Center.

## 2. WORKING PRINCIPLE

A rack and pinion is a type of linear actuator that comprises a circular gear (the *pinion*) engaging a linear gear (the *rack*), which operate to translate rotational motion into linear motion. Driving the pinion into rotation causes the rack to be driven linearly. Driving the rack linearly will cause the pinion to be driven into a rotation. A rack and pinion drive can use both straight and helical gears. Helical gears are preferred due to their quieter operation and higher load bearing capacity. The maximum force that can be transmitted in a rack and pinion mechanism is determined by the tooth pitch and the size of the pinion.

A gym powered electric generator provides a method of generating electricity by means of a modified stationary gym equipment for use in electrical energy storage and running household or other appliances. Human/mechanical energy is converted into electrical by means of an electric generator that is connected to exercise equipment. As result the energy created by the generator can be stored in various types of lead-acid batteries which may then be tapped at a later time, after dark for example, when the energy is needed to power lights or else. If AC appliances are in place then an inverter must be used to transfer the DC current into the standard 230 volts of AC current for usage by these appliances.

We hereby make use of an energy harvester system that moves in response to movement of the motion of a gym exercise machine for converting kinetic energy of the exercise equipment into electrical power. Our system makes use of the gripping rod connected to spring based motorized mechanism having rack pinion arrangement and multiple motors to power the system and generate power. The system aims to provide resistance to exercise movement while generating power from the same thus serving dual purpose. The machine makes use of 1-3 motor arrangement to provide 3 levels of generation capability. The machine aims to generate electricity through horizontal motion created while workout. The spring based mechanism



Fig -1: Name of the figure

## 3. LITERATURE SURVEY

When the energy intake of humans is considered, a large potential seems apparent. Considering the standard 2000kcal of daily consumption (97W of power in, on average), humans take in about 8.368MJ or 2324Wh of energy every single day. This is approximately the same amount of energy stored in the typical car battery (2400Wh). However, the expenditure of energy for common tasks is relatively high as well as seen

in Table 1 Also; Table 2.2 shows some values for maximum power that can be captured as a result of human activity.

**Table -1: Energy Consumption Rates of Common Human**

Activity	Power consumed(w)
Sleeping	81
Sitting	116
Swimming	582
Splitting	1630

Hence, the available energy that can be captured over a short period of time is in reality quite limited. To replace just one of the largest capacity coal power plants in the United States (Arizona Public Service Co, Palo Verde, AZ) would require approximately the population of 2 New York City metro areas to be riding human power generating bicycle :

$$\frac{3937MW}{100W \text{ per person}} = 39,370,000 \text{ people}$$

The obvious impracticality of this figure shows why the scope thus far in human power generation has been limited to lower power applications such as consumer electronics

Producing 1800 watts for a few seconds should be within the range of the best power lifters and perhaps for up to a minute. Remember 1 watt means applying a force of 1 Newton through a distance of 1 meter in 1 second. So if you lifted 1 kg, that's 9.8,Newton's of force, about 10newtons, for 1 meter in 1 second that would be 10 watts. So lifting 180 kg, 1 meter high in 1 second would be 1800 watts. The best power lifters can do squats of several times their body weight for 1 rep. Let's say the power lifter weighed 100 kg, about 220 lbs.

He might be able to do 3 times his weight for a single rep. That would be 300 kg. But remember he's actually raising his own weight as well. So he's actually lifting 4 times his weight, 400 kg for this one rep. For a male of average height, he might be raising this over a distance of 1 meter. So doing 1800 watts of power for one minute would be like giving this power lifter a weight of only 60 kg (for a total weight of 180 kg) and doing squats with this light weight for the high number of reps of 1 per second over one minute. This would be possible for a weight so much lighter than their usual 1 rep maximum weight.

### 3.1 Calories to Watts

First keep in mind that Watts and Calories are two different units of measurement that can't be directly converted back and forth. However if you use Watt-Hours instead of just

"Watts" you then have a way to convert to calories. Here are the steps: Convert Watt-Hours to Watt Seconds (Joules), then convert Joules to Calories, and then adjust Calories with human body efficiency factor. So for this example let's assume that 11 you provide pedal power to a 100 Watt television for one hour. Since one Joule is equal to one Watts X Seconds you perform dimensional analysis and get:

$$100\text{Watt-hours} \times (3600 \text{ seconds} / 1 \text{ Hour}) = 360,000 \text{ J}$$

Now use the conversion factor:

$$1 \text{ cal} = 4.184 \text{ J to convert Joules to Calories}$$

$$360,000 \text{ J} / 4.184 = 86,042 \text{ Calories}$$

When you look at the label of Oreo cookies or other food items at the store, the term "Calories" is really (kilo-Calories). So you divide by 1000 to get 86 Calories. Assuming that your body is about 25% efficient when cycling you divide by 0.25: Calories burned running a 100 Watt Television for 1 hour = 86 / 0.25 = 344 which is about equivalent to one piece of pizza. .

## 4. COMPONENTS USED FOR POWER GENERATION

### DC Motor with Gearbox

1000RPM 12V DC geared motors for robotics applications. Very easy to use and available in standard size. Nut and threads on shaft to easily connect and internal threaded shaft for easily connecting it to wheel.



**Fig 2: DC Motor with Gearbox**

These motors are simple DC Motors featuring gears for the shaft for obtaining the optimal performance characteristics. They are known as Center Shaft DC Geared Motors because their shaft extends through the center of their gearbox assembly. Nut and threads on the shaft to easily connect and internally threaded shaft for easily connecting it to the wheels This DC Motor – 1000RPM – 12Volts can be used in all-terrain robots and a variety of robotic applications. These motors have a 3 mm threaded drill hole in the middle of the shaft thus making it simple to connect it to the wheels or any other mechanical assembly.

## 5. RESULT

We construct innovative exercise equipment for generating electricity. By using gym equipment, Dynamo, capacitor bank, rectifier circuit and LED lamp. We successfully take the 12 V output supply and it is used to light 3v led and 5v. When the exercise machine is not used, the main supply is used to charge the battery. So the battery also charges while the exercise machine is not in use. So provide a continuous supply.

## 6. CONCLUSIONS

This design and implement an innovative exercise equipment to generate electrical power for the house appliances. Energy storage is deemed necessary and important within renewable energy systems to ensure stability of the system. Reciprocating motion driven generation and storage will drastically increase reliability of the smart system. These models vary in complexity and accuracy and therefore the model chosen must match the application for which it is needed. It will be very helpful for the rural areas. In this day where the world is challenged to be more responsible in its sourcing of electrical power, the method of human power generation could be a solution that also helps mitigate the issue of obesity and overweight. If additional design and study of this concept proves it effective in energy use reduction, localized energy delivery and sustainability education, it could efficiently answer the three great challenges; source of electrical power, reducing the emission of CO<sub>2</sub> to the atmosphere

## ACKNOWLEDGEMENT

A deep sense gratitude to project guide Asst prof. Md Naser Ahmed whose overall direction and guidance has been responsible for the successful completion of this project. We would like to thank all the faculty of mechanical engineering department who motivated throughout in spite of their schedules and commitments. Our sincere thanks to Dr. syed mujahid hussaini head of the department, mechanical engineering for the encouragement and guidance provided. Special note of thanks to Dr. syed abdul sattar, Principal, nsakcet and management of nsakcet for providing facilities for project. And also we thank almighty for bestowing upon us all his blessings for compilation of this project. We would like to express our depth of gratitude to our parents for supporting us and motivating toward studies.

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