IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 8, June 2022
Impact Factor: 6.252

Power Generation using Gym Equipment

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Abstract: *As the global need for energy grows, there is a pressing need to find new technologies for energy transmission and generation, particularly those that are less environmentally harmful. Human power has potential use in emerging places where electric power is either unavailable or too expensive. There is also the untapped potential for harnessing human power at most fitness facilities. Nowadays, spin bikes are extensively used for exercise in both the gym and at home. The drive for gyms around the country to capture this energy and convert it into usable power that can be supplied back into the grid. We are creating electrical power in this project using a non-traditional way of just pulling up and down using Gym equipment. Pull up pull down is a non-conventional energy source that converts mechanical energy into electrical energy. The conversion of force energy into electrical energy is the focus of this study. Pull-ups and pull-downs are a good source of energy, with 95 percent of the effort put into them converting to energy. In the gym If power is not available for an extended period of time, AC power is used for our gadget, which is stored in the battery, resulting in a significant output. Exercise is then performed, and electricity is created in the battery.*

Keywords: Gym Equipment, Electrical Energy, etc.

I. INTRODUCTION

In this generation, we require uninterruptible power for factories, hospitals, universities, and other places where continuous labour is required on a daily basis. The majority of these settlements do not have access to power. Technology is evolving at this time, and power is playing an increasingly significant role in the technical sector. Because nearly all technologies rely on the use of electricity, the proportion of electricity in total primary energy supply is rapidly growing. We squander energy at the gym when exercising on the cycle and treadmill, but if we use that energy to generate electricity and build a device to generate electricity, we can disperse the device in rural regions and many other places where power is required. Also, by just pulling up and down, you may generate electrical power in an unconventional way.

Pull up pull down is a non-conventional energy source that converts mechanical energy into electrical energy. Gym power is most typically used to power gyms or homes, but it is also used to power agricultural and hand equipment, as well as to generate energy. There is a scarcity of energy in many parts of our country, which causes work to be disrupted. To address such issues, we may employ people to store energy using gym equipment such as the Lat Pulldown Machine, treadmill, and cycles, and then use that energy when electricity is unavailable. In addition, the goal of this project is to create a simple human-powered generator out of an old bicycle that can power light bulbs, blenders, mobile phones, computers, and other small gadgets. For densely populated nations like India and China, where people are obsessed about gyms, the proposal for using waste energy for power generation by gym pulley is quite relevant and vital.

II. LITERATURE SURVEY

Ansari Saddam Husain, Gujja Govardhan, Gund Kumar, Mohd Ahmad, Vivek Tiwari, Yakub Khan," Power Generation through Gym Equipment" [1] They employed bench press equipment to generate power in their study report. Energy conservation is becoming a more prominent topic of inquiry among scientists nowadays. The goal of the lat pull down machine is to transform mechanical force into electrical energy using a generator-based system, which may then be used to power light bulbs, mobile phones, and other small gadgets.

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Machine, chain, free wheel, fly wheel, gears, battery, dc generator, and inverter are typical components of a lat pull down machine. The flywheel's kinetic energy is transferred to the dc generator through gears. The lead acid battery stores the produced energy. Solid works is used to build and evaluate component drawings for the numerous pieces necessary for the design of a lat pull down machine (2012). The project's findings reveal that if all of the gym's machines are outfitted with proper power generation equipment, more power can be stored in the battery.

Ruchith, Akshitha, Supreeth, Syed Khaja, Girisha," Power Generation using Gym Equipment" [2] According to this study report, as global energy consumption continues to climb, new technologies for energy conservation and power generation, particularly those with lower environmental implications, are urgently needed. Despite the fact that human power is not optimal in terms of life cycle costs, there are interesting applications for human power in growing places where electric power is either unavailable or prohibitively expensive.
The globe is experiencing an energy crisis due to a disparity in demand and supply, as well as a scarcity of natural resources. As a result, there is a need for energy conservation and the development of a low-cost, realistic alternative energy source. The goal is to focus on how electrical energy may be created using gym/exercise equipment. People in metropolitan regions are highly health concerned, and they spend an average of one hour in the gym to maintain their physical condition. Using a generator-based system, this invention captured the machine's mechanical energy and turned it to electrical energy.

Madhup Kumar, Dr. G S Mundada, "Energy Harvesting from Gym Equipment" [3] The purpose of this research is to look at how electrical energy may be created through gym/exercise equipment. People in metropolitan regions are highly health concerned, and they spend an average of one hour in the gym to maintain their physical condition. Using a generator-based system, this invention captured the machine's mechanical energy and turned it to electrical energy. When individuals work out in the gym, they use a lot of energy in the process.
Energy is lost in the environment owing to pulley spinning, rolling/up-down movement of workout equipment, heat, and other factors. The goal is to use mechanical energy and convert it to electrical energy. The pulley of workout equipment is connected to a mechanical shaft with a dynamo. When individuals exercise on exercise equipment, the pulley rotates owing to the up-and-down movement of the equipment, and the pulley turns, which moves the dynamo shaft. According to Faraday's law, the voltage is generated as the shaft rotates. This voltage may then be stored in a battery, which can then be utilised to power street lighting.

M. Musharraf, Ifrah Saleem, Dr. Farhat Iqbal, "Energy Generating Gymnasiums Machines for Renewable, Sustainable and Green Energy "[4] This study proposes a theoretical model of Energy Generating Gymnasiums System (EGGS), which will contribute to the renewable energy industry. People in current culture are health-conscious, and they use gymnasium workouts to obtain their desired fitness level. A gym is a facility where individuals use their bodies to physically control a variety of devices by exerting force on them.
Smart EGGS is based on the premise that human energy wasted on machines in a gym should be turned into electrical energy. The electrical energy generated by smart EGGS will be clean, renewable, and long-lasting. People are also a source of renewable energy, according to research presented for smart EGGS, and chemical energy possessed by humans can be turned into electrical energy. EGGS will be extremely advantageous to regions experiencing acute energy shortages. The combined output of all gymnasium machines will provide enough electrical energy for the gymnasium's electrical equipment. Excess electrical energy can be sold back to the power company.

Avish Bhandari, Shailesh Itte, Jas Jangipuria, Ramesh Harayan, "Power Generation Using Gym Equipment" [5] Due to the paucity of traditional energy sources, it is now necessary to adopt renewable energy sources. This project is about a system that uses gym equipment to create power. Humans are used as the power source for the gym equipment. This apparatus is intended to serve as both a workout machine and a power generator.

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The reciprocating action of the equipment will be transformed to rotary motion using a rack and pinion arrangement, and the rotational speed will be raised using a chain drive as the gear reduction technique. The rotating motion will be converted into electrical energy using an alternator. The transmission of energy from a human source to a rack and pinion system is known as pull up pull down power. The most popular application of this technology is in a gym or a home. Gym power is occasionally utilised to power agricultural and hand equipment, as well as to create energy. Battery-powered household appliances are one of the applications.

The articles on this page discuss the numerous fantastic applications of gym pulley technology for power generating. When the individual is permitted to pass over the gym pull up pull down. As the springs are attached to gym equipment, they are compressed, and the rack attached to the bottom of the rod moves down, converting the reciprocating motion of the rack into rotary motion with a specific RPM. These shafts are connected to the dynamos via a chain drive, which converts mechanical energy into electrical energy. As the free wheel is fitted into the gears, it is now made to revolve in one direction by delivering power to the shaft, while the other is made to rotate freely on the shaft.

III. IMPLEMENTATION

1) Introduction

The power created in a typical human-powered gym based on currently available equipment is examined in this research. The quantity of CO2 avoided, as well as the payback period for putting this gym in place, are all calculated. The energy-generating equipment at the gym was discovered to not only assist the environment in the long term.

The entire system, including the lateral pull down and pull-down machine, is operated by a human, and the overall energy created during a workout on this equipment is converted linear to rotational motion using the Rack and Pinion Mechanism, as shown in the upper block diagram. With the aid of a 500 RPM DC motor and the necessary numerical data, mechanical energy is turned into electrical energy.

The reverse charge protection mechanism in this system prevents the current/losses created during motion from flowing backwards. Because there are low losses, this gadget generates a significant quantity of energy. As a result, the quantity of energy obtained is stored in the battery (12V, 7AH capacity) for future use. The energy that is obtained but not required can be stored in the inverter and used later. There is no energy waste in this manner.

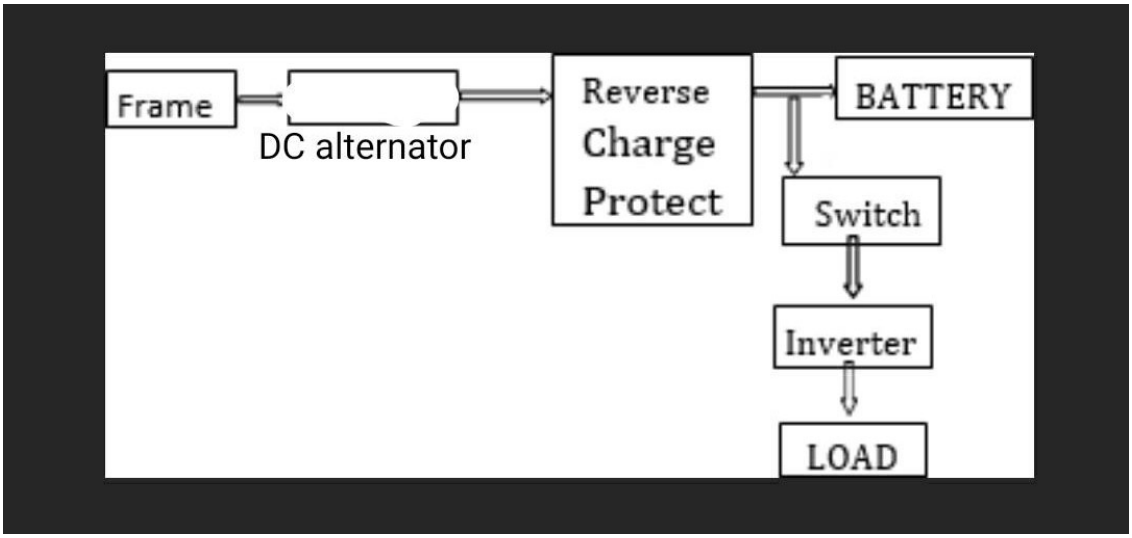

Figure 3.1: Block Diagram

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2) FEA on Lat Pull Up Machine Assembly

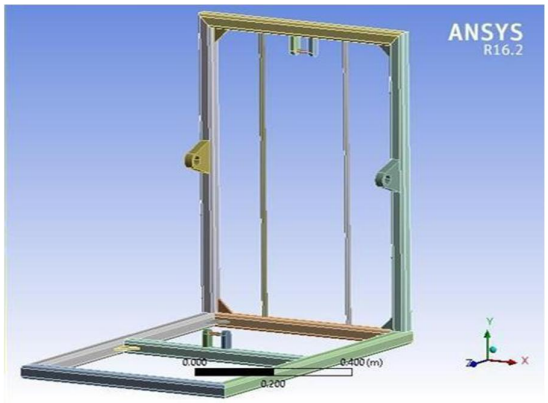

Figure 3.2: Frame Structure Gym equipment or System

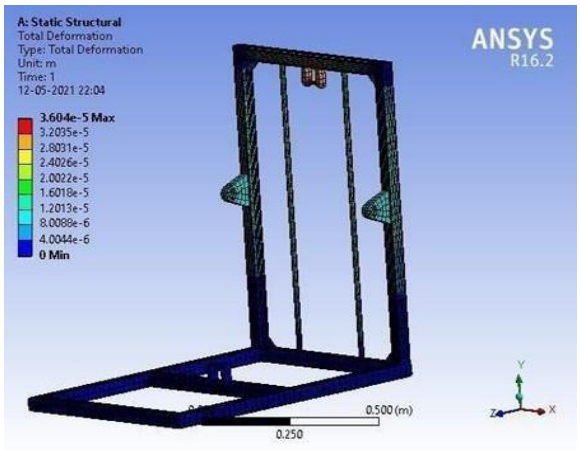

Figure 3.3: Total Deformation

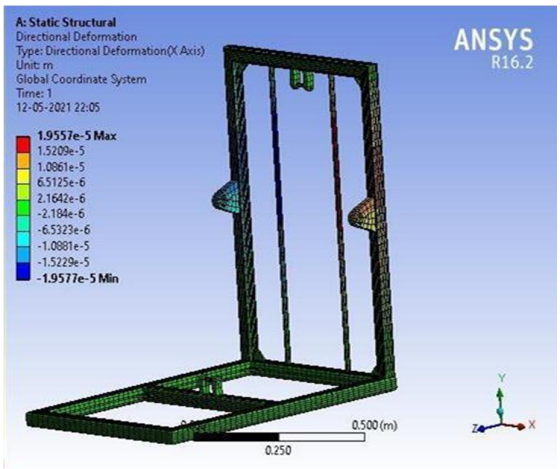

Figure 3.4: Directional Deformation

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3) Components

1. Pully and Rope
2. Weights SOLIDWORKS
3. Rack and Pinion
4. Frame
5. Motor
6. Alternator
7. Battery

Following the simulation tests, it is clear that the material we chose and the model made using this material give us a variation of 0.34mm after lifting 100kg weight, and that the more weight proportional the deviation will be, and the deviation of 0.34mm will be nearly negligible, and that not everyone can lift 100 for an extended period of time.

4) Theoretical Analysis of Power Generation in LAT Pull up Machine

- Dynamo specifications: Rated as 12V and 5A each.
- LED bulb specifications: Rated as 12V and 40mA each.

The concept is "The average human generates around 100 watts in an average day. Depending on the person's activity, weight, and metabolism, a person's power can be slightly higher or lower. A typical American consumes about 2500 kilocalories of energy in a day. Assuming no weight gain or loss, this also means that 2500 kilocalories are used by the body in a day. With 2500 kilocalories of energy, the body is able to function properly. This allows you to do everyday activities such as reading, jogging, sleeping, etc."

1 calorie = 4.2 joules 2500 kilocalories = 1.05 × 107 J 1 day = 86400 s P = W/t = 1.05 × 107 J/86400 s = 121.5 W. For simpler calculation we take this as approximately 100 W.

Power Calculation

Average a man can produce a power of approx. 100 watts in a day from a single exercise equipment.
1 day =100 watt
30 days = 30×100 watt = 3 Kilo Watt
With the amount of 3-Kilowatt power 03 Celling Fan can run approx. 08 hours in a day for whole month.

Table 1

Appliance	Watt s	No.	Hours	Watt x Hours	Units/day
Ceiling Fans	100	3	8	2400	2.40

If the charge for electricity is □4/- per unit then the monthly electricity bill of 03 celling fan will be 2.4*30 = 72 unit/day,
72*4= 288 Rs/day
So, power generation by a single human on a single exercises machine is saving 288 rupees per month.

IV. CONCLUSION AND DISCUSSION

To summaries, we began our study by designing and creating models utilising software, establishing soft and maximum constraints, and estimating the quantity of power that might be created. As a result of the simulation tests, we conclude that the material we chose and the model made using this material give us a variation of 0.34mm after lifting 100kg weight, and that the more weight proportional the deviation, the smaller the deviation and the deviation of 0.34mm will be, and that not everyone can lift 100 for long periods of time.

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As a result, if we put our model into practice, it will be safe to utilize. Second, based on the calculations, if 100 people go to the gym every day, we will get enough electricity to power the gyms and start the supply of electricity in the future. On the other hand, if we could use a more powerful amplifier, we might even be able to charge phones, laptops, and other electronics. Using this type of power reduces pollution and aids in the conservation of fossil resources. One step closer to environmental protection.

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