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EFFORT TO ENERGY: A STUDY OF ENERGY CONSERVATION IN GYM

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Abstract:

In this paper, the energy transfers occurring in a gymnasium have been examined and a new method of using mechanical forces to obtain electrical energy was devised. The pull loads which cause the tensile and compressive forces to act on our muscles while working out in the gym can also be used as a power source for electronic devices. Urbanization and environmental factors have made the current generation more open to the idea of fitness and the number of gym-goers is only increasing every day. On an average, a person burns 298-500cal=2084 watts per session of the gym. This energy has a lot of potential. Through the proposed design, a power output of 2.127 watts has been obtained using the action made by the latte resistance- training machine. This can be used to power the gym electronics, mobile phones and the energy can also be stored and used for various other purposes.

Keywords- Universal buildings, Potential opportunity for energy saving.

1. INTRODUCTION

"Energy" in today's world is as important as air that we breathe. Be it for the economy of a country or one's every day basic needs. Power sector hence has a major role to play. Power shortage is a major issue in the world today. Our current problems involve lack of power in certain regions and the lack of continuous supply in other regions. Our primary source of energy is fossil fuel. The usage of fossil fuels has both its advantage and disadvantages.

Exercise	Surface	Resistance	Time	Distance	RPE	Enjoyment	Calories
Cycling	Road	Nil	20 mins	5	6	7	120
Walking	Grass	-	40 mins	3	4	9	68
Elliptical	Gym	2	20 mins	2.7	7	5	74
Swim	Water	Shallow	20 mins	4 laps	Dead	10	220
Rowing	Gym	1	10 mins	Not sure	6	3	45

Table.1. ***The Statistics of various events and their following parameters***

It has a very high efficiency and can supply steady current for a large period and it has a relatively high power output but it has many disadvantages as well. The emissions of fossil fuels cause air pollution, global warming, greenhouse effect and other major environmental pollution. These conventional methods

are more efficient and produce a large amount of electricity and this makes it the most preferred method of electric power generation. This has pushed the idea of unconventional energy. Although they are very effective and can be a viable replacement for fossil fuels, the set-up requires large areas and complex technology and also specific conditions for effectively trapping the energy. Hence, the prospect of using human effort in the form of mechanical force to conserve energy has a lot of scope.

2. GYMNASIUM-A "POWER HOUSE" OF ENERGY

Most of the energies we know the one energy that is still not completely utilised i.e. human energy. Gymnasium a place where tens and thousands of people visit every day and burn on an average of 298-500 calories (2084wats) During each individual's work out, some amount of energy can be retrieved. Though most of these calories are utilised by our body in the form of heat due to burning of fat and conversion sweat in the sebaceous glands, others are just wasted. So these energy that are lost in the form of waste can be tapped through various mechanisms.The microhardness and macrohardness was measured using a microhardness tester and Brinell hardness tester. Specimen for impact test was prepared having a gauge length of 100mm, a gauge width of 10mm and a gauge width of 10mm.

3. THE STRENGTH TRAINING/WEIGHT GAIN SECTION

This section of the gym is used for muscle toning and for weight gain. It involves an exertion of human force in terms of pulling or pushing to lift loads via simple mechanisms. The mechanisms involve pulleys, high tension wires, and sliders etc. which provide the required motion. These mechanisms are tentative to change depending on the muscle to be toned. A few equipment of this section include the chest press, shoulder press, bicep curl, lat pull down, seated row, leg press, toe raise etc.

4. EXPERIMENTAL SETUP

A basic latte machine and the bench press. Both these machines work on the basic pulley system. Since the pulley system is common to most of the other weights equipment the power obtainable though a pulley was selected. All these equipment drive the pulley through a pull bar at front end (while lifting the weight) and dead weights at rear ends (while leaving the weights). In the cardio section treadmill & cycle are the two equipment worked on.A machine with firm wiring and sufficient lubrication between sprocket and chain as well as the wire over the secondary pulley is considered. The load is secured. Pulling force is exerted via the bar, which lifts the load with the help of the sprocket and pulley mechanism. Due to this force applied, the sprocket rotates which makes the connecting rod to rotate along with the sprocket. The other end of the connecting rod is coupled to the crank of the electrical dynamo. As the sprocket rotates, the connecting rod rotates, which rotates the crank, thus powering the dynamo. The dynamo further stores charges the capacitor which further is feed to the portable power bank.

5. DETERMINATION OF REQUIRED PARAMETERS

No load was applied at the start of the experiment. A reference mark was made on the support beam of the machine. Another reference mark was made on the part of the wire passing between the pulley and the dead weights. Force is then applied to the bar in order to lift the dead weights. At the end of the pull stroke, the motion is paused; the distance covered by the reference mark on the wire with respect to the reference mark on the support beam was measured. At the same time, the time taken to lift the loads until

the final position of the workout is reached was measured using a stopwatch. The readings were tabulated. The procedure was repeated for various loading conditions and the observed values were tabulated and calculated. Based on the experimental conditions the power generated from the mechanical action in the resistant training process could be calculated by considering the following strategy.

Load	Load	Distance	Time (s)		Velocity (m/s)		Angular velocity (rad/s)	
(kg)	(N)	(cm)	Pull	Release	Loading	Unloading	Loading	Unloading
No load	0	80	2.4	2.4	0.033	0.3	0.5611	0.361
2	19.62	69	2.6	3.0	0.028	0.28	0.5765	0.3911
3	29.43	65	1.98	3.4	0.0328	0.19	0.5582	0.325
4	39.24	58	1.48	3.81	0.039	0.015	0.6636	0.2588

Table.2. Weight Section

4. PROPOSED SYSTEM

These obtainable energies can be tapped using a simple and universal. The cardio machines are the most commonly used gym equipment in comparison with the weight lifting machines. Besides being used at the gyms, they are used profusely at homes, colleges, schools, hospitals etc. They are easy to use and to maintain. Some of the cardio machines are tread mills, stationary bikes, elliptical machines and stair steppers, etc. All these machines work on a belt drive system and chain sprocket systems. A setup including a small gear box, a dynamo and a power bank can be attached to the front wheel of the bike provided an external attachment is fitted in the wheels. As discussed earlier, the dynamo set up is portable and the individual can attach it to the respective machine in which he is working out. When the person starts to pedal, the dynamo converts the mechanical energy to electrical energy stored in a conventional manner. A socket can be attached to the power bank and the power stored is adequate to charge mobile phones or iPods. A socket can be attached to the power bank and the power stored is adequate to charge mobile phones or iPods. A calorie calculator and a digital screen can also be attached where the person can keep in track of his work out details. Similarly in a rowing and EFX machine, the dynamo can set up can be attached to the wheels and the generated power can be stored in the power banks. There is no point in attaching this dynamo setup to a treadmill because this will reduce the efficiency of the motor driving the treadmill. Further much more efficient method could be devised using better mechanisms and equipment can be directly fabricated completely form scratch for this particular module of work.

CONCLUSION

This area of tapping human energy has been left unfocused which has very strong potential in bringing about a further more advanced and a sustainable society. The mechanism designed can generate an output power of output 2.127 watts in a single cycle of the load-unload procedure. The losses in energy conversion have not been considered as this is a proposed idea and hence there will be a decrease in the

power generated. But it will not affect the output by a large margin and hence this proposed model has the potential to be a good energy conservation source.

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