

Automated machine design through software controller support

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Abstract - The idea behind this paper is that can we create a continuous cyclic mechanism in Machines with the help of software! The Engine Core Components are designed to utilize the energy which is released by Electricity or Combustion or Steam. Here, we are using mechanical power to generate electricity and from Electric motor to Mechanical power again. This cyclic motion will be controlled by Controller with help of software and Predefined constant values.

the same process will be repeated to get into the Cyclic Mechanism. The Software main intention is to Control the Engine revolution and the Consumption of the Released Power. The left-out Energy from the Machine is the Output from the Machine.

Key Words: Crank, Shaft, Jack, House Jack, Torque, Power, 4 stoke, Revolutions, Rotations, KW, W, and Arduino.

1. INTRODUCTION

The Sun is the best and the cleanest source of natural energy available to us. The best part about the solar energy is that it is present in abundance and will not disappear in the years to come. However, the availability of sun with beneficial state is up to 7 to 9 hours per day and Cost is one of the main factors for the disappointment. To overcome these undeniable obstacles, I am looking for the possible options which can help us to produce more reliable and continuous energy generation ways. One of them was creating self-sustained machines. The Advantages would be,

- We can replace the Volatile Oil utilization by this Process.
- Echo Friendly.
- Pollution Free.
- Low Maintenance.

Here, Most of the Work is related to Machine (90%). However, we need software (10%) to control the Released Energy which is the key component in the Project. The Software would provide the monitoring and Power adjustment capabilities.

2. EXISTING SYSTEM

As of Today, Some Technologies are available to run Engines as Echo friendly. But those are not completely successful. Their disposal is very much hazardous to Nature. For example, Some Automobile companies have developed mechanical technology to run the vehicles with Lithium

Batteries and they will get recharged again with Electricity. Some Companies have developed Hybrid Technology as the vehicle get recharged on running. However, both technologies are failed to create Cyclic motion energy in the vehicle.

3. PROPOSED SYSTEM

A jack is a mechanical lifting device used to apply great forces or lift heavy loads. A mechanical jack employs a screw thread for lifting heavy equipment. A house jack, also called a screw jack, is a mechanical device primarily used to lift buildings from their foundations for repairs or relocation. These types of jacks are used to lift very great weights. To make it lift the 100Kg Weight only I have to spend only 1/40 power using this Jack that means 2.5Kg of weight pressure is required to lift 100Kg weight by the jack.

If we use the electric machine to lift same weight, we need nearly 1kw electric power to lift 100kg at the rate of 1meter per second.

Let's do a quick calculation here:
power = work/time
work = force x distance

So, power = force x distance/time or equivalently,
power = force x speed of lifting (rate)

Force needed to hold 100 kg against gravity = 100×9.8 ,
rounding it up to 1000N.

Let's say the machine lifts it up at a rate of 1 meter per second.

So power needed would be $1000 \times 1 = 1\text{kW}$.

But this is the power needed without frictional and other losses. Fairly if assembly is 80% efficient, actual power the motor pumps in from the source would be
 $1000/0.8 = 1.25\text{kW}$.

This verifies the afore mentioned fact that higher the rate with which the weight needs to be lifted, more would be the wattage rating.

With the same Calculations, If I wanted to lift 2.5Kg of weight with 1-meter lift per second.

$$\begin{aligned} \text{Power} &= 2.5 \times 9.8 \times 1 \\ &= 24.5\text{W} \end{aligned}$$

According to this calculation I can lift 100Kg of weight with 24.5W using House Jack.

3. COMPONENTS

In this machine design I am using below components.

- Ball Nut Screw
- Replacing Crank Setup
- Gear shafts
- Coils of wire
- Controller

3.1 Ball Nut Screw

The Friction between threads of House jack is another challenge. To decrease the friction, I am intended to use Ball Nut Screw technique since the friction constant co-efficient is very low as show below table.

Bearing Type	Coefficient of friction - μ
Deep Groove Ball Bearing	.0015
Angular Contact Bearing	.0020
Cylindrical Roller Bearing, Cage	.0010
Cylindrical Roller Bearing, Full Comp.	.0020
Tapered Roller Bearing	.0020
Spherical Roller Bearing	.0020
Ball Thrust Bearing	.0015
Cylindrical Roller Thrust Bearing	.0050
Tapered Roller Thrust Brg. Cage	.0020
Tapered Roller Thrust Brg. Full Comp	.0050

If a more accurate calculation of bearing friction taking into account the effects of speed and lubrication is required for an application, please contact American’s sales department. More important to the equipment designer than frictional force is the amount of frictional torque that must be overcome. This parameter can easily be calculated using the formula below:

$$\text{Torque} = \frac{P \times \mu \times dm}{2}$$

Where:

P = Equivalent Load on the bearing

μ = Coefficient of friction

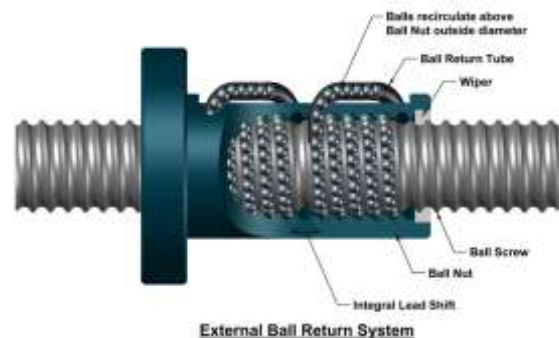
dm = Pitch diameter of bearing

The ball screw assembly consists of a screw and a nut, each with matching helical grooves, and balls which roll between

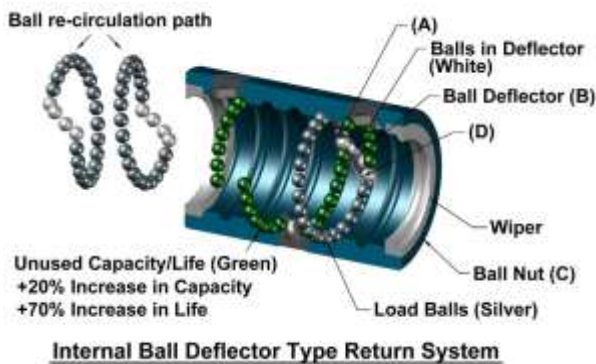
these grooves providing the only contact between the nut and the screw. As the screw or nut rotates, the balls are deflected by the deflector into the ball return system of the nut and they travel through the return system to the opposite end of the ball nut in a continuous path. The balls then exit from the ball return system into the ball screw and nut thread raceways continuously to recirculate in a closed circuit.

The ball nut determines the load and life of the ball screw assembly. The ratio of the number of threads in the ball nut circuit to the number of threads on the ball screw determines how much sooner the ball nut will reach fatigue failure (wear out) than the ball screw will.

- (a) The External Ball Return System. In this type of return system, the ball is returned to the opposite end of the circuit through a ball return tube which protrudes above the outside diameter of the ball nut.
- (b) The Internal Ball Return System (There are several variations of this type of return system) The ball is returned through or along the nut wall, but below the outside diameter.



Example (1): Some manufacturers have one revolution circuits where the balls are forced to climb over the crest of the thread on the screw by the return system. This is known as a cross-over deflector type internal return system. In the cross-over deflector type of ball nuts, the balls make only one revolution of the shaft and the circuit is closed by a ball deflector (B) in the nut (C) allowing the ball to cross over between adjacent grooves at points (A) and (D).



The above Diagram has 2 Gear wheels. The Big one has nearly double radius means the rotation and revolution of Small one will be high when we attach both as shown in the picture.

3.2 Replacing Crank Setup

The Crank setup was used convert up and down movement to rotational motion. This is revolutionary invention in Mechanical industry. Here, I want to replace this system with Worm Gear Wheel Technology.



If I attach another Big wheel as above pic, Then the double rotation of the small one will be passed on to Big one. That's how the Big wheel has double the rotation to double. The same process repentance the Big wheel might get 4 rotations.

These rotations will be attached to one shaft which is going to be discuss in the next section.

The below mentioned Worm Gear Technology will generate back and forth movement of threads to Rotational movement.



3.4 Coils of Wire

This Components is the electricity generator for the whole machine. In traditional power generators the rotational shaft will be connected to the Coils for the Frequency generation. This frequency can be converted to output power.

The sample Power generator specifications:

Name	Medusa T1101
Part number	03955
Engine type	4-stroke, single cylinder, air cooled, OHV
Engine size	2.4 HP
Fuel type	Unleaded petrol
Rated output (peak)	1100 watts
Rated output (continuous)	900 watts
AC voltage	230v ~50hz
DC voltage	12 v
DC current (max.)	5.8 amps
Fuel tank capacity	6 Litres
Sound power (LwA)	93 dB(A)

3.3 Gear Shafts

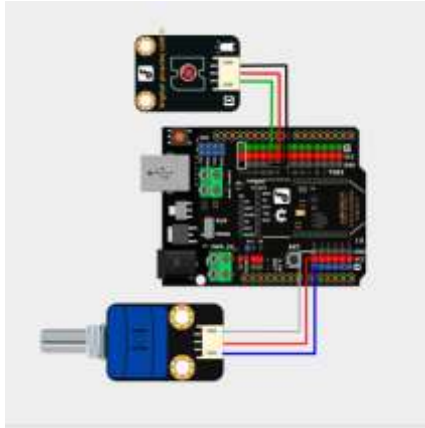
The Most modern gearboxes are used to increase torque while reducing the speed of a prime mover output shaft (e.g. a motor crankshaft). This means that the output shaft of a gearbox rotates at a slower rate than the input shaft, and this reduction in speed produces a mechanical advantage, increasing torque. A gearbox can be set up to do the opposite and provide an increase in shaft speed with a reduction of torque. Some of the simplest gearboxes merely change the physical rotational direction of power transmission.

In this existing system we will replace the 4-stroke engine with the gear shaft for the rotation as medium.

3.5 Controller

When we are running the Machine in Cyclic mode one Controller is required to handle input and output energy and Power Consumption. Since it is difficult with Human touch, we are proposing a Controller to do this Job.

The Design of the Controller will be made by Arduino Chip setup and Arduino Programming and Commands will be used to develop the component.



The Rotational sensor will be worked as we programmed in the Controller. The below image depicts the actual image of the Sensor.



- Arduino compatible
- Can rotate 10 full rounds
- Based on multi-turn precision potentiometer
- Operation voltage:3.3V-5.0V
- Weight: 10g

This component will be targeted to shaft of the Power Generator. As instructed with Arduino programming it will calculate the current rotational speed of the shaft. These calculations will be used as stabilized state. If User wants to produce more power and according to his/her setting the machine will follow the instructions.

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BIOGRAPHIES



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