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Experimental Investigation of Energy Production by Using Pendulum

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Abstract- ***This paper deals with energy production from the gravity. Moreover, this paper is also intended to gain the useful and green energy by using gravity effect. In this paper, two-stage mechanical oscillator with gear mechanism, cam mechanisms and dynamo is fabricated to conduct the experiment.The process of this machine is that when the pendulum is applied with the input energy, the pendulum oscillates on the free moveable pivot point and this oscillation effect can move the lever arm to produce the second oscillation motion as same as seesaw arrangement system. Meanwhile, at the other edge of the lever arm, the output can be available as the impact effect. This effect can be used as the output energy to drive the other mechanisms such as hammer, water pump, electric motor, and generator for the useful energy. As the results, the output energy is the maximum (41.2N) at*** l_1 ***= 435 mm,*** m_2 ***= 8.7 kg,*** $Ø_0$ ***= 60°,*** m_1 ***= 3.2kg and*** l_2 ***= 610mm for this machine. The significant considerable key points of this machine are mass balancing and friction to gain optimum output energy. As the weak point, the input energy needs to be continuous and the output energy is intermittent. However, compared with the other energy devices, this gravity machine can provide energy at any time and location as the advantages.***

Indexed Terms- ***Gravity, Pendulum, Gravity Machine, Two-stage Mechanical Oscillator, Electrical Energy, and Gravitational Energy.***

I. INTRODUCTION

For a long time, people are using fossil fuels for power. Most of the fossil fuels produce carbon dioxide and cause to be air pollution and global warming. Therefore, there is a need for powerfrom the renewable sources. The reason for power using gravity is that it is available for all over the world, abundant, and consistent. This research is tending to gain the useful electrical power by amplifying gravitational energy from pendulum. The basic concept of gravity power generating mechanism is sample [1].

This is a sample mechanism with a new mechanical effects which represents the source of clean energy. This gravity machine is called the two-stage mechanical oscillator and consists of only two main parts, a massive lever and a pendulum. The interaction of two-stage lever multiplies the input energy into output energy convenient for useful work (mechanical hammer, press, pump, transmission, electric generator and so on).

Physical pendulum is used as a single-stage oscillator in the system with a lever. If the pendulum oscillation is used as the driving force to another lever with the counter weight, it can produce another stage oscillator called the two-stage oscillator. Meanwhile, the counter weight can produce the green energy as the useful energy [7].

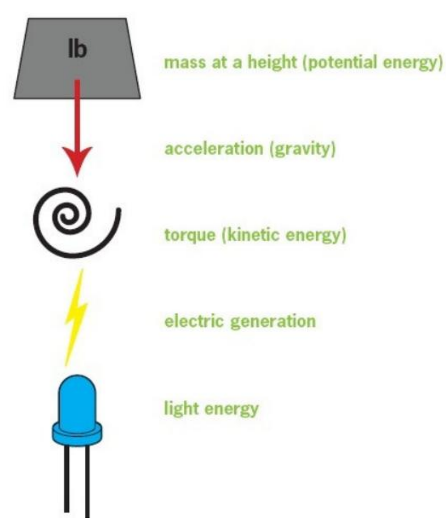

Figure 1. Procedure of Energy Transformation
Source: [8]

The idea of gravity machine to produce the green energy is explained in figure 1. When a body is at certain height from the ground, it possesses potential energy due to gravitational pull the body falls down. In this process, potential energy is converted to kinetic energy in the form of torque (oscillation motion). And this converted into electrical energy using generator. The electrical energy is supplied to the LEDs, where electrical energy is converted into light energy [8].

II. TWO-STAGE MECHANICAL OSCILLATOR

Two-stage oscillator is a compound pendulum in which energy is transferred from one pendulum to another. Once the pendulum is provided with some input, it keeps on oscillating for some time thus transferring the energy to the other pendulum. In the year 1999, Sir VeljkoMilkovic invented the two-stage oscillator mechanism. It was a new concept at that time. The highlight of the mechanism was the amount of energy input proved to be less than the energy obtained. The statement seems to be hypothetical but this was explained by carrying out various kinds of experiments. NebojšaSimin explained the phenomenon of increasing the input energy by operation of the pendulum-lever system. Sir Jovan Bebic and Lujbo Panic also developed a relation between output and input energy of the system and found that the system has efficiency greater than unity. Jovan Marjanovic discussed the theory of gravity machines [6]. The logic of this theory was also used to explain the two-stage mechanical oscillator of VeljkoMilkovic and pointed out a way to improve its behavior. He also stated that the pivot point should have some lag before moving up or down until pendulum comes in position such that its pivot point and bob move in opposite directions. Jovan Marjanovic analyzed the factors affecting the free energy of the pendulum and various other factors. He also figured out that output energy was solely based on the mass of the bob of pendulum [10]. The conceptual design of two-stage mechanical oscillator is shown in figure 2.

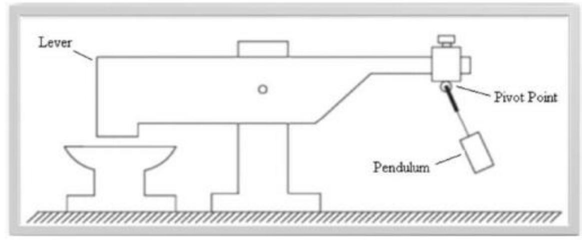

Figure 2. Conceptual Design of Two-Stage Mechanical Oscillator

III. DESIGN CALCULATION OF TWO-STAGE MECHANICAL OSCILLATOR

The average effective force(output) can be obtained from this equation as $F'_{(2avg)}$:

$$F'_{2_{avg}} = \frac{1}{2}F'_2 = \frac{1}{2}g\frac{(m_2 l_2 - m_1 l_1 \cos(\emptyset_0)^2)}{l_2}$$

The equation of the initial angle ($\emptyset_0$) is:

$$h = l - l\cos(\emptyset_0)$$

Input energy equation is:

$E_{in} = m_1 gh$

$l_{(bob)} = 350$ mm, $m_1 = 3.2$ kg

Output result

l_1 = 385 mm

l_2 = 610 mm

m_1 = 3.2 kg

m_2 = 8.2 kg

$$F'_{2_{avg}} = \frac{1}{2}F'_2 = \frac{1}{2}g\frac{(m_2 l_2 - m_1 l_1 \cos(\emptyset_0)^2)}{l_2}$$

$\emptyset_0 = 30° \rightarrow$

$F'_{2avg} = 0.5 \text{ x } 9.81 \text{ x } 8.2 \text{ x } 0.61 - 3.2 \text{ x } 0.385 \text{ x} \cos(\emptyset_0)^2 l_2$

$F'_{2avg} = 32.79$ N

$\emptyset_0 = 45° \rightarrow F'_{2avg} = 35.268$ N

$\emptyset_0 = 60° \rightarrow F'_{2avg} = 37.7444$ N

The following data from the table 1 are the relations of length of lever arm and the counter weight which are observed from the experiment of two stage-oscillating machine to get the oscillating motion with mass balancing and are used in calculating the output force. Before fabricating, the machine has to be avoid the out of balance and too much friction in bearings.

Table 1. Relations of Lever Arm Length and Counter Weight

Run no.	Length of lever arm, l_1 (mm)	Counter weight, m_2 (kg)
1	385	8.2
2	410	8.2
3	435	8.2
4	385	8.7
5	410	8.7
6	435	8.7

The table 2 is figured out the calculation of input energy and output force for the two-stage mechanical oscillation machine. The initial point starts from the angle of 30° and ends at that of angle 90° because the pendulum waving is too small to lift the lever arm below the angle of 30° and the maximum moving area does not overcome above the angle of 90° not to hit the lever arm. Therefore, the initial angle should be 30° and 90° for this two-stage mechanical oscillation motion. The relation of the angle and the output forces are also shown in figure 3.

Table 2. CalculatedResults of Input Energy and Output Force

Run no.	Initial angle (°)	Input energy(J)	Output force(N)
1	30	1.472	32.79
	60	3.218	35.268
	90	5.4936	37.744
2	30	1.472	32.309
	60	3.218	34.946
	90	5.4936	37.584
3	30	1.472	34.76612
	60	3.218	37.397
	90	5.4936	40.0361
4	30	1.472	31.826
	60	3.218	34.6245
	90	5.4936	37.4228
5	30	1.472	34.378
	60	3.218	37.077
	90	5.4936	39.875
6	30	1.472	35.244
	60	3.218	37.721
	90	5.4936	40.197

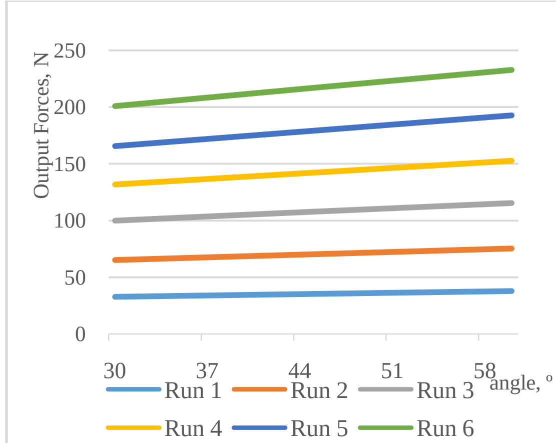

Figure 3. Comparison of Variable Calculated Forces

IV. EXPERIMENTAL INVESRTIGATION OF TWO-STAGE MECHANICAL OSCILLATOR

After evaluating the angle, the lever arm length and counter weight, the two-stage mechanical oscillator is constructed by using the trial and error method. In this study, fabrication and design calculation are carried out in parallel. After that, the experiments are conducted.

Table 3. Relations between variable lengths and masses

Run No.	l_1 (mm)	l_2(mm)	m_1(mm)	m_2(mm)
1	385	610	3.2	6.4
2	410	610	3.2	6.4
3	435	610	3.2	6.4
4	385	610	3.2	8.2
5	410	610	3.2	8.2
6	435	610	3.2	8.2
7	385	610	3.2	8.7
8	410	610	3.2	8.7
9	435	610	3.2	8.7

The table 3 is related with the variable left and right lever arm lengths and pendulum mass m_1 and counter weight m_2. These data are used in measuring the output force in the practical experiment. The output forces are measuring with weight scale which is shown in the table 4.and the results are figure out in figure 4.

When two-stage mechanical oscillator is constructed, the output energy is not still useful work. Therefore, there are a need to transfer from mechanical energy to electrical energy. The Autodesk Invertor Professional 2014 software is used to analyze the motion of the two-stage mechanical oscillating machine. The design modelling is shown in the figure 5. The actual design fabrication is shown in the figure 6. In this experiment, the two-stage mechanical oscillating machine is attached with the DC electric dynamometer to get the electricity attached with the gear mechanism. The attachment device is ready to produce the electricity.

Table 4. Experimental Results of Two-Stage Oscillator

$Ø_0$	Experimental Output Forces (N)								
	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8	R_9
1	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-
20	-	-	-	20	22	-	20.2	25	25
30	14	15	15	28.5	33.6	25.5	26.4	34.8	35
40	17.5	18	18.5	34.2	35.7	33.8	35.5	35.7	35.8
50	20	22.5	20.5	36.7	36	36.9	36.8	28.5	38.9
60	25	24.5	25.5	38.8	40	40.1	40.2	40.5	41.2
70	-	-	-	-	-	-	-	-	-
80	-	-	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-	-	-

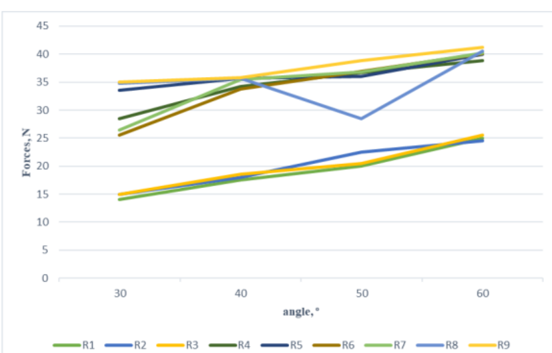

Figure 4. Experimental Output Results with Initial Angle

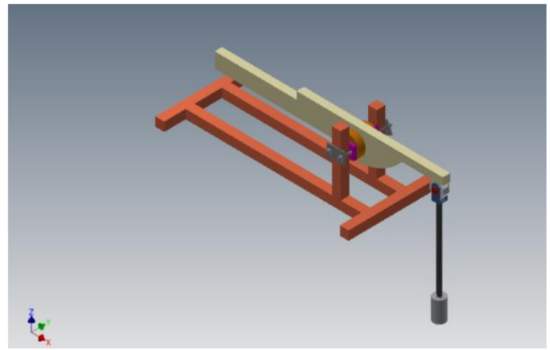
Figure 5. Design Modelling with Autodesk Invertor Professional 2014 Software


Figure 6. Construction of Two-Stage Mechanical Oscillator with Gear

V. RESULT AND DISCUSSION

The two-stage mechanical oscillator provides the oscillation motion. At the end of the lever arm, the output force provides vertically as the outer weight moves up and down. The output calculation result is the maximum (40.196N) at l_1 = 435 mm, m_2 = 8.7 kg, $Ø_0$ = 90°, m_1 = 3.2kg and l_2 = 610mm. Meanwhile, the experimental result is the maximum (41.2N) at l_1 = 435 mm, m_2 = 8.7 kg, $Ø_0$ = 60°, m_1 = 3.2kg and l_2 = 610mm. As the calculated result is compared with experimental one, the maximum experimental output force outcomes more than calculation one at the initial angle, $Ø_0$ = 60° as the initial angle deals with the input energy. However, the output energy is not too much difference between the calculation and experimental results. Besides, in the experiment, the output energy doesn't outcome at the initial angle $Ø_0$ = 90° because of out of balance. There has one of the factors in this machine as the weak point. There are losses in this machine due to friction. In this machine, mass balancing is prominent for the machine to operate instantaneously. To obtain the optimum output results, the machine is needed to reduce friction by using bearing ring and to operate the stable condition.According to the results, the output force at run 8 at 50º angle is differed from the other experimental measurement because of weight scale error. The calculated results of output forces are less than that of experiment. As the comparison, the maximum calculated force is available at the angle of 90º meanwhile the maximum experiment force is only found at the angle of 60º. The difference between these two results are approximately close within the range of 40N and 42N. However, the actual experimental measurement force is maximum at the angle of 60º and the rests above the angle of 60º are out of balancing to measure the results. Compared with these data at the angle of 60º, the difference between them is around 8%.

VI. CONCLUSION

In this research, two stage mechanical oscillator is constructed by using trial and error method. This machine intends to produce energy by amplifying from gravity and transform into useful electricity by using pendulum. Nowadays, this machine is widely used in the world but meanwhile, in our country, this has not been used yet. As the result, m1(3.2 kg), m2 (8.7 kg) and l1(435 mm), l2 (610 mm) and initial angle between 30°and 60° yield useful energy output. As well as in experimental result, maximum output energy is produced from initial angle ($\emptyset_0$=60°). In comparison, experimental result and analysis result are approximately the same. Main point in this machine is mass balancing. If the mass is not balanced, it does not work and cannot give output energy. Useful energy is from initial angle within the range of 30° and 60° and the remaining angle can only represent out of balance according to the experiment and Jovan Marjanovic's theory.

VII. NORMALCLATURE

m_1 = pendulum bob weight
m_2 = counter weight
l_1 = length of the lever arm for m_1
l_2 = length of the lever arm for m_2
$\emptyset_0$ = initial angle to move pendulum
h = height of lever arm due to oscillating motion
E_{in} = input energyof pendulum
$F'_{(2avg)}$ = average effective force
$l_{(bob)}$ = pendulum bob length

REFERENCES

[1] Veljko Milkovic. December 27, 2013. Gravity Machines Book. ISBN-13: 9788688883030, 1st Edition, Serbia.

[2] Patrick J. Kelly. June 19, 2014. PJK Book – Practical Guide to "Free Energy" Devices. 25.92 version, United Kingdom.

[3] Veljko Milkovic's pendulum power of free energy (online). Available: http://www.veljkomilkovic.com.

[4] Veljko Milkovic's two stage oscillator research lab home page (online).Available:http://www.rexresearch.com/milkovic/milkovic.htm.

[5] S. Nithiya, K. Sadhuna, A. Saravanan. 2014. "Energy Harvesting Using Oscillating Pendulum", IJRDE. ISSN: 2279-0500, special Issue: pp-017-019. India.

[6] Jovan Marjanovic, B.Sc. in electrical engineering. October 07,2008. "Keys of The Understanding of Gravity Machines". Novi Sad, Serbia.

[7] Veljko Milkovic Research & Development Center, Bulevarcara Lazara 56, 21000 Novi Sad, Serbia, address code 403652 webpage (online) Available: http://www.pendulum-lever.com.

[8] K. Preyankha, V. Sheeba Rani, G. Spoorthi, M. Sushma Bala. 2014."The project report GRAVITY POWER GENERATION", B. Engineering project. Gokaraju Rangaraju Institute of Engineering and Technology.

[9] Science and invention of Leonardo da Vinci free encyclopedia webpage(online). Available: http://www.freewikipedia.com.

[10] Nikhade, G. R., Patil, R.U. and Bansal, S. P. 2013. "Two-Stage Oscillator Mechanism for Operating a Reciprocating Pump". Department of Mechanical Engineering, Shri Ramdeobaba College of Engineering and Management, Nagpur, India.