EUROPEAN ACADEMIC RESEARCH
Vol. VI, Issue 9/ December 2018

Impact Factor: 3.4546 (UIF)
DRJI Value: 5.9 (B+)

ISSN 2286-4822
www.euacademic.org

Designing a 3000 Watt Non-Fuel Power Plant Machine Using Flywheel Rotation

RAZALI
Department of Mechanical Engineering
MUHARNIS
Department of Electrical Engineering
Bengkalis State Polytechnic, Riau, Indonesia

Abstract

Recently, the need of energy has increased, however the resource is very limited. Therefore, it is very important to conduct further research on alternative energy. Based on these issues, it is necessary to make an applied flywheel in an electric generator, in order to produce a concept of energy efficiency and increased power, stabilizing the output voltage on the generator. The process of making the applied generator flywheel machine started from designing the mechanic of the flywheel, calculating for the number of rotation per minute and the power produced by the generator (with experiments), it is found that a 40 kg flywheel produces better voltage on the generator compared to the other four flywheels. The voltage produced is 230 V in 15 seconds of test and 1480 rpm flywheel rotation.

Key words: Power Plant, Flywheel

INTRODUCTION

Electrical energy is one of the most important and vital human needs that cannot be separated from daily life. Human can hardly do work well or fulfill their needs without electric. The lack of electrical energy may affect daily activities. Therefore, the existence of electrical energy must be maintained.

Nowadays, the use of electricity is increasing as the population increased and the information and technology advanced. As the crisis of the lack of energy resource appeared, the role of an energy storage device becomes very important due to the efficient use of energy. One of the most effective storage devices that can store the energy to be reused is flywheel. The flywheel energy storage obtains kinetic energy in the form of rotational inertia, and store it in the form of kinetic energy, then releases it when needed. The result showed that the kinetic energy storage is so significant.

As we know, Flywheel is a disk that can withstand the drastic change of speed due to its weight so that the rotation of the machine's shaft becomes smoother. However, it is rarely known that the density of energy that flywheel has is much better compared to batteries. It can store and release the energy more quickly. Therefore, a new innovation was made which is a power plant machine using flywheel rotation. Although the power produced is not much, it is hoped that it can be used for other workshop tools.

Problem Statement

The problems of this research are formulated into; how to design a power plant using the energy stored in the flywheel and how to design a mini model of power plant using the flywheel. The purposes of this research are to design a power plant using the energy stored in the flywheel and to design a power that is effective and efficient to increase the electrical power.

LITERATURE REVIEW

Chas Campbell is an inventor from Australia, he developed a power plant using flywheel system. Chas Campbell has designed and tested a power plant that can generate by itself (over unity).

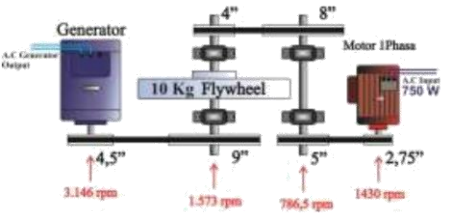

Figure.1 Chas Campbell System

According to R.S. Khurmi, et all [1], a flywheel used in a machine functions as a reservoir that can store energy during a period when the energy supply is excess and released during the period when the supply of the energy is needed.

Mardiyanto and Wijoyo [2], Perancangan Alat Uji Daya Motor Bakar Kendaraan Roda Dua dengan Metode Moment Inertia. This device tests the power with the flywheel inertia moment method to provide information on the Fuel Motor Power. This device system needs to be developed so that the flywheel inertia moment can be used as a power plant.

RESEARCH METHODOLOGY

The steps carried out during the research is described in the following flowchart

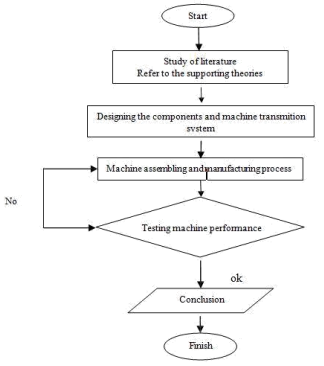

Fig. 2 The flowchart of research

After the framework of all testing device components are finished, the components were made. The components that are available on the market are directly purchased, sich as pully, belt, electric motor, generator, flywheel, bearing and other supporting components. Meanwhile, the components that cannot be found in the shops such as shaft unit were made. The process of assembling the tool's components was carried out in the Workshop and Laboratory of Mechanical Engineering Department. The manufacturing process is shown in the following diagram:

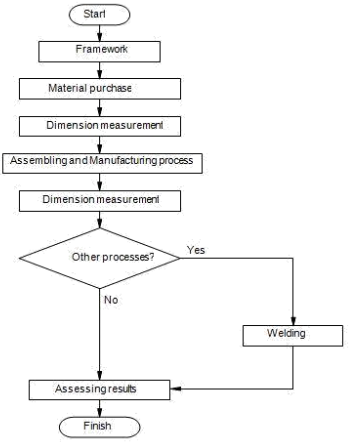

Figure.3 The flowchart of manufacturing process

RESULTS AND DISCUSSION

The flowchart of the testing is shown in below.

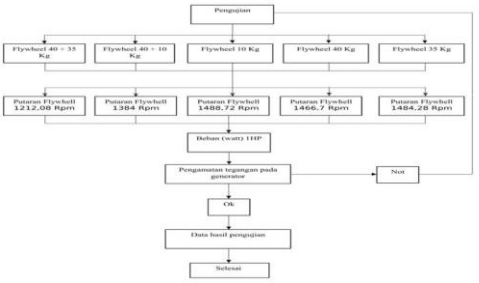

Figure.4 The flowchart of the testing of device

1. The result of 75 kg flywheel performance:

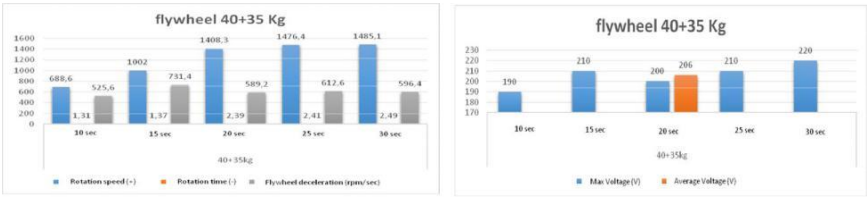

Figure 5. (a) Performance graph of 75 kg flywheel (b) The graph of Voltage produced by 75 kg flywheel

2. The result of 50 kg flywheel performance

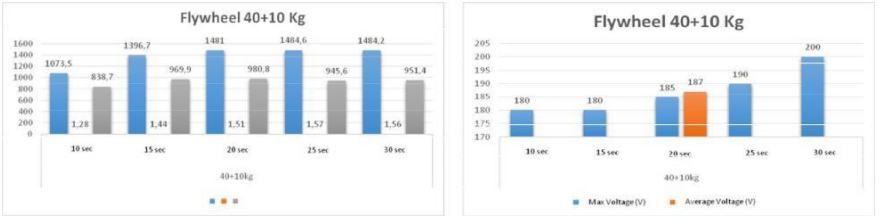

Figure 6 (a) Performance graph of 50 kg flywheel (b) The graph of Voltage produced by 50 kg flywheel

Flywheel type	Load (HP)	Initial generator voltage (V)	Final generator voltage (V)	Flywheel rotation (Rpm)
75 kg	1	220	215	1405,8
50 kg	1	200	190	1323,8
40 kg	1	240	230	1485,1
35 kg	1	240	220	1404,6
10 kg	1	210	180	1259,8

CONCLUSION, IMPLICATION AND LIMITATION

After all the research processes have been carried out, started from the literature studies, the mechanical design, the installation design, the component selection, and the device making, to the testing of each flywheel and implementation testing, there are several things that can be concluded related to this research, they are: Based on the results of all tests of the power plant system using flywheel use, it can be stated that the

system can be made but it has not become a power plant that can generate power by itself (over unity). The generator output produced is 1: 3, Based on the results of testing the weight of 70 kg flywheel, the highest rotation occurred at 30 seconds with the rotation speed of 1485.6 rpm and the stop time is 2.49 seconds. Meanwhile, for a flywheel with a capacity of 50 kg, the highest flywheel rotation occurred at of 25 seconds with the rotation speed of 1484.6 rpm and the stop time is 1.57 seconds. Whereas, for a flywheel with a capacity of 40 kg, the highest flywheel rotation occurred at 25 seconds with a rotational speed of 1487.3 rpm and the time stop is 1.36 seconds, Based on the voltage produced, it is found that a 40 kg flywheel produces better voltage on a generator, compared to the other two flywheels. The voltage produced is 230 V at the 15th seconds and the flywheel rotation speed is 1480 rpm.

REFERENCES

1. Alphaputra Yapeth, Aryamanggala. 2011. Analisis Pengaruh Variasi Flywheel Terhadap Energi Kinetik Yang Mampu Disimpan Oleh Flywheel Pada Sistem, Electro-Mechanical Kers. Surabaya: Institut Teknologi Sepuluh November
2. Cibulka, J. 2009. Kynetic Energy Recovery System by Means of Flywheels Energy Storage: Advance Engineering.
3. Mardiyanto, Wijoyo 2013," Perancangan Alat Uji Daya Motor Bakar Kendaraan Roda Dua Dengan Metode Moment Inerti": www. e-jurnal.com.
4. Muhammad Muhtada, 2014" Analisa Penyerapan Energi Kinetik Pada Berbagai variasi Kecepatan inersia Flywheel, Jurnal Rekayasa Mesin Vol, 5
5. Soebyakto 2014, "Prototype Pembangkit Listrik Tenaga Ombak SistemOsilator".
6. Sutrisno, 1984. "Fisika Dasar 2 Mekanika", Bandung: ITB Bandung.
7. Tipler, Paul A. 1998. " Fisika untuk Sains dan Teknik". Jilit 1 Jakarta : Erlangga