Study of Designing Electrical Energy Plants With Feedback Method From Generator Output

Samsurizal(1), Andi Makkulau(2) , Miftahul Fikri(3), Junas Haidi(4), Hendri Hestiawan(5)
[1,2]*Departement of Electrical Engineering*, Institut Teknologi PLN, Jakarta Barat, Indonesia
[3]*Departement of Electrical Technology*, Institut Teknologi PLN, Jakarta Barat, Indonesia
[4] *Departement of Electrical Engineering*, Universitas Bengkulu, Bengkulu, Indonesia
[5] *Departement of Mechanical Engineering*, Universitas Bengkulu, Bengkulu, Indonesia

Email address : ***samsurizal@itpln.ac.id**

***Abstract*— The use of electricity has now become a primary need for people who are used for activities as an energy source such as: lights, air conditioners, water pumps, washing machines, TVs, etc. and the longer the need for electrical energy in Indonesia is increasing while power plants are constantly increasing, this forces the government to continue to build power plants to meet the needs of electrical energy in the community. Of course, the construction of this power plant uses very large costs and various obstacles, one of the obstacles is that fuel that used to be a power plant used a lot of oil, now switches to gas and coal to reduce high electricity production costs. The research method that will be carried out is by feeding the generator output back into a rotor drive energy source so that there is a continuous circulation of energy so that the generator output can be charged according to the remaining power capacity fed by the generator. Based on the test results, results were obtained using a 25 Watt DC motor when the input voltage was 12 Volts the power generated on the motor was 13.8 Watts with a motor speed of 768 rpm. Testing on an 800 Watt generator obtained a maximum rpm result of 764 and a vout of 13.8 volts. the highest input voltage (Vin) obtained was 10.06 volts, the output voltage (Vout) was 3.9 volts, and the power produced was 41.34 Watts. The prototype design that was tested produced energy even though the results were still not significant.**

Keywords—Generators, Feedback, New Energy.

I. INTRODUCTION

From year to year the price of electricity has increased coupled with the lifting of electricity subsidies by the government for the middle and upper class from per kWh of Rp 900 to Rp 1500. This certainly makes people's expenses increase, even small entrepreneurs are threatened with going out of business because production costs have increased sharply so that small entrepreneurs have to increase the selling price of goods to cover very high electricity costs and this will match the decline in people's purchasing power for these products.

The country of Indonesia is a very large country consisting of islands that make it difficult for PLN to install electricity, so that not a few regions in Indonesia have not enjoyed electricity such as inland areas and small archipelago areas. Of course, with the above reasons, a cheap and even free source of electrical energy must be found for the poor and small entrepreneurs.

Thus we will conduct research on creating free electrical energy Generation of Electrical Energy With The Feedback Method From The Output Generator To Create Free Electrical Energy That Can Be Utilized By Areas That Have Not Been Reached By PLN And Small Entrepreneurs So That The Community's Economy Can Develop.

The advantages of generating electrical energy with the feedback method of this generator output compared to other renewable energy do not depend on temperature, weather, summer or rainy season and the weakness of this feedback generation system cannot generate large power and fluctuating loads, so it is suitable for the needs of household and home industries that believe in stable loads such as lighting lamps and water pumps. Because Indonesia geographically consists of islands, it is an obstacle for PLN to install electricity networks in remote areas. To support the government's program to find cheap alternative energy, this research was carried out designing and testing the Generation of Electrical Energy With the Feedback Method from the Output Generator to Create Free Electrical Energy.

II. METHODS

The research method used by making prototypes and experiments, the generator used is a DC generator. From the generator, one generator will be obtained that believes the most optimal output so that it will be used as a feedback generator. After the type of generator is obtained, an experiment will be carried out to determine the most optimal generator drive, whether it is an AC motor or a DC motor. After the generator and motor as the generator drive are obtained, the assembly of Electrical Energy Generation will be carried out by the Feedback Method from the Generator Output. After the plant is completed, a load test will be carried out starting from the minimum load to the maximum load with a loading scale of 5 Watts. So that the performance ofthe Generation of Electrical Energy With the Method of Feedback from the Output Generator can be seen. The design is shown in figure 1.

As for this research, the design made is studied in figure 2 below.

https://jurnal.polines.ac.id/index.php/eksergi

ISSN 0216-8685 (print); 2528-6889 (online)

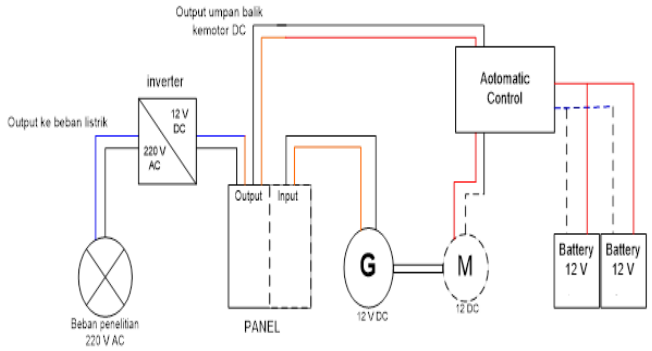

Fig. 1. DC generator power plant design driven by DC motor

III. Results and Discussion

In this study, it began with the design of the testing equipment and the next stage a simulation was carried out to see the value of the power produced. This research will be conducted in the energy and electrical engineering conversion laboratory of Bengkulu University and the electrical machinery laboratory of the PLN Institute of Technology. To obtain the optimal generation of electrical energy by using the generator feedback method.

A. Tool Designing

In this study before testing and simulation of the design and the tools used include:

1. DC generator with an output power capacity of 800 Watts
2. While the electric motors used are AC and DC motors with high torque specifications and rotation equating with generator rotation.
3. Inverters and Rectifiers
4. Controler
5. 12 V DC voltage battery with 100 Ah capability.
6. Electrical panels for load splitters.
7. Cables and tools of the protection system.
8. Multimeter

The prototype that was made and tested is shown figure 3.

Fig. 2. Prototype generator with feedback

B. Testing and Analysis

The next stage in this study is by conducting testing and analyzing the test results that have been obtained. From the tests carried out in order to obtain a plant that is able to output the most power and the generating system works stably at the time of loading. The initial stage of testing was carried out testing the characteristics of a 25 Watt DC motor without load shown in table 1.

Table 1 Character Data DC Motor 25 Watts No Load

Vin (V)	Iin (A)	Power (W)	Rpm
1,05	0,1	0,105	76,3
2,06	0,16	0,3296	119
3,06	0,24	0,7344	182
4,05	0,32	1,296	246
5,07	0,41	2,0787	311
6,02	0,54	3,2508	375
7,03	0,63	4,4289	442
8,01	0,74	5,9274	505
9,02	0,89	8,0278	566
10,02	0,95	9,519	638
11	1,05	11,55	703
12	1,15	13,8	768

Based on the tests carried out is shown the table. 1 that is by using a 25 Watt DC motor without load to see the power characteristics and speed of the motor produced. The test was carried out by regulating the input voltage and changing every 1 volt, the results were obtained that the greater the input voltage, the greater the speed of the motor produced, when the input voltage was 12 Volts the power generated on the motor was 13.8 Watts with a motor speed of 768 rpm. The DC motor used during testing is shown in figure 4.

https://jurnal.polines.ac.id/index.php/eksergi

ISSN 0216-8685 (print); 2528-6889 (online)

Fig. 3. DC motor test equipment 25 watt

Furthermore, the motor load testing / torque test stage is carried out to see the extent ofthe performance si of the power generated presented in table 2 using a 25 Watt DC motor.

TABEL 2 MOTOR LOAD TEST / TORQUE TEST

Vin (V)	Iin (A)	Power (W)	Torque (Kg/cm)
1	0,35	0,35	3,5
2	1,2	2,4	6,8
3	2,8	8,4	11
4	5,5	22	14
5	7,2	36	18
6	13	78	21

From the test results presented in table 2, it can be seen that to get a large torque, a large power is needed, when the test is carried out by setting the input voltage (Vin) to be increased every 1 volt, but when testing the input voltage of 5 Volt, a power of 36 Watts with a torque of 18 kg / cm is obtained, this makes the motor over heat and only continued up to Vin 6 Volts and get an Iin result of 13 Amperes, 78 Watt power and 21 kg / cm torque, over heat that occurs because the dc motor used is only 25 Watts. However, from these tests, it can be said that the torque we want to know can be obtained by increasing the power capacity of the motor.

The next stage using an 800 Watt capacity generator with a 25 Watt DC motor drive is presented in table 3 with no-load testing.

Based on table 3, it can be seen with the generator capacity of 800 watts used, that the highest input voltage (Vin) obtained is 10.06 volts, the output voltage (Vout) is 3.9 volts, and the power generated is 41.34 watts. The result obtained is also presented in the form of a graph in figure 5.

TABEL 3 PENGUJIAN GENERTOR KAPASITAS 800 WATT DENGAN MOTOR 25 WATT TANPA BEBA

Vin (V)	Iin (A)	Power (W)
1,02	0,33	0,3366
2,06	0,64	1,3184
3	0,8	2,4
4,01	1,26	5,0526
5,01	1,54	7,7154
6,5	1,8	11,7
7,05	2	14,1
7,56	2,64	19,9584
8,08	2,85	23,028
9,05	3,35	30,3175
10,04	3,68	36,9472
10,6	3,9	41,34

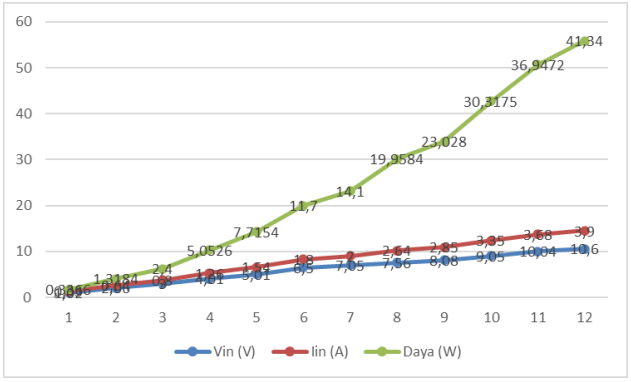

Fig. 4. Test results graph

The test picture carried out is shown in figure 5 by connecting the generator with the motor to obtain the amount of power generated in each test.

Fig. 5. Generator testing

https://jurnal.polines.ac.id/index.php/eksergi

ISSN 0216-8685 (print); 2528-6889 (online)

The next stage in this study was to test the output produced on an 800 watt capacity generator, the test was carried out by looking at and adjusting the Rpm rotation presented in table 4.

TABLE 4 GENERATOR CAPACITY 800 WATT NO LOAD

Rpm	Vout
95	1,4
154	3,8
242	5,4
327	8,6
411	10,8
455	12,4
500	13,6
539	13,8
630	13,8
716	13,8
725	13,8
764	13,8

Based on those presented in the form of graphs shown in figure 6.

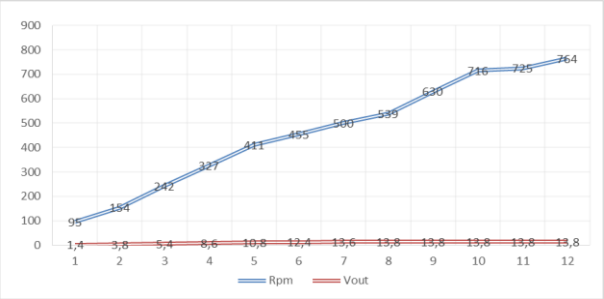

Fig. 6. Graph of testing generator capasity 800 Watt No Load

Judging from the figure 6, testing a generator with a capacity of 800 Watts, it can be said that the faster the rpm / rotation of the generator, the output produced from the generator is also greater. Because the capacity of the generator is limited, the largest output result is 13.8 volts, which occurs when the rpm shows 764.

In the design by making a prototype, it can be said that it is in accordance with what was desired in the early stages of this test, although the output of the generator produced is still small, it can be said that using this feedback method, electrical energy can be obtained that can be used to load or stored on the battery.

IV. CONCLUSION

Conclusions from the research that has been carried out and based on simulated tests include:

1. By using a 25 Watt DC MOTOR without load to see the power characteristics and speed of the motor produced, the greater the input voltage, the speed of the motor produced is greater, when the input voltage is 12 Volts the power generated on the motor is 13.8 Watts with a motor speed of 768 rpm
2. Testing on an 800 Watt GENERATOR obtained a maximum rpm of 764 and vout of 13.8 volts. the highest input voltage (Vin) obtained was 10.06 volts, the output voltage (Vout) was 3.9 volts, and the power produced was 41.34 Watts.

The design of the DC generator power plant is driven by an AC motor and the generator output is fed by the electric motor and the load has been prototyped and produces energy although the results have not been significant.

ACKNOWLEDGMENT

The author would like to thank LPPM through the PLN Institute of Technology for funding and providing support. Bengkulu University helped carry out research and or writing this article, hopefully this article will be useful.

REFERENCES

[1] Al-Fikri, H. I. 2014. Analisis Pembangkit Listrik Dengan Generator Stirling. Jurnal Teknik Elektro Universitas Tanjungpura, 1(1).

[2] Anonim, 2008, "Energy Systems Engineering Technology, Idaho State University

[3] Asy'ari Hasyim., Jatmiko., Ardiyatmoko Azis., 2012, "Desain Generator magnet permanen kecepatan rendah untuk pembangkit listrik tenaga angin atau bayu (PLTB)" Seminar Nasional Aplikasi Teknologi Informasi, Yogyakarta.

[4] Budiman Wildan, dkk., 2014, " Perancangan dan realisasi sistem pengisian baterai 12 Volt 45 Ah pada pembangkit listrik tenaga Pikohidro di UPI Bandung", Jurnal Reka Elkomika. Vol.2 No.1, januari 2014, p 1-12

[5] Djaufani Beny Muhamad, dkk., 2015, " Perancangan dan realisasi kebutuhan kapasitas baterai untuk beban pompa air 125 Watt menggunakan pembangkit listrik tenaga surya", Jurnal Reka Elkomika. Vol.3 No.2, juli 2015, p 75-86

[6] Habibi Afnan Muhammad, dkk., "Kajian penggunaan motor listrik DC sebagai penggerak speedboat", Universitas Brawijaya, Malang.

[7] Sdiyarto., 2010, "Dampak Perubahan Putaran Terhadap Unjuk Kerja Motor Induksi 3 Phasa Jenis Rotor Sangkar", Jurnal Kompetensi Teknik. Vol.1 No2, Mei 2010, p 57-64

[8] Khairi Agung, Amien Syamsul., 2014, " Analisis pengaruh jatuh tegangan terhadap torsi dan putaran pada motor arus searah penguat shunt", Jurnal Singuda Ensikom. Vol.6 No.2, Februari 2014, p 54-59

[9] Mismail Budiono., 2011, "Sistem tenaga dan telkomunikasi jilid 3", UB Press, Malang

[10] Nazaruddin Nazris., 2011, " Pembuatan inverter satu phasa berbasis mikrokontroler dengan gelombang sinus untuk kontinuitas pelayanan listrik", Jurnal Poli Rekayasa. Vol.7 No.1, januari 2014, p 18-30

[11] Putra, R. P., Samsurizal, S., & Pahiyanti, N. G. 2018. Desain Sistem Kontrol Penggerak Mula Generator Magnet Permanen PLTMH Menggunakan Planetery Gear. KILAT, 7(2), 149-159.

[12] Portela Pedro., Sepulveda Joao., Esteves Sena Joao., 2008, Alternating Current and Direct Current Generator, International Journal on hands on science, The hands-on scienc network. Vol.1 No1, November 1, September 2008, p 44-46

https://jurnal.polines.ac.id/index.php/eksergi

ISSN 0216-8685 (print); 2528-6889 (online)

[13] Sarjan Muhammad., 2011, “perbandingan karakteristik motor induksi belitan gelung dengan belitan spiral”, Jurnal ilmiah foristik. Vol.1 No.1, Maret 2011, p 6-15

[14] Waroh p.y. Anthoinete., 2013, ” Analisis dan simulasi sistem pengendali motor DC”, Jurnal ilmiah Sains. Vol.14 No.2, Oktober 2014, p 80-86

[15] Yoakim Simamora, Samsurizal, Zalmahdi. 2018. Pembagian Pembangkitan Sistem Pembangkit Termal Pada Kondisi Beban Yang Berubah Terhadap Waktu Menggunakan Quadratic Programming. Energi & Kelistrikan, 10(1), 78-83. https://doi.org/10.33322/energi.v10i1.331

https://jurnal.polines.ac.id/index.php/eksergi

ISSN 0216-8685 (print); 2528-6889 (online)