

# Keyboard-Gen to Produce Electrical Energy Using Macro Fibre Composite (MFC)

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**Abstract**— the problem of limited energy to cope with the fulfillment demand for electricity, it can be done by creating a new innovation that has power and ability to reduce depend on electricity from country. Innovation Keyboard-Gen to Produce Electrical Energy using Macro Fibre Composite (MFC), the electricity producer Keyboard using Macro Fiber Composite (MFC) can generate due to the piezoelectric effect which the result of the polarization between positive and negative poles can generate electrical energy. Where in the piezoelectric substrate has a part that is most efficient to develop and can convert 80 percent of mechanical energy into electricity. Keyboard-gen has systematically work as follows: 1 ) The user can type using the keyboard and the resulting output can be displayed visually via the monitor; 2 ) mechanical voltage will then be converted into an electric current through the piezoelectric effect; 3 ) The energy produced can be applied directly, or saved to be used for future. MFC will generate a high voltage to be used to charge the capacitor. Then, the DC voltage of the capacitor via micro-transformers. Micro-step-down transformers will strengthen the flow and lowering supply voltage until around 3.60 to 5.20 VDC to the LED circuit.

**Keywords**— *Keyboard; Generator; Renewable Energy; Macro Fibre Composite (MFC)*

## I. INTRODUCTION

Energy demand of electric energy particularly in Indonesia, growing into indispensable part of people's living needs. Electrical energy developed between increased development in the field of technology, industry and information [1]. For that problem we need an appropriate technology, efisien and able to produce a large electrical energy capacity.

Electrical demand in Indonesia is increasingly rising. Refer to the total electrical capacity of 49.630 megawatts have been installed. The demand for electricity during the year 2013 amounted to 188 terrawatt and 2014 is estimated at 208 terrawatt. Some areas in Indonesia will have limited power supply because the need is greater than the power supply. From 188 terrawatt, 41% of household used, industry 34%, 19% business, and public 6% [2]. Increased demand for

electricity in the future is expected to grow an average of 6,5 percent per year until 2020 [3].

In addition to the growing electricity needs, the lack of electricity supply today due to the number of existing power plants is currently no increase. To cope with the fulfillment of the demand for electricity, it can be done with the new innovations that have power to reduce the dependence of electricity from the Country.

This Keyboard with specially designed can be used for various purposes began to turn mobile phones, GPS and MP3 players, even in large quantities it can be used to turn on the laptop. And usually the type using a keyboard typing more than 10,000 per day. It's very big potential energy wasted when it is used as an alternative energy that has been untapped.

Therefore, it is necessary to create a keyboard-gen, which energy whenever typing one character was able to convert into electricity and store it. With the increasingly rapid growth of technology, gadgets almost possessed by everyone because the need for it is increasing. If every person typing with a keyboard-gen every day, it can produce electrical energy which is quite amazing. The keyboard-gen has a great opportunity to use when typing with laptop/computer.

With these considerations, we took the initiative to make keyboard-gen to produce electrical energy, in order to fulfillment national electricity consumption, which is still experiencing problem primarily because of the supply. Every year, electricity rates always increase electricity tariff, so it make many complained about service and costs. Therefore, the existence of the Keyboard-gen to produce electrical energy is expected to help people fulfill the electricity needs.

### A. Piezoelectricity

Piezoelectricity is the ability of a material that can generate an electric field or electric potential in response to mechanical pressure result [4]. The piezoelectric effect is a reversible effect, where there is a direct piezoelectric effect (direct piezoelectric effect) and inverse piezoelectric effect (converse piezoelectric effect). Direct piezoelectric effect is the

production of electric potential due to mechanical pressure. While the inverse piezoelectric effect is the production of pressure due to the provision of power supply voltage, for example is lead zirconate titanate crystals that will change the dimensions of up to a maximum of 0.1 % if the given voltage [5].

In a piezoelectric crystal, the positive electrical charges and negative electrical charges are separated, but symmetrically distributed. So overall the crystalline neutral. Macro Fiber Composite (MFC) can generate a piezoelectric effect in which the results of the polarization between positive and negative poles.

Each side forming an electric pole. And when a mechanical pressure is received by a piezoelectric crystal symmetrical shape of each electrical charge is transformed into asymmetrical which will produce electric voltage. For example, 1 cubic cm quartz crystal with mechanical pressure of 2,000 Newton will generate an electric voltage of 12,500 volts.

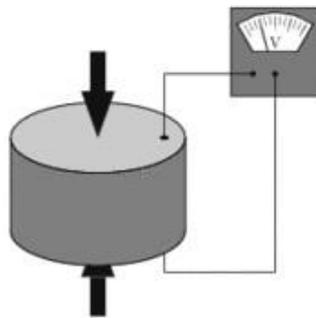


Fig. 1. Piezoelectric rubber that produce a voltage due to pressure.

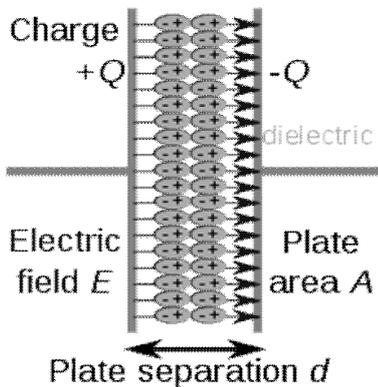


Fig. 2. Cross section deployment electrical charge of the piezoelectric crystal.

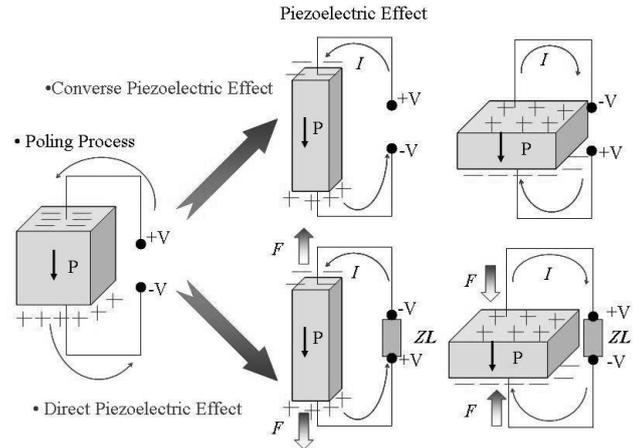


Fig. 3. Piezoelectric effect mechanism.

Under the direction of the pressure, there are three operations that can be performed namely the effect transverse, longitudinal effect, and shear effects. Based on piezoelectric technology some physical quantities can be measured, the most common is the pressure and speed. Specifications Piezoelectricity is the combined effect of the electrical properties materials namely electric flux, electric permittivity, electric field, Hooke's law.

**B. Sensor Design**

Based on piezoelectric technology various physical dimensions can be measured, the most important is the pressure and acceleration. Fig. 4 shows a schematic configuration of sensor in the configuration section. In both designs, the elements contained thin cube-shaped along the longest extension. For pressure sensor, a thin membrane known as the dimensions and the large base used; ensure that pressure is applied specifically contains the elements in one direction. For accelerometers, a seismic mass is attached to the crystal element. When the accelerometer experiencing movement, earthquake loads invariant mass of elements according to Newton's second law of motion  $F = ma$  [6].

Schematic of the specimens showed 31 - arch mode piezoelectric and measurement. Substrate layer, the upper and lower contact electrode substrate is shown. (B) dielectric pressure oscillating displacement (left axis) and induction (right axis). (C) D31 as a function of time in the field poling of  $\sim 100 \text{ kV / cm}$  [7].

Sensors tend to be sensitive with more than one physical dimension. Therefore, it is essential to offset the unwanted effects. For example, sophisticated pressure sensors often use acceleration compensation elements. Their compensation is based on the fact that the measuring element can be subjected to pressure and acceleration events. A support unit of measurement is added to the sensor assembly that is only accelerating.

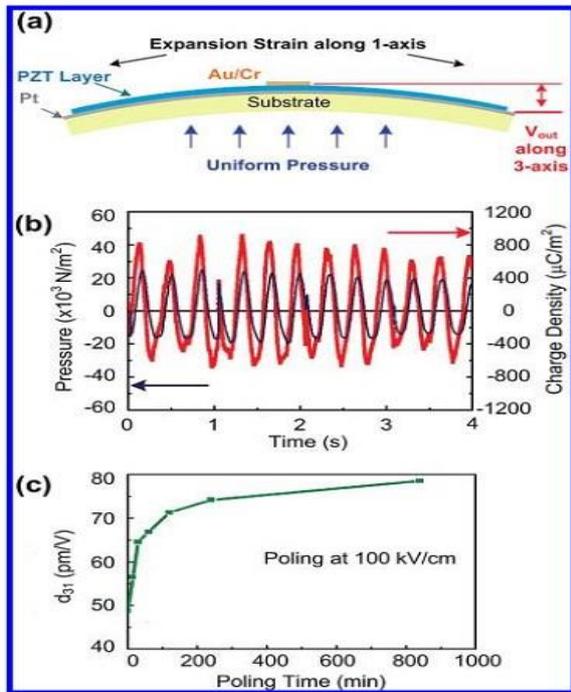


Fig. 4. Transversal piezoelectric constant .

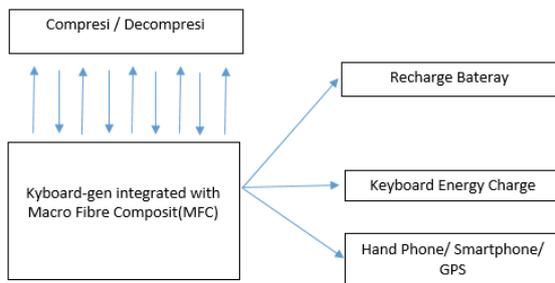


Fig. 5. Application keyboard power producer.

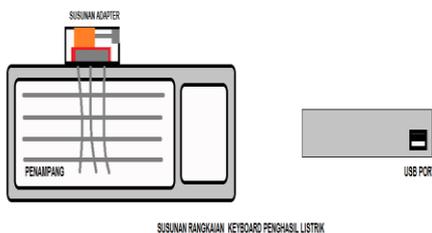


Fig. 6. Keyboard-gen Prototype Design.

The scientists describe a new manufacturing method that solves the problem of Macro Fiber Composite (MFC). It is possible to apply nano-sized ribbons of lead zirconate titanate (substrate) - each strand about 1 / 50,000 the width of a human hair to ribbons of flexible silicone rubber. Substrate is one of

the most efficient piezoelectric materials to be developed and can convert 80 percent of mechanical energy into electricity. The combination produces a super-thin films that they called piezo-rubber which seems to be an excellent material to produce energy from body movement [7].

Development of a method for integrating energy conversion materials are highly efficient, bio-compatible rubber can produce breakthroughs in alternative energy generation systems or can be used ener. Electrical energy. Electromechanically combined, the piezoelectric crystal is a particularly interesting subset smartmaterials that serves as a sensor/actuator, BioMEMS devices, and energy converters. However, the crystallization of these materials usually requires high temperatures for maximum performance efficiently, rendering them in compatible with temperature-sensitive plastics and rubber. Based piezo-forcemicroscopy indicate that their electromechanical energy conversionmetrics among the highest reported in a flexible medium. The good performance of the piezo-ribbon assemblies coupled with stretchable, biocompatible rubber allows a number of interesting street in basic research and new applications [8].

## II. METHODOLOGY

### A. Planning

This stage includes the plan preparation namely consultation with the supervisor about the preparation of the research, conducted a survey of materials, prepare the equipment used in research, and the purchase of materials used in the research.

### B. Action

This action includes the design stage a keyboard producing electricity. Illustration of the application device shown in Figure 5. The application and system flow diagrams keyboard work producing electricity following:

The following explain system in the blocks diagram:

- The user typed using the keyboard, the keyboard-gen resulting mechanical pressure (input) on the keyboard.
- Mechanical pressure on the keyboard will cause the keyboard slightly pressed down.
- Shifting down on the keyboard will cause the MFC keyboard under pressure.
- Emphasis crystal piezoelectric generator will create will generate electrical energy.
- The electrical energy produced will be stored and then used to replenish the Energy Storage.

Keyboard Prototype Power Producer (Keyboard-Gen) With Macro Fibre Composite (MFC) designed to be easy to use principle. The basic material used is a keyboard and Macro Fiber Composite (MFC) by using as a producer of pressure or vibration. Use as a producer of pressure based on

the concept to generate electricity from mechanical power so that the results will be easy to use. Keyboard-Gen design as following:

C. Observation

Phase observation is a continuation of the stage action. So, at this stage of observation, testing of the output voltage generated from the keyboard producing electricity if it is to meet the needs of weight. Observe whether the keyboard is the power producer's safe to be applied in everyday life. How MFC and its layout arrangement from other components that are effective in generating electricity.

1) Output Voltage Keyboard-Gen.

Based on the results of a large observational keyboard output voltage 4.8 VDC power producer, out voltage is stable so that it can be used to charge the battery Hand phone/Smartphone. Capacity Storage Adapter On keyboard-Gen is 2850 m Ah. MFC itself produces 0.4 VAC which will be stored in the capacitor.

2) Time Typing and Storage capacity adapter.

Energy produced is still very little is because of MFC has variations according to size to produce electricity.

3) Layout and structure

The layout and arrangement of the keyboard-gen as follows figure 2. The keyboard is made of a cross-section with a string like figure 2. The composition Laying Macro Fibre Composite (MFC) is beyond the keyboard and created a place where connected with a cross-section to get the highest pressure on the MFC.

4) The application of daily life.

At this observation phase keyboard-gen can be used for charging Smartphone, Surely keyboard-gen will also be used on other filling energy storage with 4.8 VDC input voltage.

TABLE 1. ANALYZING CAPACITY STORAGE OF ADAPTER

Typing Time	Capacity Storage
2 hours	10 m Ah



Fig. 7. Keyboard-Gen Prototype

D. Analyzing

Phase analyzing (data analysis) is investigating how much voltage is generated from the weight of varied users. How big weight that allowed users to use the keyboard. Weight Storage Keyboard-Gen is 4.8 VDC and is stable. In accordance with the use of state at the time of the observation is to use the Smartphone and managed doing charging.

III. RESULT AND DISCUSSION

Prototypes keyboard electricity producer has managed to produce electricity and was able to perform charging Energy Storage mainly Smartphone. MFC itself produces 0.4 VAC which will be stored in the capacitor. Based on the results of a large observational keyboard output voltage 4.8 VDC power producer, out voltage is stable so that it can be used to charge the battery Hand phone/Smartphone. Capacity Storage Adapter on keyboard-gen is 2850 m Ah.

IV. CONCLUSIONS

Keyboard - Gen is an idea that emerged from a need for renewable energy and human habits. This keyboard is specially designed to be able to be used for various purposes began to turn mobile phones, GPS and MP3 player and usually the type using the keyboard flat rate of more than 10,000 keystrokes per day. It's very big potential energy wasted when it is used as an alternative energy innovation so far untapped. Prototypes Keyboard-gen itself produces 0.4 VAC which will be stored in the capacitor. Based on the results of a large observational keyboard output voltage 4.8 VDC power producer, out voltage is stable so that it can be used to charge the battery Handphone/SmartPhone. Capacity storage adapter On keyboard-gen is 2850 mAh.

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