

# Establishment of Power Generation Method By Air Pressure and Its Efficiency

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## Purpose

Currently, fossil fuels are mainstream methods of power generation, but there are various problems such as rising carbon dioxide concentration in air and the depletion of fossil fuels.

Therefore, we aim to establish a small-scale and environmentally friendly power generation method that does not use fossil fuels and to improve its efficiency.

## Experiment

### < Policy >

At first, we thought about the power generation method using changes in temperature and atmospheric pressure. However, it was thought that it could hardly generate electricity because the temperature and atmospheric pressure did not change significantly in a short time. So we decided to think about the power generation method of generating and using air pressure by the pressure on the ground.

### < Preparations >

Silicone bottle, Strong adhesive tape, Neodymium magnet, Air pump, Lubricating oil, Coil, Air valve(from air pumps for floats)

### < How the Device Works >

Add pressure from above  
↓  
Air is pushed out of the bottle  
↓  
With the extruded air, the magnet attached to the device moves  
↓  
The coil causes electromagnetic induction  
↓  
Generate electricity  
↓  
Repeat the process

### < Experiment 1 >

Use one silicone bottle and one air pump. When the silicon bottle is stepped on, air is forced out of the bottle, and the air pushes a piston with a magnet attached. Magnets attached to the piston move through the coil and generate electricity by causing electromagnetic induction. Confirm that current is generated and measure the amount of generated electricity.

Add pressure here

Air

Figure 1 Apparatus in Experiment 1

### < Experiment 2 >

Make two devices for experiment 1 and place them facing each other. This allows the two pistons to push against each other and generate electricity continuously. In addition, two air valves are attached to each end of each bottle so that it can be automatically refilled with fresh air after power generation. In this device, it is confirmed that generated electricity can be continued and the amount of generated electricity is measured.

Add pressure here

Air

Air

Add pressure here

Figure 2 Apparatus in Experiment 2

## Result

### <Experiment 1>

It was confirmed that a very small amount (0.01mA) of current was generated by a magnet passing through the coil. However, after the magnet passed through the coil once, it was impossible to continue to generate power because the magnet did not return to its initial position (the magnet only moved one way through the coil)

### <Experiment 2>

In order to correct the shortcomings of experiment 1, when I increased the number of bottles and air pumps to 2 and installed air valves to send air into the bottle. Although amount of generated electricity was very low (0.01mA) as well as experiment 1, electricity enable to continue to be generated.

Table 1 : Compare Experiment 1 with 2

	Experiment 1	Experiment 2
Amount of electricity	0.01mA	0.01mA
Merit	Nothing special	Can be continued

## Experiment in the other way

### <Experiment 3>

From experiments 1 and 2, it became clear that the reciprocating motion of pistons and magnets can be used to convert the pressure on people stepping on the ground into electricity. However, the amount of generated electricity was low, so I thought I had to find another more efficient way. So I came up with a way to use a windmill, that is, a way to turn a windmill by the air pushed out by stepping on the bottle.

### < Result >

We made a windmill using a plastic bottle as a material and succeeded in turning the windmill by the flow of pushed out air. However, its power is weak and the speed of rotation is slow, so it was thought that the efficiency would be lower than experiments 1 and 2 if it was aimed at amount of generated electricity. Therefore, the method of using this wind power has been discontinued.

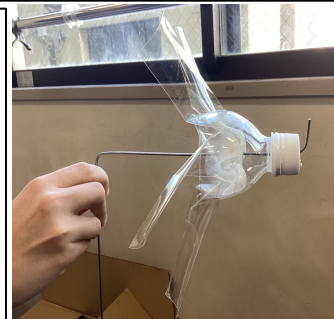


Figure 3 Windmill Made of a PET Bottle

## Evaluation

Since the device can generate really low electricity (0.01mA), it is clear that to use it is difficult now. However, considering the fact that it requires little work, consumes few resources, has little negative effect on the environment, and can be placed in various locations, it will surely be useful to society in the future.

## Future Outlook

In experiments 1 and 2, the silicone bottles and the air pumps or air valves were connected by adhesive tape, however it is considered that this cannot connect completely. Unfortunately, there were some chinks between the silicone bottles and the air pumps or air valves. If they are connected by stronger adhesive, there will be no chink and the air will be able to be used only for generating electricity. Therefore, the amount of electricity generated must increase.

In addition, all the materials used for the device were parts taken from ready-made goods that had been dismantled. For example, the air valves were existed from air pumps for floats. So, sometimes inconvenient occurred. If dedicated parts were used to build the device instead of parts existed from ready-made goods, the amount of electricity generated must also increase.